Deposit Insurance, Market Discipline and Bank Risk

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Abstract

Using evidence from Russia, we explore the effect of deposit insurance on multiple measures of bank risk. Drawing on bank-level variation in the ratio of deposits held by households and firms, so as to isolate the so as to isolate the change in market discipline after the introduction of deposit insurance, we demonstrate that banks for which the decline in market discipline was relatively large were more likely to experience a greater subsequent increase in traditional measures of risk and a greater subsequent rate of failure. These results are robust to the inclusion of time-varying bank-specific controls and bank-level fixed effects. Moreover, they hold in a difference-in-difference setting in which state and foreign-owned banks, whose deposit insurance regime does not change over the period of analysis, serve as a control.

Keywords: deposit insurance, market discipline, moral hazard, risk taking, banks

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1 Introduction

Architects of modern financial safety nets face a challenge if policies designed to stabilize the banking sector weaken stabilizing forces already in place (Calomiris, 1999). The introduction of explicit deposit insurance poses just such a dilemma. Its potential for limiting bank runs (Diamond and Dybvig, 1983) explains its adoption throughout the world over the past generation (Demirgüç and Kane, 2002). But its capacity for desensitizing depositors to the consequences of institutional failure may relax an important, market-disciplining, constraint on the build-up of excessive risk. These potentially offsetting effects raise the stakes for empirical analysis, giving greater urgency to the question of how deposit insurance in fact affects bank risk.

Much of the published research on whether explicit deposit insurance actually relaxes market discipline and increases bank risk draws on comparisons across banks or countries that vary with respect to deposit insurance coverage. But correlations identified through cross-sectional variation are open to criticisms of omitted variable bias and reverse causation. A smaller number of studies infer the impact of deposit insurance on market discipline and bank risk by comparing the behavior of a well-defined group before and after the introduction of explicit deposit insurance. This approach, however, cannot dismiss the possibility that results are driven by time-specific factors other than the introduction of insurance. In an earlier paper (Karas et al., 2013), we exploited what amounted to a quasi-experiment from the introduction in 2004 of explicit deposit insurance in Russia to circumvent these identification problems. In a manner unique to the literature, we explored how deposit insurance affected the deposits of households relative to those of firms, an uninsured control group. Using a difference-in-difference estimator, we demonstrated that household sensitivity to bank capitalization diminished markedly after the introduction of deposit insurance. The quasi-experimental setting, in other words, turned up strong evidence of deposit insurance causing a decline in market discipline.

This earlier paper, however, did not address whether decreases in market discipline actually translate directly into increases in bank risk. We did not explore whether banks at which the deposit-insurance-induced decrease in market discipline was relatively significant were indeed the ones that were more apt to take on greater risk. It is to this question that we turn in this paper. To answer it, we begin from an assumption, well-grounded in the empirical and theoretical literature (Karas et al., 2013; Gropp and Vesala, 2004), that the bank-level treatment effect of deposit insurance i.e., the magnitude of the decline in market discipline can be proxied for by the ratio of firm deposits to the sum of firm and household deposits. Banks relatively more dependent on firm deposits, ceteris paribus, experience a lesser decline in market discipline.

Drawing on bank-level variation in this deposit ratio, both before and after the introduction of explicit deposit insurance, we demonstrate that banks at which the decline in market discipline is relatively large were more likely to experience both a greater subsequent increase in several traditional measures of bank risk and a greater subsequent rate of failure. These basic results are robust to the inclusion of time-varying bank-specific controls and bank-level fixed effects. Moreover, they hold in a difference-in-difference setting in which state and foreign-owned banks, whose deposit insurance regime has not changed over our period of analysis, serve as a control.

Our findings make the following contributions to the literature. First, our data allow us to carry out what we believe to be the cleanest test heretofore of the direct impact of deposit insurance on bank risk. Second, we bring together in one analysis two related literatures as to the moral hazard costs of deposit insurance. Some articles explore the correlation between the introduction of deposit insurance and subsequent changes in market discipline but only by implication suggest consequences for bank risk. Other articles highlight the relationship between the introduction of deposit insurance and later changes in bank risk but only by implication identify a potential shift in market discipline as the intervening factor. Here, our analysis integrates both market discipline and bank risk in an explicit manner; a time-varying, bank-level measure of the former, that is, is shown to be robustly related, with a lag, to multiple measures of the latter

Our article is organized as follows. Section 2 reviews prior research on the relationship between deposit insurance, market discipline and bank risk. Section 3 reviews the relevant histories of deposit markets and deposit insurance in Russia. Section 4 introduces our data. Sections 5 focuses on identifying the effect of deposit insurance on bank risk. Section 6 offers concluding thoughts.

2 Deposit Insurance, Market Discipline and Bank Risk

Compared to much of the literature, our quasi-experimental setting allows for relatively clean identification of deposit insurance's moral hazard effect. Noteworthy initial studies drew primarily on cross-sectional variation. Some, for instance, exploited individual country caps on coverage to compare fully-insured bank deposits with those above the cap and thus only partially insured (Park and Peristiani, 1998; Martinez Peria and Schmukler, 2001). As a way to identify deposit insurances effect, this approach presented problems in so far as small, fully-insured depositors may systematically differ from large, partially-insured ones in ways related to market discipline. The latter, for instance, may be more risk averse or better informed about bank fundamentals.

Other studies have drawn on multi-country bank-level data and cross-country variation in deposit insurance policies (Demirgüç-Kunt and Huizinga, 2004; Nier and Baumann, 2006). As with within-country comparisons of insured and uninsured depositors, this approach relies largely on inferring market-disciplining effects of deposit insurance from a potentially diverse group of depositors. Those in countries with, say, more generous deposit insurance, however, may be fundamentally different from those in countries with less. As such, comparing these groups behavior may be uninformative as to how the introduction of deposit insurance affects the propensity of a given group of depositors to engage in market discipline.

To avoid drawing conclusions from a contemporaneous comparison of fundamentally different groups, a test for the effect of deposit insurance on market discipline, ideally, should involve a pre-and-post assessment. For a given group of depositors and/or banks, that is, we would like to compare behavior both prior to and after a change in the deposit insurance regime. For instance, a recent study using Bolivian data from 1999 to 2003 demonstrated that after the introduction of deposit insurance in 2001, banks, in line with a decrease in market discipline, began making riskier loans (Ioannidou and Penas, 2010). Below, our analysis initially follows this basic approach; that is, we track a well-defined group of banks before and after the introduction of deposit insurance. This type of comparison, however, can offer, at best, only suggestive evidence as to an actual effect. It cannot distinguish changes in behavior driven by the deposit insurance regime from those due to other time-contingent factors.

The most convincing evidence for a deposit-insurance-induced moral hazard effect comes from applying a difference-in-difference estimator in a quasi-experimental setting. To our knowledge, Karas et al. (2013) first adopted this approach, demonstrating that flows of newly insured household deposits in Russia became, relative to those of uninsured firms, less sensitive to bank capitalization after the introduction of deposit insurance. Lambert et al. (2017) first applied this approach in assessing the connection between deposit insurance and bank risk. Exploiting a dramatic increase in per-deposit insurance coverage ushered in by the 2008 U.S. Emergency Economic Stabilization Act, the authors demonstrate that banks whose share of insured deposits increased the most after the new policys introduction experienced the largest increase in risky lending. Like Lambert et al. (2017), we apply a difference-in-difference estimator in a quasi-experimental setting to assess the effect of deposit insurance on bank risk. Our empirical setting, however, allows us to extend their approach in several meaningful ways. First, we can assess the effect of deposit insurances introduction as opposed to its expansion. Second, we can explore the robustness of our findings to a wider array of bank risk measures. Third, we can delineate our treatment and control groups more clearly by comparing risk at banks affected by deposit insurances introduction (i.e., private domestic banks) with risk at (foreign and state-owned) banks wholly unaffected by the policy change.

Much of the empirical literature as to the moral hazard costs of deposit insurance can effectively be divided into two categories. One highlights the relationship between deposit insurance and market disciplining behavior, suggesting, but not demonstrating, that any evidence for the hypothesized relationship would necessarily hold implications for bank risk. The other focuses on the relationship between deposit insurance and bank risk, assuming, either implicitly or explicitly, that any relationship between the two can be understood as the consequence of a change in market discipline. Both literatures, in other words, recognize a potential two-link causal chain from deposit insurance through market discipline to bank risk, but each effectively ignores one of the links.

Our article, we feel, makes an additional contribution to the literature by explicitly bringing these two links together. We lay out here, for one, a natural extension of our earlier work on deposit insurance and market discipline (Karas et al., 2013). In that study, we used a difference-in-difference estimator to demonstrate that Russian households market disciplining behavior, relative to firms, abated after the introduction of deposit insurance. Here, we also use a difference-in-difference estimator, but to assess the relationship deposit insurance and bank risk. In doing so, we also connect the two aforementioned links by highlighting the relationship between a time-varying, bank-specific measure of the deposit-insurance-induced change in market discipline to the change in subsequent bank risk.

3 The Russian Context

Dating back just over two decades, Russias modern experience with liberalized deposit markets has been relatively brief. When financial markets were first permitted in the early 1990s, bank deposits, particularly those of households, were held almost exclusively by Sberbank, the state-owned savings bank. But lax entry policies in the early post-communist period contributed to the quick development of a relatively competitive market for deposits. By 1994, private banks had captured over half of the household deposit market. The mix of liberalized deposit rates, naive depositors and over-burdened regulators proved destabilizing. System-wide crises, including a particularly large one in 1998, led to the insolvency of many of the largest banks on the retail market during the first decade of post-communist reform. Obligations to tens of thousands of depositors went unmet (Perotti, 2002; Radaev, 2000; Schoors, 2001; Spicer and Pyle, 2000). These experiences quickly heightened Russians awareness of the private costs of bank failure and thus the value of carefully monitoring their financial institutions. Karas et al. (2010), for instance, provide evidence for the existence of market discipline in the half decade after the 1998 crisis, but before the introduction of explicit deposit insurance. Flows of household and firm deposits during this period were consistent with quantity-based sanctioning of weaker banks; more poorly capitalized banks, that is, were less successful in attracting the deposits of households and firms. Evidence for the standard form of price discipline (i.e., depositors requiring a deposit rate premium from less stable banks) was mixed.

Russias Deposit Insurance Agency (DIA) was created as an independent agency in January 2004 and given responsibility for administering the national deposit insurance fund. The DIA was charged with determining bank premiums, making any necessary payouts to depositors and overseeing the liquidation of insolvent banks. The Russian government provided initial seed capital but premiums payable quarterly and assessed on the daily averages of a banks insured deposits quickly became the funds primary source of financing. The deposits of households, but not firms, were to be covered. And all private banks that accepted household deposits were required to participate. All deposits up to 100,000 rubles were fully insured from when banks were first admitted into the system in September 2004 until August 2006. From then until March 2007, up to 190,000 rubles per deposit were insured, with amounts above 100,000 insured at a 90 percent rate Camara and Montes-Negret (2006). After March 2007, the 190 thousand ruble ceiling was increased to 400 thousand rubles. A further increase in October 2008 took the ceiling to 700 thousand rubles.

By January 1, 2005, several months into the systems operation, 829 banks and a bit more than 330 million deposit accounts, with an average deposit size of seven thousand rubles (roughly $252), were insured by the system. Of these accounts, 98.5 percent were under 100,000 rubles and thus fully insured. Three years later, 934 banks and roughly 383 million deposit accounts, with an average deposit size of thirteen thousand rubles (roughly $529), were covered by the program. Of these, 99.6 percent held deposits under 400,000 rubles and thus were insured at a rate of at least 92.5 percent.

Generally, it has been the case that since the introduction of deposit insurance, we have observed particularly rapid growth in personal deposits, much of which has been accounted for by term deposits with maturities between half a year and three years. Sberbanks market share, moreover, declined after household deposits became insured. There has also been a decline in the combined market share of the thirty largest banks, suggesting that the insurance scheme has contributed to greater competition within the retail banking market (Camara and Montes-Negret, 2006; Chernykh and Cole, 2011).

Russia was struck by a small banking crisis during the spring and summer of 2004. In response, Russias State Duma swiftly modified the arrangements governing deposit insurance (Tompson, 2004). Household deposits with failed institutions that were outside the deposit insurance system would be temporarily covered for sums of up to 100,000 rubles. In other words, from the middle of July 2004, all household deposits were covered by temporary insurance (Federal Law No. 96-FZ). This emergency coverage was subsequently replaced by that from the general deposit insurance program for those banks that were admitted. Banks not admitted to the general program lost the rights to attract new household deposits and renew existing deposit contracts, thus leading to a progressive deterioration in their household deposit base.

4 Data and Variables

Our first data source is Karas and Vernikov (2016). This dataset documents major events Russian banks experience through their lifetime: birth, entrance to the deposit insurance system, license loss, merger, acquisition, liquidation, etc. These records are available over 1988q1-2016q2. In addition, Karas and Vernikov (2016) provide a time-varying classification of all Russian banks into three groups: state-controlled, foreign-controlled, and private domestic banks. This classification spans 1999q1-2016q2.[1]

Additionally, we use quarterly bank balance sheets and income statements, purchased from two private financial information agencies, Interfax (`www.interfax.ru`) and Mobile (`www.mobile.ru`). Karas and Schoors (2005, 2010) describe these datasets and confirm their comparability with each

[1] Specifically, we use records *os50* and *of50* from Karas and Vernikov (2016). We backfill missing 1999 records of *os50* with the first available records from 2000q1.

other. We use both because some indicators are provided exclusively by Interfax, while some exclusively by Mobile. This panel dataset covers 1999q2-2010q1. The panel is unbalanced as banks fail, merge and get founded throughout the sample period. When one bank acquires another, the former gets a new identifier in our panel.

Table 1 reports summary statistics of the balance sheet indicators we use in this paper. The first four represent measures of bank credit risk: loan loss reserves over total assets, $\frac{LLR}{TA}$; non-performing loans over total assets, $\frac{NPL}{TA}$; log of loan loss reserves over capital, $\ln(1+\frac{LLR}{Cap})$; and log of non-performing loans over capital, $\ln(1+\frac{NPL}{Cap})$. We take a log transformation in the case of the latter two measures in order to reduce the effect of extreme values produced by dividing through by capital.

Our fifth risk measure is the bank's Z-score, defined as the number of standard deviations a bank's return on assets has to fall to wipe out its capital:

$$Z = \frac{\overline{CAR} + \overline{ROA}}{\sigma(ROA)}$$

Here CAR stands for capital-to-assets ratio; ROA is net income over assets; upper bars indicate averages; σ stands for standard deviation. Averages and standard deviations are based on a rolling window of 16 quarterly lags plus the current observation (add reference). We take the log of Z to reduce the effect of extreme values.

COMMENT ON TABLE 1.

5 Baseline

We estimate the following equation for bank i in quarter t:

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} I + \lambda_t + \mu_i + Controls_{it} + e_{it} \tag{1}$$

F_{it} is the share of firm deposits in total deposits of firms and households of bank i at time t. $\Delta Y_{it+\delta}$ measures what happens to bank i's risk over the subsequent period $[t, t+\delta]$. The coefficient β_1 measures the sensitivity of the latter to the former. β_2 measures by how much this sensitivity changes when the value of deposit insurance dummy I switches from 0 to 1; the switch happens in 2004q4.

If market discipline is the only mechanism driving the signs of β_1 and β_2, we would expect both to be negative. First, compared to households, firms exercise stronger market discipline (Karas et al., 2010); therefore, banks with higher F_{it} should engage in less risk taking: $\beta_1 < 0$. Second, deposit insurance further reduces households' incentives to monitor their banks (Karas et al., 2013); this makes the effect above stronger: $\beta_2 < 0$. Unfortunately, there is a host of mechanisms other than market discipline that can make β_1 positive or negative. For that reason all our tests focus on β_2 - the change in sensitivity induced by deposit insurance.

To focus on risk taking over $[t, t+\delta]$, we calculate changes between t and $t+\delta$ of the five risk measures reported in Table 1: $\Delta\frac{LLR}{TA}$, $\Delta\frac{NPL}{TA}$, $\Delta\ln(1+\frac{LLR}{Cap})$, $\Delta\ln(1+\frac{NPL}{Cap})$, and $-\Delta\ln Z$. In case of the latter, we take the negative to make sure higher values correspond to more risk.

Our sixth risk measure is the bank's failure probability, $PFail$, estimated from a logit regression of a failure dummy on a set of bank balance sheet variables (for details see appendix A). Again, we calculate the change, $\Delta PFail$, over $[t, t+\delta]$.

Our seventh measure of risk taking is a dummy, $Fail$, equal to 1, if during interval $[t, t+\delta]$ the bank loses its license or gets liquidated. This dummy captures the most extreme form of risk realization - bank failure.

Several factors affect our choice of future horizon, δ. On the one hand, it likely takes a not inconsiderable amount of time for changes in market disciplining behavior first to affect bank risk taking and then for that risk taking to reveal itself in loan non-performance and other measures of bank health. To this end, it is worth noting that during our period of analysis, the majority of outstanding bank loans to households and firms have maturities exceeding one year. Indeed, in 2010, over 70 percent of loans to households and 40 percent of loans to firms exceeded three years. A sufficiently large δ is thus needed to capture the time that will inevitably need to pass between changes in market discipline and, first, changes in the quality of loan portfolios and, second, possible failure. On the other hand, by choosing too large a value for δ, we reduce the number of observations available for estimation. In view of these two considerations, we set the baseline δ_{base} equal to 16 quarters for LLR, NPL, Z-score and $PFail$, and to 20 quarters for $Fail$; we then test whether the results are robust to $\delta_{base} \pm 4$.

Time dummies λ_t control for changes in the macroeconomic environment. Bank-level fixed effects μ_i control for unobserved bank heterogeneity. We present specifications with and without controls for bank balance sheet structure $Controls_{it}$: deposits over assets, loans over assets, and liquid assets over demand liabilities.

The sample includes private domestic banks accepted to the deposit insurance system; the sample period is 1999q2-2010q1. For depositor discipline to have a significant effect on bank behavior, deposits must account for a substantial share of bank funding; we therefore exclude banks with the deposit-to-assets ratio below 10%.

Tables 2-3 report the results of estimating equation 1 with and without $Controls_{it}$. Across twelve of the fourteen specifications in these two tables, β_2 is negative and statistically significant at the 5 percent level. The relationship, that is, holds for risk measures based on balance sheet and profitability data from 1999 to 2010 as well as for bank failure which, because we have it measured for a longer period, allows us to extend the analysis through 2015. The consistency of this finding on β_2 is precisely what we would expect if deposit insurance both (1) reduces household-imposed market discipline relative to that of firms, and (2) relaxes a constraint on a bank's risk-taking in direct proportion to its reliance on insured households relative to uninsured firms.

MOTIVATE THE FOLLOWING EXERCISE. We estimate a version of equation 1 in which we interact F_{it} with time dummies λ_t:

$$\Delta Y_{it+\delta} = \beta_0 + \beta_t F_{it} \lambda_t + \lambda_t + \mu_i + Controls_{it} + e_{it}$$

This specification allows β_t, the sensitivity of risk to depositor mix F_{it}, to take a different value in *every* quarter. Figures 1-7 plot β_t for various measures of risk over time.

6 Difference-in-Differences

Our analysis so far assumes dummy I captures the effect of deposit insurance introduction. Of course, there may be other time-varying factors correlated with I, whose impact on banks varies with depositor mix F_{it}. To address this concern, we expand our analysis to compare two groups of banks: the treatment and the control group. The first includes private domestic banks accepted to deposit insurance; these are banks analyzed in section 5. The second group includes banks not affected by the introduction of deposit insurance; these are state- and foreign-controlled banks. Only if changes we document in section 5 for the treated, are not observed for the control group, can we attribute the effect to deposit insurance.

To compare the behavior of the two groups of banks, we estimate the following difference-in-differences equation for bank i in quarter t:

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} T + \beta_3 F_{it} I + \beta_4 F_{it} T I + \lambda_t + \lambda_t T + \mu_i + Controls_{it} + e_{it} \qquad (2)$$

Dummy T equals 1 for the treated; 0 for the control. Deposit insurance dummy I represents treatment. The main coefficient of interest, β_4, measures whether the before-after change in the sensitivity of $\Delta Y_{it+\delta}$ to depositor mix F_{it} for the treated, differs from that for the control group.

We define the control group to include state- and foreign-controlled banks. We believe these banks are not affected by deposit insurance because Russian depositors have always considered them safe. Before 2004, the state explicitly guaranteed retail deposits of state-owned banks (Civil Code art. 840.1). After this explicit guarantee was removed (Federal Law No. 182-FZ), the implicit backing continued: state-owned banks enjoyed privileged access to state funds, de facto exemption from some regulatory norms and, on occasion, financial support from the state (Tompson, 2004). This implicit guarantee shows, for example, in the relatively low deposit rates state banks typically enjoy. Foreign banks are perceived to be backed by the rich pockets of their (typically Western) mother organizations. For example, De Graeve and Karas (2014) show that during bank runs Russian depositors treat state- and foreign-owned banks as equally safe.

Tables 4-5 report the results of estimating equation 2 with and without $Controls_{it}$. β_4 is negative and statistically significant in ...

MOTIVATE THE FOLLOWING EXERCISE. Figures 8-14 replicate figures 1-7 but plot β_t for both groups of banks: the treated and the control. These figures are based on estimating the following equation, with dummy C being equal to 1 for the control group:

$$\Delta Y_{it+\delta} = \beta_0 + \beta_t^C F_{it}\lambda_t C + \beta_t^T F_{it}\lambda_t T + \lambda_t C + \lambda_t T + \mu_i + Controls_{it} + e_{it}$$

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Tables

Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	P1	P25	P50	P75	P99
LLR/TA	42383	.03	.05	0	.01	.02	.04	.21
NPL/TA	42383	.01	.04	0	0	0	.01	.17
$\ln(1+\frac{LLR}{Cap})$	42071	.15	.19	0	.03	.09	.2	.76
$\ln(1+\frac{NPL}{Cap})$	42071	.06	.14	0	0	.02	.07	.55
$\ln Z$	29862	3.68	.84	1.43	3.17	3.68	4.22	5.72
Capital/TA	42071	.26	.18	.05	.13	.2	.32	.91
ROA	41941	.01	.03	-.04	0	0	.01	.06
Firm Dep/Deposits	42239	.68	.24	.11	.5	.71	.88	1
Liquidity	41992	.81	.74	.05	.47	.68	.93	3.98
Loans/TA	42381	.51	.21	0	.38	.54	.67	.9
Deposits/TA	42383	.53	.22	.01	.38	.55	.7	.9

Table 2. Estimation Results: Equation 1

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} I + \lambda_t + \mu_i + e_{it}$$

$\Delta Y_{it+\delta}$ is a measure of bank risk taking over period $[t, t+\delta]$. Specific measures are reported in column headings. F_{it} is the share of firm deposits in total deposits of firms and households. Dummy I equals 1 after the introduction of deposit insurance in 2004q3. Only coefficients of interest are reported. Clustered standard errors are in parentheses. ** p<0.01, * p<0.05, + p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	$\Delta \ln \frac{LLR}{Cap}$	$\Delta \frac{LLR}{TA}$	$\Delta \ln \frac{NPL}{Cap}$	$\Delta \frac{NPL}{TA}$	$-\Delta \ln Z$	$\Delta PFail$	$Fail$
F	0.02	0.008	0.01	0.009	-0.06	0.0009	-0.002
	(0.02)	(0.006)	(0.02)	(0.007)	(0.1)	(0.002)	(0.03)
FI	-0.09**	-0.03**	-0.05*	-0.01*	-0.4**	-0.008**	-0.09*
	(0.03)	(0.007)	(0.02)	(0.007)	(0.2)	(0.002)	(0.04)
Observations	21,321	21,451	21,321	21,451	12,280	21,547	37,390
R^2	0.060	0.050	0.092	0.084	0.074	0.111	0.126

Table 3. Estimation Results: Equation 1

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} I + \lambda_t + \mu_i + Controls_{it} + e_{it}$$

$\Delta Y_{it+\delta}$ is a measure of bank risk taking over period $[t, t+\delta]$. Specific measures are reported in column headings. F_{it} is the share of firm deposits in total deposits of firms and households. Dummy I equals 1 after the introduction of deposit insurance in 2004q3. Only coefficients of interest are reported. Clustered standard errors are in parentheses. ** p<0.01, * p<0.05, + p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	$\Delta \ln \frac{LLR}{Cap}$	$\Delta \frac{LLR}{TA}$	$\Delta \ln \frac{NPL}{Cap}$	$\Delta \frac{NPL}{TA}$	$-\Delta \ln Z$	$\Delta PFail$	$Fail$
F	0.009	-0.002	0.01	0.005	-0.1	-0.001	0.006
	(0.02)	(0.007)	(0.02)	(0.007)	(0.1)	(0.002)	(0.03)
FI	-0.08**	-0.02**	-0.03	-0.009	-0.4**	-0.006**	-0.09*
	(0.03)	(0.007)	(0.02)	(0.006)	(0.2)	(0.002)	(0.04)
Observations	21,280	21,404	21,280	21,404	12,270	21,526	37,129
R^2	0.062	0.073	0.096	0.094	0.079	0.126	0.127

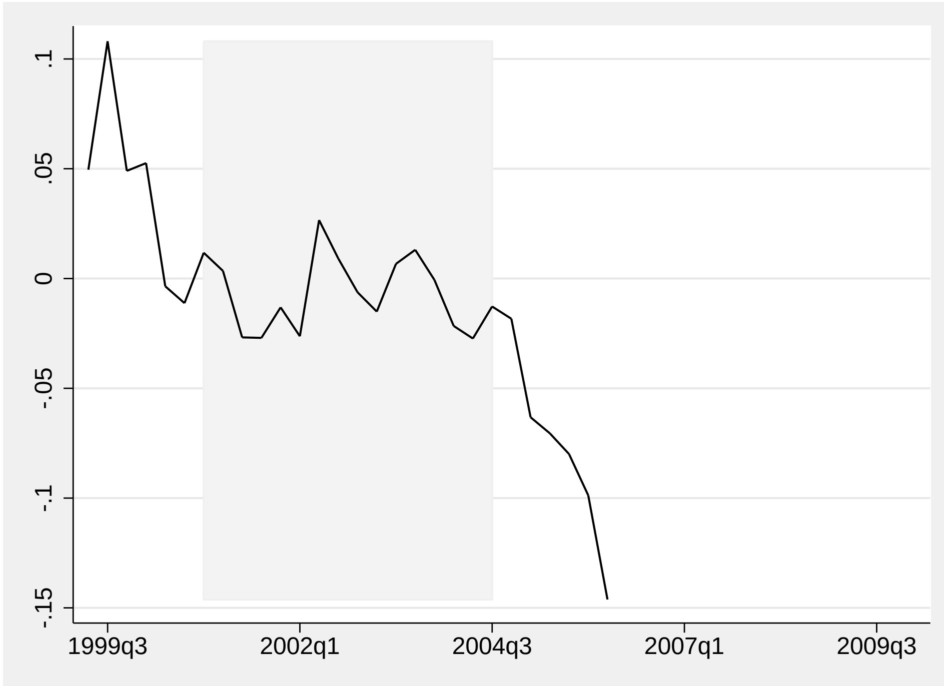

Figure 1. β_t over Time with $\Delta \ln \frac{LLR}{Cap}$ on the LHS

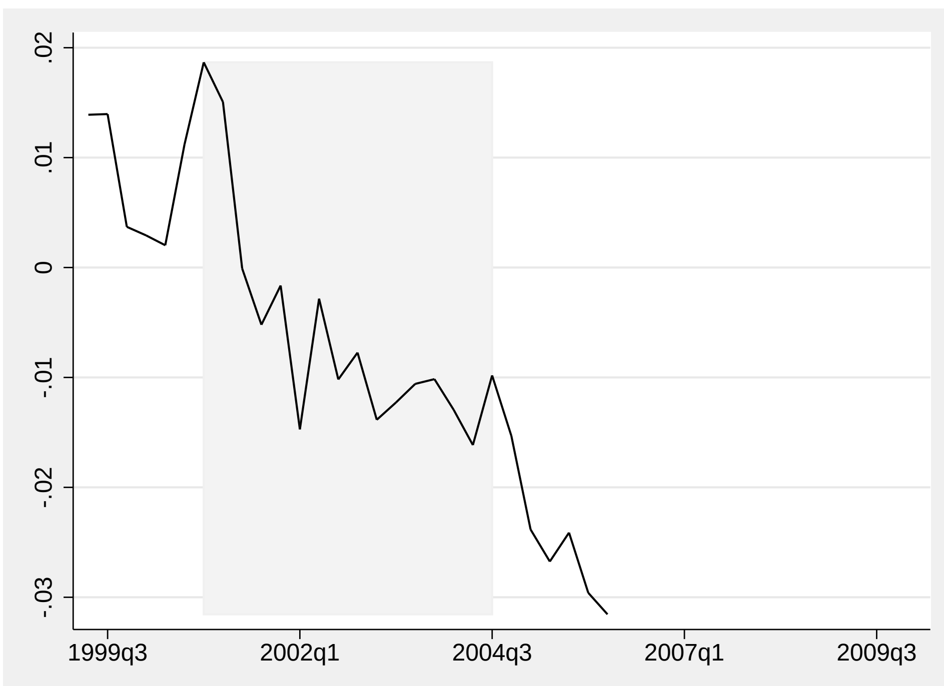

Figure 2. β_t over Time with $\Delta \frac{LLR}{TA}$ on the LHS

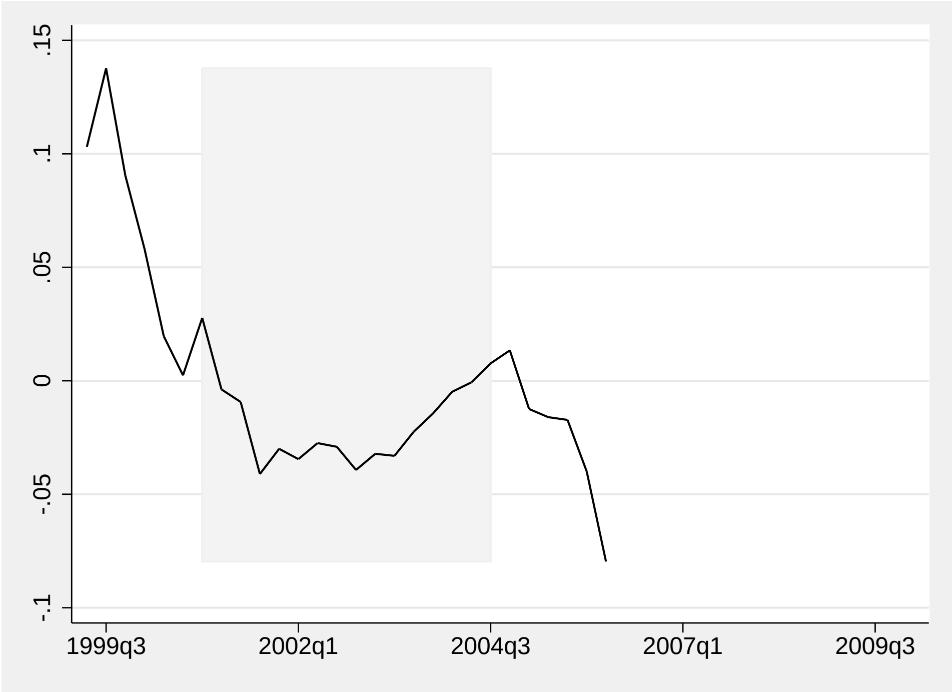

Figure 3. β_t over Time with $\Delta \ln \frac{NPL}{Cap}$ on the LHS

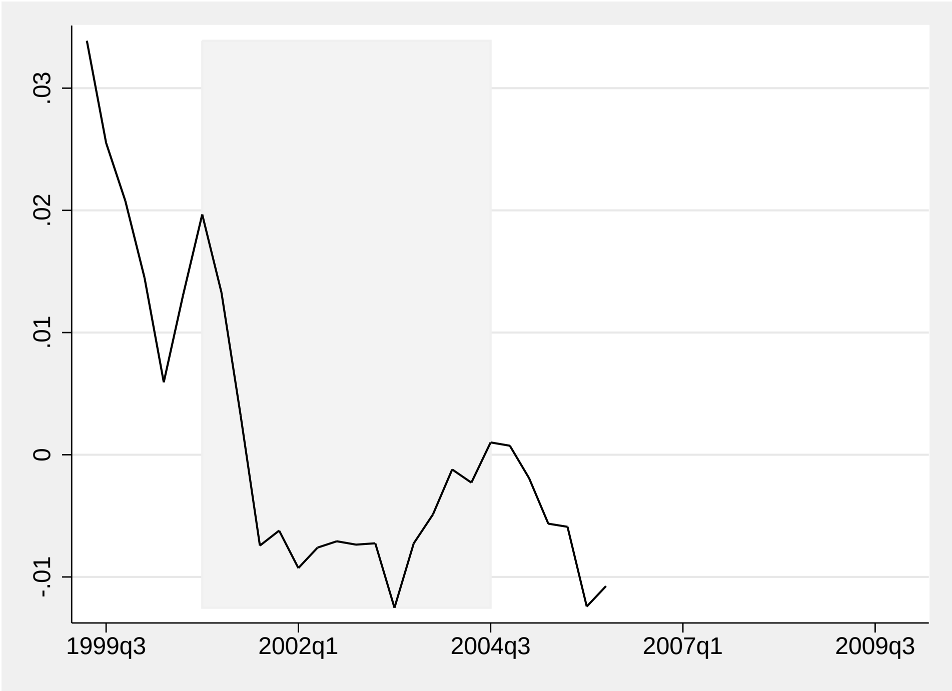

Figure 4. β_t over Time with $\Delta \frac{NPL}{TA}$ on the LHS

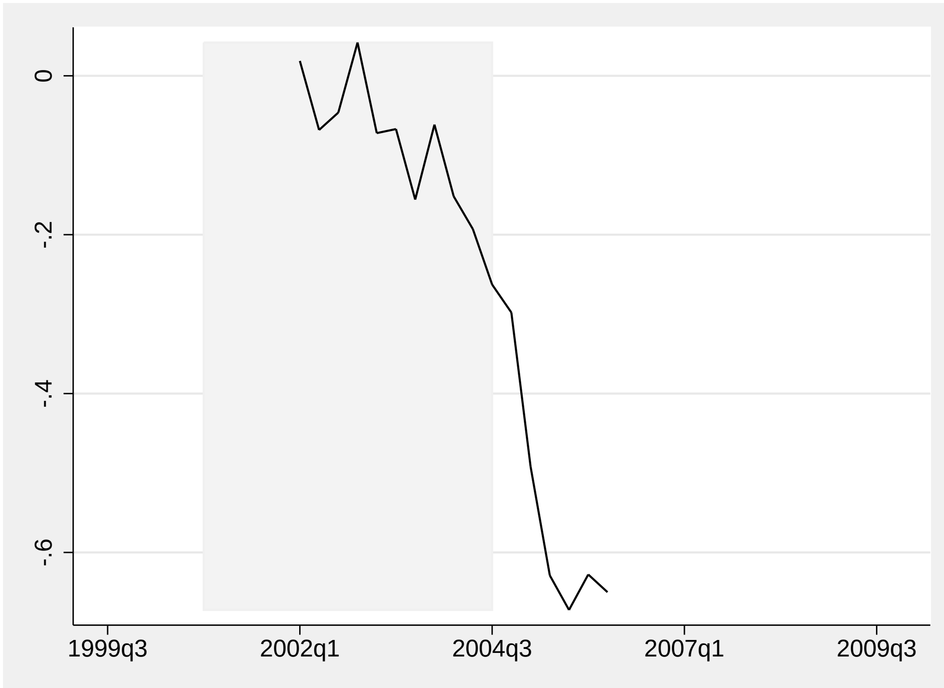

Figure 5. β_t over Time with $-\Delta \ln Z$ on the LHS

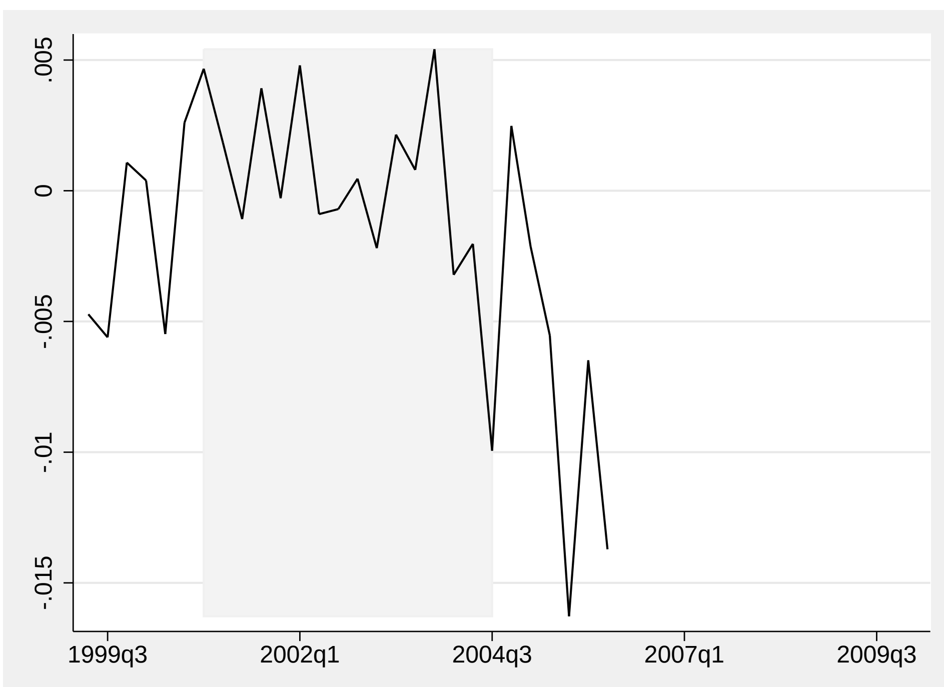

Figure 6. β_t over Time with $\Delta PFail$ on the LHS

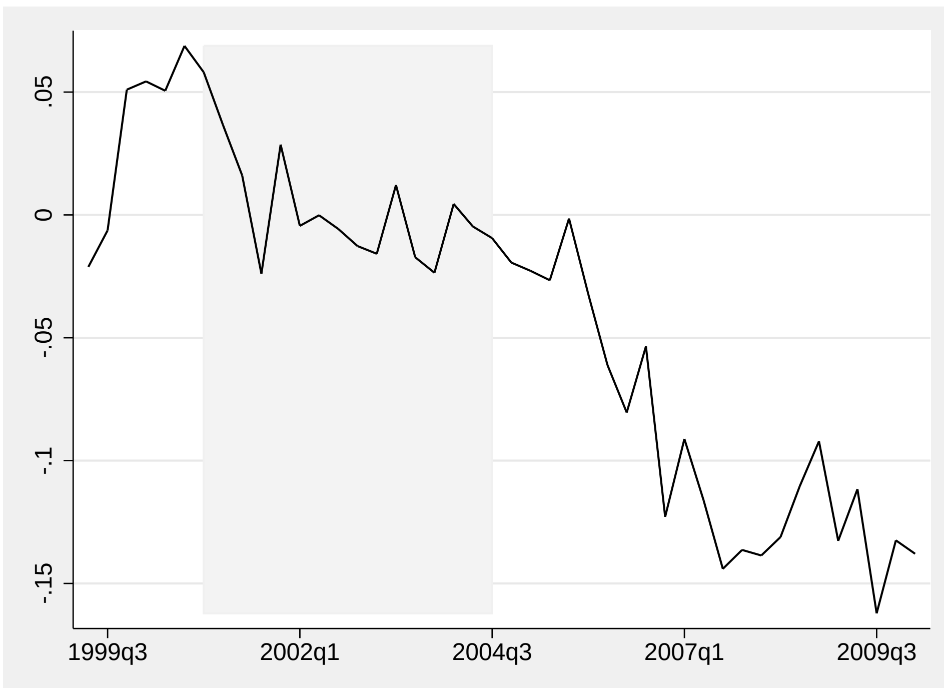

Figure 7. β_t over Time with $Fail$ on the LHS

Table 4. Estimation Results: Equation 2

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} T + \beta_3 F_{it} I + \beta_4 F_{it} TI + \lambda_t + \lambda_t T + \mu_i + e_{it}$$

$\Delta Y_{it+\delta}$ is a measure of bank risk taking over period $[t, t+\delta]$. Specific measures are reported in column headings. F_{it} is the share of firm deposits in total deposits of firms and households. Dummy I equals 1 after the introduction of deposit insurance in 2004q3. Dummy T equals 1 for private domestic banks; 0 for state- and foreign-owned. Only coefficients of interest are reported. Clustered standard errors are in parentheses. ** p<0.01, * p<0.05, + p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	$\Delta \ln \frac{LLR}{Cap}$	$\Delta \frac{LLR}{TA}$	$\Delta \ln \frac{NPL}{Cap}$	$\Delta \frac{NPL}{TA}$	$-\Delta \ln Z$	$\Delta PFail$	$Fail$
F	0.03	0.02*	-0.02	0.01	-0.5	0.002	0.2
	(0.07)	(0.010)	(0.07)	(0.01)	(0.5)	(0.006)	(0.1)
FT	-0.009	-0.01	0.03	-0.004	0.5	-0.001	-0.2
	(0.07)	(0.01)	(0.08)	(0.01)	(0.5)	(0.006)	(0.1)
FI	0.07	-0.007	0.1+	0.007	0.6+	0.02	-0.3+
	(0.07)	(0.009)	(0.07)	(0.009)	(0.4)	(0.01)	(0.2)
FTI	-0.2*	-0.02+	-0.2*	-0.02+	-1.0**	-0.02*	0.2
	(0.08)	(0.01)	(0.08)	(0.01)	(0.4)	(0.01)	(0.2)
Observations	23,168	23,316	23,168	23,316	13,420	23,385	40,388
R^2	0.064	0.053	0.094	0.088	0.076	0.110	0.129

Table 5. Estimation Results: Equation 2

$$\Delta Y_{it+\delta} = \beta_0 + \beta_1 F_{it} + \beta_2 F_{it} T + \beta_3 F_{it} I + \beta_4 F_{it} TI + \lambda_t + \lambda_t T + \mu_i + Controls_{it} + e_{it}$$

$\Delta Y_{it+\delta}$ is a measure of bank risk taking over period $[t, t+\delta]$. Specific measures are reported in column headings. F_{it} is the share of firm deposits in total deposits of firms and households. Dummy I equals 1 after the introduction of deposit insurance in 2004q3. Dummy T equals 1 for private domestic banks; 0 for state- and foreign-owned. Only coefficients of interest are reported. Clustered standard errors are in parentheses. ** p<0.01, * p<0.05, + p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	$\Delta \ln \frac{LLR}{Cap}$	$\Delta \frac{LLR}{TA}$	$\Delta \ln \frac{NPL}{Cap}$	$\Delta \frac{NPL}{TA}$	$-\Delta \ln Z$	$\Delta PFail$	$Fail$
F	0.03	0.02+	-0.009	0.01	-0.5	0.002	0.2
	(0.07)	(0.009)	(0.07)	(0.010)	(0.5)	(0.006)	(0.1)
FT	-0.01	-0.02	0.03	-0.007	0.4	-0.003	-0.2
	(0.07)	(0.01)	(0.08)	(0.01)	(0.5)	(0.007)	(0.1)
FI	0.07	-0.002	0.1+	0.009	0.7+	0.02	-0.3+
	(0.07)	(0.010)	(0.07)	(0.010)	(0.4)	(0.01)	(0.2)
FTI	-0.2*	-0.02+	-0.2*	-0.02+	-1.1**	-0.02*	0.2
	(0.08)	(0.01)	(0.08)	(0.01)	(0.4)	(0.01)	(0.2)
Observations	23,123	23,265	23,123	23,265	13,409	23,360	40,048
R^2	0.066	0.074	0.097	0.097	0.082	0.126	0.129

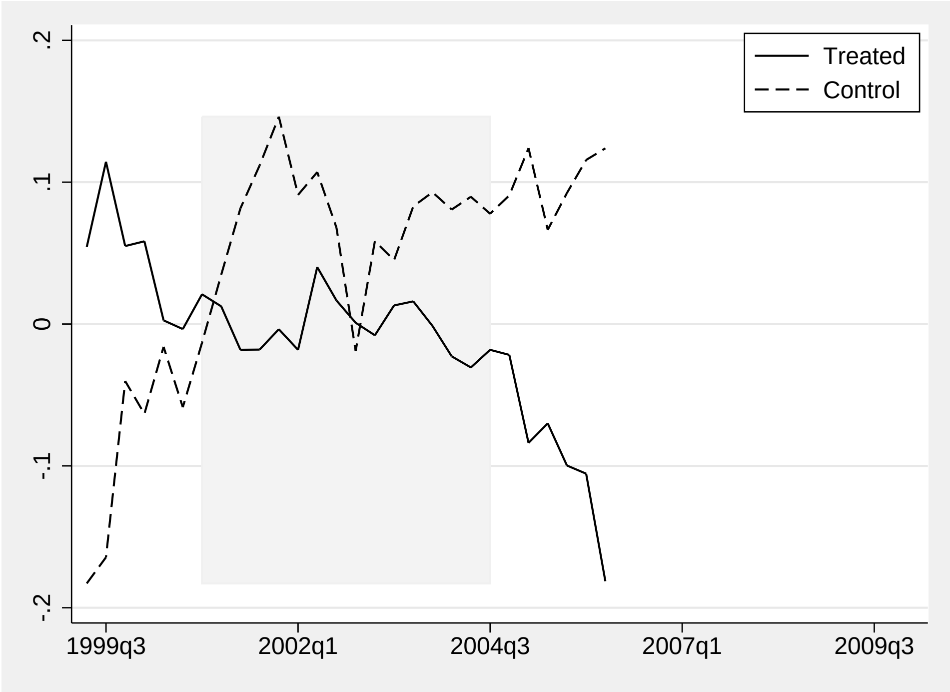

Figure 8. β_t over Time with $\Delta \ln \frac{LLR}{Cap}$ on the LHS

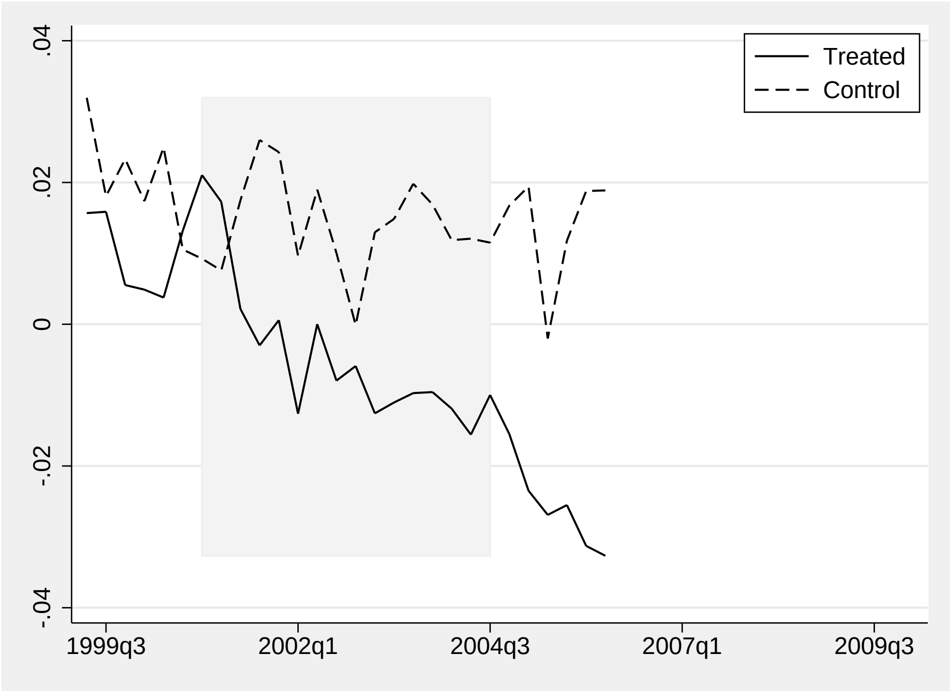

Figure 9. β_t over Time with $\Delta \frac{LLR}{TA}$ on the LHS

Figure 10. β_t over Time with $\Delta \ln \frac{NPL}{Cap}$ on the LHS

Figure 11. β_t over Time with $\Delta \frac{NPL}{TA}$ on the LHS

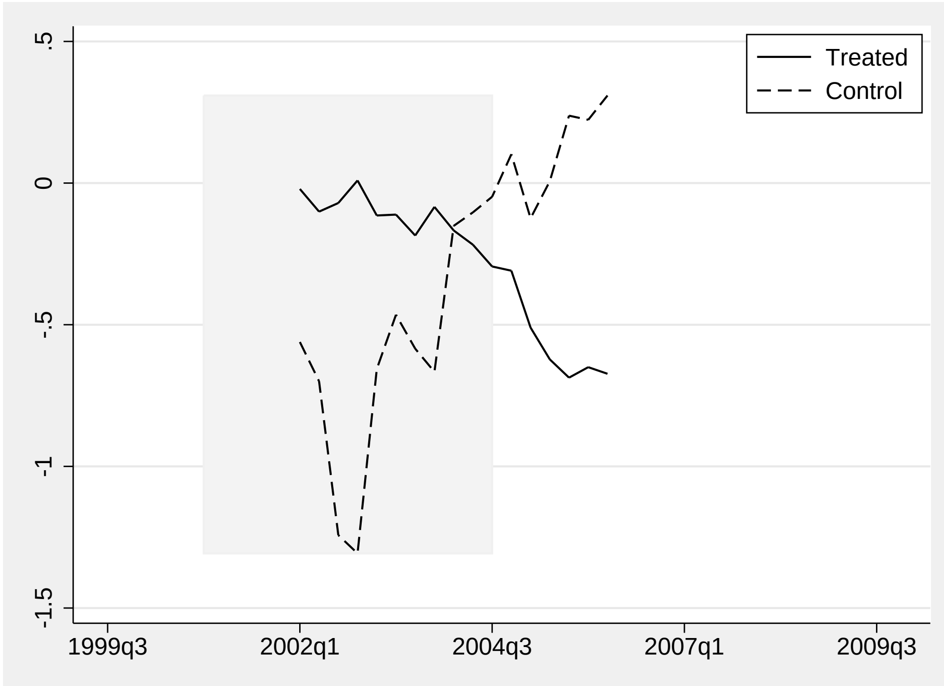

Figure 12. β_t over Time with $-\Delta \ln Z$ on the LHS

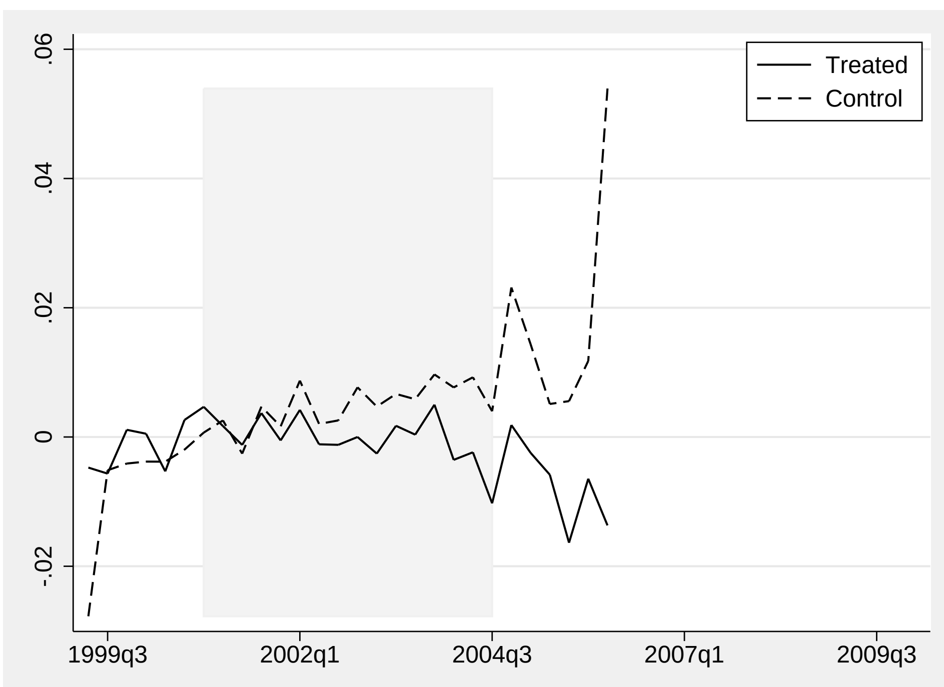

Figure 13. β_t over Time with $\Delta PFail$ on the LHS

Figure 14. β_t over Time with $Fail$ on the LHS

Appendices

A Default Prediction Model

Following De Graeve and Karas (2014), we estimate a logit regression of a dummy equal to 1 if a bank loses its license in quarter t, on a set of bank balance sheet variables measured at the end of quarter $t-1$. COMMENT ON THE TABLE.

	(1)
VARIABLES	revdum
Log (Assets)	-0.17***
	(0.036)
Capital/Assets	-2.13***
	(0.38)
ROA	-9.44***
	(1.15)
Liquid Assets/Assets	-3.50***
	(0.83)
Non-performing Loans/Assets	4.19***
	(0.94)
Non-Government Securities/Assets	2.71***
	(0.34)
Term Deposits of Firms/Assets	-5.89***
	(1.51)
Term Deposits of Households/Assets	-6.49***
	(1.07)
Observations	51,275
# Failures	358
Pseudo R2	0.19
AUR	0.82