Bank Capital, Monitoring and Bank Performance

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Existing theories suggest that bank capital strengthens the screening / monitoring incentives of banks. While it may seem intuitive that enhanced monitoring and screening would subsequently improve operating performance of the bank, empirical evidence on this topic is scarce. This paper tries to fill this void. Based on a simple extrapolation of the existing theories, it is hypothesized that a bank with more capital has improved monitoring and screening incentives, lower loan defaults and better return performance. Testing these predictions is complicated by an omitted variables or reverse causality concern. While the theory predicts that higher capital results in better bank performance via the bank screening / monitoring channel, in reality the causality may also be reversed in that better bank performance (due to factors outside the model) leads to greater retained earnings and hence higher bank capital. To deal with this concern, I test the predictions using data on mergers and acquisitions. If two banks merge, the capital ratio of the higher-capital bank decreases while that of the lower-capital bank increases, reducing monitoring incentives at the former and strengthening them at the latter. Assuming diminishing marginal returns to monitoring, the decrease in performance at the high-capital bank will outweigh the performance increase at the low-capital bank, leading to an overall improvement in performance at the merged bank. Moreover, recognizing that in an acquisition it is typically the acquiring bank that is the influencer and the target bank that is influenced leads to the prediction that the larger the increase in capital of the target bank due to the acquisition, the greater is the improvement in the performance of the merged bank relative to the weighted average of the pre-merger performances of the two banks. The evidence supports the prediction: the greater the increase in capital of the target bank as a result of the merger, the greater is the decrease in loan defaults and the greater is the increase in profitability of the merged bank relative to the stand-alone banks prior to the acquisition. These results hold while controlling for various other factors that may affect merger performance. Robustness checks examine a variety of alternative explanations and show that the results are not driven by other factors like the acquisition per se, changes in total capital or risk of the merged bank, a reduction in informationally-sensitive lending, or a change in market power.

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1. INTRODUCTION

Financial intermediation theory portrays banks and other intermediaries as providing valuable screening and monitoring services in credit markets (e.g., Diamond, 1984; Ramakrishnan and Thakor, 1984; Millon and Thakor, 1985; Boyd and Prescott, 1986; and Allen, 1990).[1] Recent theories have argued that banks screen and monitor more if they have more capital (Holmstrom and Tirole, 1997; and Dell-Ariccia and Marquez, 2006). While this important theoretical result is very intuitive, it has not received much empirical attention. In fact, even evidence on the bank's role as a monitor independently of the effect of bank capital is quite limited, as noted by Shleifer and Vishny (1997) in their overview article on governance.[2]

There are at least three possible reasons for the limited evidence on banks' role as screening / monitoring intermediaries. First, empirical detection of bank screening / monitoring is difficult. Second, at the firm level, it is hard to disentangle the effect of borrower leverage per se from the effect of bank financing on activities with scope for managerial private benefits in the borrowing firm (e.g., Yafeh and Yosha, 2003). That is, greater reliance on leverage may invite greater lender scrutiny, thereby achieving both improved screening / monitoring as well as reduced free cash flow problems at firms independently of the actions of the bank. And third, at the bank level, any attempt to examine the link between bank capital and bank screening / monitoring suffers from a potential omitted variables or reverse causality problem. In the theory developed in Holmstrom and Tirole (1997), bank capital enhances a bank's incentive to monitor the borrower and thus lowers loan defaults and improves performance. In reality, the causality may also run in the opposite direction. Better bank performance, stemming possibly from more favorable market conditions and other factors outside the theory, would lead to higher earnings and thus higher bank capital through earnings retentions.

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[1] There are also other theories of financial intermediation in which banks play a somewhat different role. Examples are Diamond and Dybvig (1983) where banks exist to create liquidity, Coval and Thakor (2005) where they act as a "beliefs bridge" between optimistic entrepreneurs and pessimistic investors, and Araujo and Minetti (2007) where financial intermediaries facilitate a reallocation of assets of distressed firms.

[2] The limited evidence that is available is somewhat indirect and at times conflicting. For example, Kaplan and Minton (1994) and Kang and Shivdasani (1995) document that management turnover in Japan is higher after poor performance at firms with a main banking relationship. Gorton and Schmid (2000) show that banks in Germany improve the performance of firms they own equity in, while evidence in Morck, Nakamura and Shivdasani (2000) suggests the opposite. Using the share of the largest creditor in Japanese firms' debt as a proxy for the intensity of bank monitoring, Yafeh and Yosha (2003) provide limited supporting evidence on banks' role as monitors.

The goal of this paper is to tease out the *screening / monitoring-related* effect of the increase in bank capital on bank performance by focusing on a situation in which bank capital receives a shock: mergers and acquisitions. The empirical analysis is motivated by the theory developed by Holmstrom and Tirole (1997). A key prediction of their model is that monitoring incentives are positively affected by the bank's capital, implying a positive relationship between bank capital and performance. A direct corollary of their result is that if a bank's capital ratio is shocked with more (less) capital, it will engage in more (less) monitoring; their logic also extends trivially to higher capital implying more screening. If two banks with different capital ratios merge, the capital ratio of the combined bank will be some weighted average of the capital ratios of the merger partners.[3] This implies that the bank with the higher capital ratio (say, the acquirer) receives a negative shock to its capital ratio and will monitor less while the bank with the lower capital ratio (say, the target) receives a positive shock to its capital ratio and will monitor more. With diminishing marginal returns to monitoring, the drop in performance at the higher-capital bank will be less than the performance improvement at the lower-capital bank, leading to an overall improvement in performance.

While this discussion suggests that any deal in which two banks with different capital ratios merge will result in a performance improvement regardless of whether the acquirer or the target had the higher capital ratio, in practice this is unlikely to be true. In an acquisition, the acquirer's credit screening and monitoring process will typically influence the target's. This assertion, which will be empirically tested in this paper, implies that if the acquirer has higher capital and thus a stronger credit-quality screening and monitoring process than the target, we should expect the target's screening and monitoring to improve post acquisition. But if the acquirer has a weaker screening and monitoring process than the target, then the target's screening and monitoring process will be diluted rather than the acquirer's screening and monitoring process being strengthened. This asymmetry in the influences of the acquirer and the target is fairly commonplace[4] and by no means unique to banking.

Thus, the impact of capital on a bank's credit-risk choice and profitability is most fruitfully examined by focusing on how the change in capital *at the target bank* due to the acquisition affects the

[3] I am abstracting from merger-related write-offs, accounting issues, equity issuance at the time of the merger if any, etc.

[4] Discussions with bankers involved in M&A have supported the observation that the acquirer's practices are typically prevalent after the acquisition.

performance of the merged bank. More specifically, I formulate two predictions. First, the larger the increase in the target bank's capital as a result of the acquisition, the greater is the decline in the post-acquisition loan default rate at the merged bank. And second, the larger is the increase in the target bank's capital as a result of the acquisition, the greater is the improvement in the merged bank's post-acquisition profitability.

The choice of a mergers setting is only one of several ways to deal with the earlier-mentioned omitted variables or reverse causality problem. Another remedy is to use instrumental variable regressions. However, good instruments for capital are hard to find. Yet another approach would be to shock banks with more capital (e.g. by imposing higher capital requirements) and examine the effect on operating performance. While changes in capital requirements took place in the early 90s, such changes coincided with the credit crunch, making it hard to disentangle the effect of changes in capital from the effects of the crisis. The beauty of a merger of two banks is that at the time of the acquisition, the capital ratios of the two banks involved receive a one-time shock that leads to an infusion of capital from the bank with more capital to the one with less capital, and this capital infusion cannot be attributed to a slow build-up via earnings retentions due to lower loan defaults in the past. Thus, developing and testing the predictions in a mergers setting helps avoid thorny omitted variables / reverse causality issues and provides added comfort in the robustness of the results.

Combining data on 5,090 bank-level mergers and acquisitions that were completed between January 1986 and December 2006 with financial data from Call Reports and the FDIC's Summary of Deposits, I test the predictions that post-acquisition loan default rates are decreasing and profitability is increasing in the improvement in the target's capital ratio as a result of the merger. This is done by regressing the change in bank performance around the acquisition on the change in the capital ratio of the target plus a set of control variables. Three alternative bank performance measures are used, two of which are loan default measures, net charge-offs and non-performing loans (NPL), and one of which is a profitability measure, return on equity (ROE).[5] The change in bank performance is obtained by comparing the bank's post-acquisition performance with its "pro forma" performance before the acquisition, calculated by adding together the pre-acquisition balance sheets and income statements of the acquirer and target.

[5] If ROA is used instead of ROE, all the results presented in this paper continue to hold.

The control variables include acquirer size, the size of the target relative to the acquirer, acquirer and target bank holding company membership dummies, a geographic diversification dummy, and the sizes of the acquirer's and target's informationally-sensitive loan portfolios. The reason to control for the sizes of the informationally-sensitive loan portfolios at both banks is that the benefits from enhanced monitoring incentives are theoretically predicted to be the greatest with informationally-sensitive loans (e.g., Boot and Thakor, 2000; and Allen, Carletti and Marquez, 2008). However, results are similar if the entire loan portfolios are used instead. All regressions are estimated with robust standard errors clustered by year to control for heteroskedasticity as well as possible correlations across observations of different banks in the same year.

The regression results support the predictions: the greater the increase in capital at the target bank due to the merger, the greater is the improvement in performance at the merged bank relative to the pro forma performance of the combined bank prior to the merger. Specifically, an increase in target capital due to the merger significantly reduces post-acquisition net charge-offs and non-performing loans, and significantly increases post-acquisition ROE. These results hold regardless of whether unadjusted or industry-adjusted changes in performance are used.

Seven checks are performed to establish the robustness of these results. First, one potential concern is that the results are somehow directly driven by the acquisition rather than the change in capital at the target bank. If so, one would expect post-acquisition performance improvements to occur even if the change in capital is small. To investigate this, the sample is split into targets that experienced a small versus a large change in capital around the time of the merger. The results show, however, that performance improvements are significantly related to the increase in capital only if the change in capital is large.

Second, one could argue that the results may be driven by deals whereby the acquirer issued equity around the time of the acquisition, so that there was an increase in total capital. In those cases, the increase in target capital is inflated and does not purely reflect the merger-induced change in capital. To test this, I restrict the sample to deals with no equity issuances around the time of the acquisition. I find, however, that the results are even stronger than before. This test, in conjunction with my earlier finding, also provides support for the earlier assertion that there is an asymmetry in the influences of the acquirer and the target. In deals where the total capital in the merged bank does not increase much relative to the

sum of the pre-merger capital levels in the two banks, any change in capital at the target due to the acquisition is roughly the same as the change in capital at the acquirer but with the opposite sign. Since my finding is that a decrease in capital at the target leads to poorer post-acquisition performance, this means that an increase in capital at the acquirer due to the acquisition leads to poorer performance as well. In other words, post-acquisition performance improves when a better-capitalized acquirer influences a lower-capital target positively with its superior screening/monitoring process, and it declines when a less-well-capitalized acquirer negatively influences a target with weaker screening/monitoring.

Third, a substantial literature argues that higher capital ratios may induce banks to choose less risky assets.[6] This asset-portfolio-selection argument implies that an increase in capital of the *combined* bank will lead to a drop in net charge-offs and non-performing loans, and – to the extent that those less risky assets have lower expected returns – will also cause a drop in ROE.[7] The screening / monitoring argument put forth here yields similar predictions but suggests that these effects should be driven by an increase in *target* (not *combined* bank) capital. To distinguish between these two effects of capital, I control for the change in capital of the combined bank due to the acquisition, and continue to find that post-acquisition operating performance improvement depends positively on the change in target capital.

Fourth, the literature argues that larger banks have a comparative advantage in hard-information lending while smaller banks engage more in soft-information lending.[8] Since mergers tend to increase bank size, it is possible that soft-information lending decreases as a result of the merger. Since soft-information lending is riskier than hard-information lending, the documented decline in loan default rates could be driven by a decrease in soft-information lending. I find, however, that soft-information lending on average is higher after the acquisition, so a drop in soft-information lending cannot explain the results.

Fifth, an alternative explanation for the results could be that certain banks sell off high-risk or problem assets as part of the acquisition process and end up with smaller balance sheets consisting of higher-quality assets. If so, improved performance would be unrelated to strengthened screening / monitoring incentives. To deal with this, I control for post-acquisition asset contraction / expansion and find that the main results continue to hold.

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[6] See, for example, Bhattacharya (1982), Furlong and Keeley (1989), Rochet (1992), Calem and Rob (1999), Repullo (2004), and Morrison and White (2005).

[7] The direct effect of capital on ROE is also to reduce it, since the same amount of net income is divided by a greater amount of capital. The portfolio selection effect adds to this direct effect of capital.

[8] See, for example, Stein (2002), Berger and Udell (2002), and Berger, Miller, Petersen, Rajan and Stein (2005).

Sixth, it is possible that the results are driven by omitted variables. Enhanced market power may be one such variable. Mergers may enhance market power (e.g., Prager and Hannan, 1998; Sapienza, 2002; and Kahn, Pennacchi and Sopranzetti, 2005), and greater market power could enable the bank to exhibit improved post-acquisition performance. I examine this by controlling for the increase in market power of the combined bank in the regressions and obtain qualitatively similar results.

Finally, in the main analysis, the increase in capital, was calculated using the actual capital ratios of the banks involved. However, it might be plausibly asserted that whether capital is "high" or "low" should be judged not in absolute terms, but rather in the context of a predictive model of the "expected" or benchmark level of capital, so that "excess" or "high" capital can be defined relative to this benchmark level. To examine this, I estimate each bank's "excess" capital using a methodology based on Berger, DeYoung, Flannery, Lee and Oztekin (2008), construct the change in the target's excess capital, and rerun the regressions. The earlier-documented results also survive this robustness check.

The remainder of this paper is organized as follows. Section 2 discusses the related literature. Section 3 discusses the theoretical logic underlying the two testable predictions. Section 4 develops the empirical framework, and discusses the regression variables and the data. Section 5 presents the main regression results, and Section 6 discusses the robustness checks. Section 7 concludes.

2. THE RELATED LITERATURE

This paper is related to the literature on: (1) bank monitoring; (2) the relationship between bank capital and bank performance; and (3) the effect of mergers and acquisitions on bank performance. This section discusses each of these three strands in turn and delineates the marginal contribution of this paper relative to each strand.

A vast theoretical literature exists on bank screening and monitoring. Seminal papers in this area include Diamond (1984) and Ramakrishnan and Thakor (1984). These papers endogenize the existence of financial intermediaries on the basis that they serve as delegated monitoring / screening agents. Various papers have examined different aspects of screening and monitoring.

One strand in the monitoring literature focuses on the effect of bank monitoring on performance. Theoretical contributions include Allen, Carletti and Marquez (2008), Besanko and Kanatas (1993), and Dewatripont and Tirole (1994). In these papers, bank monitoring increases the expected return on firms'

projects and thus helps improve bank performance. Despite the many theoretical papers on the subject, the empirical evidence on the value of bank monitoring is quite scant. In a notable exception, Yafeh and Yosha (2003) use firm-level data from Japan to examine whether bank monitoring reduces firms' spending on projects with scope for private benefits. They find limited supporting evidence using the share of the largest creditor in a firm's total debt as a proxy for monitoring intensity. The marginal contribution of this paper relative to that literature is to empirically examine the impact of *altered* monitoring incentives on borrower default and bank performance in a manner that circumvents a difficult reverse causality problem.

Another strand in the monitoring literature examines the relationship between bank capital and monitoring. Most theoretical contributions argue that higher capital leads to better monitoring incentives (e.g., Dell'Ariccia and Marquez, 2006). In Holmstrom and Tirole (1997), capital also strengthens monitoring incentives and enhances firms' access to credit.[9] This paper is most closely related to Holmstrom and Tirole (1997).

The literature on the relationship between bank capital and bank performance includes numerous papers as well.[10] Some papers examine the direct effect of capital on performance. For example, Berger (1995) empirically examines the relationship between bank capital and bank profitability in the U.S. and finds that capital ratios and return on equity are positively related in the 1980s but not in the early 1990s. Barth, Caprio and Levine (2004) provide international evidence that higher capital ratios (more stringent capital requirements) are associated with fewer non-performing loans. Other papers focus on the asset-portfolio-selection effect of capital. These papers argue that higher capital ratios encourage banks to invest in safer assets, such as lower-risk loans or securities, which may affect bank performance (Bhattacharya, 1982; Furlong and Keeley, 1989; Rochet, 1992; Calem and Rob, 1999; Repullo, 2004; and Morrison and White, 2005).[11] In these papers, capital has the same effect on loan default risk as in the

[9] An exception within this group of papers is Diamond and Rajan (2000), which argues that capital actually weakens the bank's monitoring incentives by making the bank less fragile.

[10] For an overview of the role of capital in banks, see Berger, Herring and Szego (1995) and Mishkin (2007). The role of capital in bank regulation is discussed in Bhattacharya, Boot and Thakor (1998), Hellmann, Murdock and Stiglitz (2000), Barth, Caprio and Levine (2004), Dangl and Lehar (2004), Decamps, Rochet and Roger (2004), Repullo (2004), and Morrison and White (2005).

[11] There are empirical papers that find that both the adoption of risk-based capital requirements and the imposition of higher capital requirements can induce a portfolio shift in favor of less risky assets (e.g., Berger and Udell, 1994; and Thakor, 1996). Hellmann, Murdock and Stiglitz (2000) argue that even though one effect of higher bank capital is to induce more prudent risk taking, it can also reduce the bank's charter value and encourage more gambling by the bank.

monitoring model, but it works through an asset-portfolio-selection channel rather than the borrower-screening / monitoring channel. The empirical tests presented here attempt to distinguish between these two effects, recognizing that the asset-portfolio-selection effect relates to the overall change in capital in the *merged* bank whereas the screening / monitoring argument here relies only on a shock to the capital ratio of the *target*. I use this fact and its implications to empirically control for the asset-portfolio selection-effect. The robustness checks verify that the screening-monitoring effect exists independently of the asset-portfolio-selection effect.

The literature on the effect of bank mergers on post-acquisition operating performance of banks reports mixed findings, consistent with the M&A literature in general.[12] Most studies tend to find that post-acquisition operating performance of the merged banks (relative to their non-merging peers) does not improve (e.g., Rhoades, 1987; and Pilloff, 1996). Notable exceptions include Cornett and Tehranian (1992), who study 30 large bank holding company mergers, and Houston, James and Ryngaert (2001), who focus on management projections of merger-related cost savings and revenue enhancements. However, this literature has not focused on how a change in capital at the target due to the acquisition affects post-acquisition operating performance through improved screening or monitoring.

3. FORMULATING TESTABLE PREDICTIONS

In this section, I summarize Holmstrom and Tirole's (1997) model, informally extend the model, and formulate two testable predictions.[13]

3.1. The Holmstrom and Tirole (1997) model

Holmstrom and Tirole (1997) examine how bank capital affects the availability of credit and hence investment. In their model, entrepreneurs have projects that each need $\$I$ at date $t = 0$ and pay off R if successful and 0 if unsuccessful at date 1. Entrepreneurs must borrow part of the financing from either banks or directly from investors in the capital market. Banks can monitor entrepreneurs to influence their project choices. No monitoring is available with direct finance.

[12] For overview articles, see Rhoades (1994) and Pilloff and Santomero (1998).
[13] A formal theoretical model that produces these two predictions is available from the author upon request.

Each entrepreneur can choose one project from a mutually exclusive set: Good, Medium and Bad. The Good project succeeds with probability p_H, the Medium project succeeds with probability p_M, and the Bad project succeeds with probability p_L, with $1 > p_H > p_M > p_L > 0$. The Good project provides the entrepreneur with no private benefit, whereas the Medium and Bad projects provide the entrepreneur with non-contractible private benefits of $b > 0$ and $B > b$, respectively. It is assumed that

$$p_H R - \gamma I > p_M R - \gamma I + b > 0 > p_L R - \gamma I + B.$$

This means that the Good and Medium projects are viable, but the Bad project is not.

Banks can engage in no, low or high monitoring of their entrepreneur borrowers. Monitoring includes a variety of activities such as verifying compliance with loan covenants, intervening in the borrower's selection of projects, and inspection of potential cash flows. If there is no monitoring, the entrepreneur chooses whichever project he prefers. Low monitoring by the bank guarantees that the Bad project will not be chosen, whereas high monitoring guarantees that neither the Bad nor the Medium project will be chosen. The cost of low monitoring is $C_l > 0$, and the cost of high monitoring is $C_h > C_l$.

In this setting, Holmstrom and Tirole (1997) show that banks with higher capital ratios engage in greater monitoring. The intuition is straightforward. When the bank keeps more capital to finance the borrower's project, the promised repayment to the bank on the loan is higher, so the bank has more to lose from a default by the borrower. This strengthens the bank's monitoring incentive when it has higher capital, and it is willing to incur a higher cost to engage in more monitoring.

The main result of their paper is that bank capital can affect the availability of credit. Since greater monitoring reduces the likelihood of borrowers investing in bad projects, higher capital ratios enhance the bank's incentive to extend credit, and also facilitate the borrower's access to credit from other sources. While Holmstrom and Tirole (1997) do not focus on this, their model can be extended to derive the result that the higher capital obtained by a target through an acquisition results in improved post-acquisition performance due to strengthened screening/monitoring incentives.

3.2. Simple extension of Holmstrom and Tirole (1997) and extraction of two predictions

For the purpose of this paper, two ingredients of Holmstrom and Tirole (1997) are important. First, banks with higher capital ratios engage in more monitoring. Second, banks that engage in more monitoring exhibit better performance. I take these two ingredients as the starting point for a simple extension.

Imagine two banks with different capital ratios: one with high capital and one with low capital.[14] Holmstrom and Tirole's (1997) analysis suggests that the one with the higher capital ratio monitors more. Suppose that the higher-capital bank decides to acquire the lower-capital bank in a stock swap. Assuming that the combined bank does not issue any new equity and abstracting from any merger-related accounting adjustments to capital, the combined bank's capital ratio will be a weighted average of the capital ratios of the acquirer and the target. That is, the merger effectively reduces the capital ratio of the high-capital bank and increases that of the low-capital bank. Applying Holmstrom and Tirole's (1997) first key ingredient, this suggests that monitoring declines in the acquiring bank and increases in the target bank. Applying the second key ingredient from Holmstrom and Tirole (1997), this implies that the performance of the acquiring bank declines while that of the target bank improves after the acquisition.

Subsequent to the acquisition, only the performance of the combined bank is observable to an empiricist. If one makes the reasonable assumption that there are diminishing marginal returns to monitoring, then the impact of the drop in monitoring at the acquiring bank will be less than the impact of the increase in monitoring at the target bank, and hence there will be a net performance improvement in the combined bank after the acquisition.

If one applied similar logic to deals whereby a low-capital acquirer buys a high-capital target, one would predict that the performance of the acquiring banks improves while that of the target declines, leading yet again to a net performance improvement at the combined bank. Thus, it may seem that performance is expected to improve after the acquisition regardless of whether the acquirer or the target has more capital. In practice, this is unlikely to be true, however, due to the asymmetry in the influences of the acquiring and target banks that was discussed in the Introduction.

The quantitative impact of the net performance improvement after the acquisition will not be the same across all acquisitions in which a higher-capital bank buys a lower-capital bank. Two factors will bear on the size of the impact: the amount of the increase in the target's capital ratio and the relative size of the target. The greater the increase in the target's capital ratio, the greater will be the resulting performance improvement, and this effect will be increasing in the relative size of the target. That is, what matters is the improvement in the capital ratio at the target weighted by the target's relative size.

[14] These banks may hold different capital ratios for a variety of reasons. The one with low capital could possibly issue equity capital if it deemed this to be optimal. The fact that one has a lower capital ratio than the other may simply reflect the different costs of acquiring and holding capital.

For brevity, I will henceforth simply refer to this as the increase in the target's capital ratio. This informal extension of Holmstrom and Tirole (1997) thus yields the following two predictions.

Prediction 1: *If a high-capital bank acquires a low-capital bank, the greater is the increase in capital (and associated enhanced screening / monitoring incentives) at the low-capital bank, the greater will be the resulting decline in the loan defaults in the merged bank.*

Prediction 2: *If a high-capital bank acquires a low-capital bank, the greater is the increase in capital (and associated enhanced screening / monitoring incentives) at the low-capital bank, the greater will be the resulting increase in the return on capital in the merged bank.*

Predictions 1 and 2 are tested in the empirical analysis that follows.

4. EMPIRICAL METHODOLOGY AND DATA

This section first presents the econometric framework and explains the regression variables. It then discusses the sample and presents summary statistics.

4.1. Regression framework

To test Predictions 1 and 2, I regress the change in performance on the change in the target's capital ratio plus a set of control variables that include year and bank fixed effects. Subsections 4.2 – 4.4 explain the construction of the change in target capital, the performance measures, and the control variables. All regressions are estimated with robust standard errors clustered by year to control for heteroskedasticity as well as possible correlation across observations of different banks in the same year.

Each variable that is expressed as a change is calculated as: (value as of December 31 of the year after the effective date minus the value as of December 31 of the year before the effective date) / (value as of December 31 of the year before the effective date). All other accounting-related variables are measured as of December 31 of the year before the effective date. Values as of year-end before the effective date are based on "pro forma" values: the pre-merger balance sheets and income statements of the acquirer and target are simply added together in an attempt to capture the pre-merger size and

performance of acquirer and target combined. The only exception is the change in the target's capital, whose construction is discussed next.

4.2. Key exogenous variable: the change in capital at the target bank

The key exogenous variable in the regressions is the change in the target's capital ratio, ΔEQRAT_target. Consistent with the discussion in the previous section, the definition focuses on the change in the target bank's (rather than the acquiring bank's or the merged bank's) capital ratio.[15]

As indicated above, the change in capital at the target bank (post-acquisition capital ratio minus the target bank's pre-acquisition capital ratio) has to be weighted by the relative size of the target because the impact of capital enhancement on post-acquisition performance will be affected by the size of the target relative to the acquirer. The bigger the acquisition, the greater the expected effect on performance. I therefore construct ΔEQRAT_target as (post-acquisition capital ratio minus the target bank's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the acquirer's and the target's pre-acquisition GTA). GTA or "Gross Total Assets" equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserves. GTA is used rather than (net) total assets because the loans extended by the bank are inclusive of these reserves and hence GTA is a better measure of bank size (e.g., Berger, Saunders, Scalise and Udell, 1998).

4.3. Dependent variable: the change in bank performance

The dependent variable in all regressions is the change in bank performance. Three alternative bank performance measures are used, two of which are loan default measures – net charge-offs and non-performing loans – and one of which is a profitability measure – return on equity (ROE).[16]

Net charge-offs, CHARGEOFFS, are the value of loans removed from the books and charged against loss reserves. Non-performing loans, NPL, are defined as loans that are past due ninety days or more and still accruing interest plus loans in nonaccrual status. Both loan default variables are measured as a percentage of gross total assets. Note that higher net charge-offs do not necessarily point toward

[15] Robustness checks show that the main results continue to hold when the overall increase in capital at the combined bank is controlled for (see Section 6.3), and when – alternatively -- the increase in capital is based on estimated amounts of excess capital in the acquiring and target banks (see Section 6.7).

[16] As noted before, I obtain similar results even if ROA is used instead of ROE.

increased problems with the loan portfolio, but may simply indicate that the bank is taking a more proactive approach to charging off loans (Ergungor, 2005). In contrast, NPL is subject to little managerial discretion (Campello, 2002). ROE is defined as net income divided by shareholders equity.

All these dependent variables are expressed in terms of changes due to the merger. The empirical predictions are that the coefficients on the change in net charge-offs and non-performing loans will be negative and significant (Prediction 1), and that the coefficient on the change in ROE will be positive and significant (Prediction 2).

4.4. Control variables

The regressions include the following control variables: bank size, relative size, acquirer and target bank holding company (BHC) dummies, an out-of-state dummy, and the size of the acquirer's and target's informationally-sensitive loan portfolios. This section discusses these variables in turn.

Bank size, lnGTA, is calculated as the natural log of gross total assets (GTA). Size is controlled for because performance enhancements could be caused by scale economies achieved through the acquisition.[17]

The size of the target relative to the acquirer, lnRELSIZE, is measured as the natural log of (target GTA / acquirer GTA). Relative size of the target is included because smaller deals are expected to have a smaller effect on post-acquisition performance (e.g., DeLong, 2001; and Anderson, Becher and Campbell, 2004).

D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a bank holding company. U.S. regulations require holding companies to be a source of strength for the banks they own. Banks in the same BHC are also required to cross-guarantee each other and provide capital when needed. This suggests that BHC membership eases a bank's access to capital, which could limit the effect of capital on screening / monitoring, and thus weaken the link between capital and performance (e.g., Heggestad and Mingo, 1975).

D-OUT-OF-STATE is a dummy variable that equals 1 if the deal involved two banks headquartered in a different state. This dummy is included to allow for the possibility that geographic

[17] The literature provides inconclusive evidence regarding the existence of scale economies in banking (e.g., Pilloff and Santomero, 1998).

diversification affects bank performance (e.g., Berger, Saunders, Scalise and Udell, 1998; and DeLong, 2001).

The acquirer's and target's informationally-sensitive loan portfolios, INFOSENSELNS_acq and INFOSENSELNS_target, include loans for which loan quality is likely to be sensitive to the quality of the bank's screening / monitoring and they are calculated as gross loans minus loans to other depository institutions, states, or foreign governments as a fraction of GTA. The focus on informationally-sensitive loans rather than all loans is motivated by the observation that the monitoring benefits highlighted in Holmstrom and Tirole (1997) are expected to be greatest for informationally-sensitive loans (see also Boot and Thakor, 2000; and Allen, Carletti and Marquez, 2008).[18,19] The size of the informationally-sensitive loan portfolio of the acquirer is controlled for because a bank with a larger loan portfolio may have accumulated better screening / monitoring technology and hence the acquisition of a less-capitalized target could be expected to yield a greater improvement in performance. Similarly, the size of the informationally-sensitive loan portfolio of the target is controlled for because performance improvements due to increased screening / monitoring should be greater if the target has a larger loan portfolio.

4.5. Data and summary statistics

Data on bank-level mergers and acquisitions that became effective between January 1986 and December 2006 is obtained from the Federal Reserve Bank of Chicago. Deals are kept in the sample if they meet the following four requirements. First, the survivor bank and non-surviving bank (henceforth referred to as the acquirer and the target) are commercial banks, credit unions, thrifts or cooperative banks. Second, the deal did not constitute a split or sale of assets and did not involve government assistance. Third, the deal consolidates banks with separate charters under a single bank charter or the bank obtains a different top-tier holding company but retains its charter. Fourth, the target's assets must equal at least three percent of the acquirer's assets.[20] The final sample contains 5,090 mergers and acquisitions.

The bank-level mergers and acquisition data is complemented with data from the FDIC's Report of Condition and Income (Call Reports), made available on the Federal Reserve Bank of Chicago's

[18] Results are similar when total loans are used instead of informationally-sensitive loans.
[19] Berger and Udell (2002) examine how organizational form and bank size affects the availability of relationship loans.
[20] This requirement does not materially affect any of the regression results.

website, to construct the regression variables discussed in Sections 4.2 – 4.4. All accounting variables used in the regressions are as of December 31.[21] Since banks are required to submit detailed, standardized financial reports every quarter, no observations are dropped because of missing accounting data. To construct measures of market power, defined in Section 6.5, the location of each bank's depository offices and reported deposit balances are obtained from the FDIC's annual Summary of Deposits data for commercial banks and thrifts.

Table 1 Panel A contains summary statistics on the regression variables used. As can be seen, on average, performance increased slightly based on net charge-offs and NPL (recall that a decrease in charge-offs and NPL means an improvement), but deteriorated based on ROE relative to the pre-acquisition pro-forma performance of acquirer and target combined. The change in the target's capital ratio, ΔEQRAT_target, was slightly negative. The average acquirer has GTA of $3.86 billion and the target's GTA are on average 48% of the acquirer's GTA. Only 10% of all acquisitions were out-of-state deals. Informationally-sensitive loans on average constituted 60% (57%) of the acquirer's (target's) GTA. Panels B and C contain some more detailed information about the acquirers and targets. Panel B shows the number of acquisitions and target relative size over time. The number of deals peaked at 377 in 1995 and has dropped to 1/3 – 1/2 that level in more recent years. Target relative size was 48% on average and ranged from 33% (in 1999) to 65% (in 1993). Panel C gives the distribution of acquirers and targets per state. By far the most deals took place in Illinois and Texas (11.3% and 8.8% of all deals in the sample).

Place Table 1 here

5. MAIN RESULTS

Table 2 presents the results of regressing the change in bank performance around the merger date on *ΔEQRAT_target*, the change in the target's capital ratio, while controlling for other factors that may affect operating performance. As explained in Section 4, these other factors include acquirer size, the size of the target relative to the acquirer, acquirer and target bank holding company membership, geographic diversification, the sizes of the informationally-sensitive loan portfolios at the acquirer and target divided

[21] The risk measures discussed in Section 6.2 are constructed as of December 31 using quarterly data.

by GTA, and bank and year fixed effects. Results are shown for the three alternative performance measures: the changes in net charge-offs, non-performing loans, and ROE.

As can be seen in the table, the coefficients on the change in net charge-offs and non-performing loans are negative and significant at the 5% level (t-statistics of 2.50 and 2.10, respectively), while the coefficient on the change in ROE is positive and also significant at the 5% level (t-statistic of 2.15).[22] These results are consistent with the main predictions: a greater increase in target capital around the merger completion date is associated with a greater improvement in post-acquisition bank performance, as evidenced by lower net charge-offs and non-performing loans, and higher ROE.

Place Table 2 here

It is useful to check whether the documented link between the increase in capital and performance improvement is accidentally driven by performance changes in the banking sector as a whole, i.e. at the industry level. To some extent, this issue has been taken care of because the sample contains banks only, so the use of year fixed effects already demeans the data. However, the demeaning is imperfect since for each deal, only one year dummy is included (for the year of deal completion), whereas the performance improvement is calculated over a few years. Furthermore, it may be useful as well to examine whether the results continue to hold when the median (rather than the mean) performance in the banking sector in that year is deducted. Industry-adjusted performance measures are therefore calculated as the bank's actual performance in a particular year minus the average or median performance of all banks in that year. Changes in these industry-adjusted performance measures are constructed and the regressions are rerun.

Table 3 Panels A and B show results based on deducting the mean and median industry performance, respectively. It is clear that the use of industry-adjusted operating performance measures does not affect the results. As before, the coefficients on the change in industry-adjusted net charge-offs, non-performing loans, and ROE have the expected sign and are statistically significant in both alternative specifications.

Place Table 3 here

[22] As indicated before, similar results are obtained if ROA is used instead of ROE.

6. ROBUSTNESS CHECKS

This section contains seven analyses to establish the robustness of the main regression results. The first robustness check involves examining whether the performance improvements may be driven by the acquisition per se rather than by changes in the target's capital ratio. As a second robustness check, I check whether the results documented here are driven by the effect of capital on the bank's asset-portfolio-selection. The third robustness check limits the sample to deals whereby the acquirer did not issue equity around the time of the merger. The fourth check involves investigating whether a decline in soft-information lending could drive the results. A fifth robustness check examines whether the results could be driven by banks simply selling off problem assets after the acquisition and operating with a smaller, higher-quality balance sheet. Sixth, since mergers may lead to increased market power, which in turn may enhance bank performance, the next robustness check controls for the change in market power due to the merger. The final robustness check attempts to estimate the "normal" level of capital a bank should have based on a structural model and then computes (positive or negative) "excess" capital based on this estimation. The regressions are then rerun using the calculated change in *excess* capital. These robustness checks leave the main conclusion unchanged.

6.1. Checking that the results are not driven by the acquisition per se

One potential concern is that the documented performance improvements are not truly driven by the change in capital at the target but merely by the acquisition itself. That is, an acquisition is usually motivated by the objective to improve operating efficiency at both banks, so post-acquisition performance improves regardless of the capital change at the target. To investigate this, I split the sample into targets that experienced a small change (less than one percentage point) in capital and those that experienced a big change (at least one percentage point) in capital. Thus, if a target had 8% capital and the merger shocked its capital ratio by +0.5% (+1.5%), it falls in the "small change" ("large change") category. In the sample, 41% (59%) of the targets experienced a small (big) change in capital. If it is just the acquisition that delivers the performance improvements, then the coefficients on the performance variables (net charge-offs, NPLs and ROE) should have the correct signs with statistical significance in all cases. If instead it is the change in capital at the target that causes the change in performance, then the results should be significant only if the target experiences a big change in capital.

Table 4 Panels A and B show results. The coefficients on the change in performance variables have the correct signs in all cases but are significant only if the target experiences a big change in capital, implying that the main results of the paper seem to be driven by the change in capital at the target rather than by the acquisition *per se*.[23]

Place Table 4 here

6.2. Checking that the results are not driven by equity issuance

A related concern is that the results are driven by acquirers issuing equity around the time of the merger. In this case the results may be driven simply by an increase in total capital at the merged bank. Unfortunately, since most of the banks in the sample are privately-held, I do not have direct access to data on equity issuance by the banks in the sample. However, one can still get at this issue by limiting attention to deals in which the post-acquisition capital ratio does not exceed the capital ratio of the pre-acquisition pro forma bank by much. Thus, to conduct this check, I impose the restriction that the post-acquisition capital ratio is at most 1.2 times the capital ratio of the pro forma bank.

Table 5 contains the results. The results are similar to the main results reported in Table 2 in that a greater increase in capital at the target is associated with a greater performance improvement of the combined bank. However, the results are stronger than before in that both the coefficients and the t-statistics are larger than before. Thus, the main results do not seem to be driven by acquirers issuing equity around the time of the merger.

Place Table 5 here

6.3. Controlling for asset-portfolio-selection effects

The results shown so far are based on regressions in which the change in performance at the combined bank is regressed on the change in the target bank's capital ratio plus control variables. It is possible, however, that the improvement in performance documented in Section 5 is somehow driven by the asset-portfolio-selection effect of capital (e.g., Bhattacharya, 1982; Furlong and Keeley, 1989; Rochet, 1992; Calem and Rob, 1999; Repullo, 2004; and Morrison and White, 2005) discussed earlier.

[23] All regressions included all the control variables, but D-BHC-acq dropped out of the regressions involving targets that experienced a small change in capital.

The asset-portfolio-selection effect suggests that an increase in capital attenuates asset-substitution moral hazard and induces the bank to invest in safer, lower-yield assets, thereby leading to less overall risk for the bank and lower loan defaults. This effect, however, is related to an increase in the capital of the combined bank rather than just the target. It is therefore possible to empirically distinguish between the asset-portfolio-selection hypothesis and the monitoring/screening argument developed in this paper.

I calculate the change in overall capital at the combined bank, ΔEQRAT_bank, as the capital ratio of the merged bank minus the pre-acquisition capital ratio of the pro-forma bank. The capital ratio of the pro-forma bank before the acquisition is 8.26% on average (median: 7.89%) and experiences an acquisition-induced increase of 0.26% on average (median: 0.18%). Note that since capital at the combined bank increases on average, we cannot rule out the possibility that the asset-portfolio-selection effect drives the results.

To examine this alternative explanation, I first focus on the loan default findings. I add the change in capital at the combined bank and the change in risk as additional control variables and rerun the regressions. The reason to also control for the change in risk is that the asset-portfolio-selection argument suggests that the bank's risk may decline due to reasons unrelated to screening / monitoring, and the change in overall capital *per se* or the change in risk could drive the documented operating performance results. Two alternative risk measures are used. The first measure is ΔZSCORE, the increase in the distance to default (e.g., Boyd, Graham, and Hewitt, 1993). The distance to default is measured as the bank's ROA plus the equity capital/GTA ratio divided by the standard deviation of ROA. The second measure is ΔEARNVOL, the increase in earnings volatility, where earnings volatility is the standard deviation of the bank's ROA. Both measures are constructed using up to twelve (minimum: eight) quarters of data. If the results presented so far are exclusively driven by the asset-portfolio-selection effect, I should find that after controlling for the overall change in the *combined* bank's capital (ΔEQRAT_bank) and risk (ΔZSCORE or ΔEARNVOL), the coefficient on the change in capital at the target bank (ΔEQRAT_target) is not significant anymore.

Table 6 contains the results of regressions that control for the overall increase in capital and changes in risk at the combined bank. Panels A and B show results for net charge-offs and non-performing loans. Both panels contain two columns that use the distance to default and earnings volatility

as risk measures, respectively. As before, a bigger increase in target capital leads to a greater improvement in performance: even after controlling for the increase in overall capital and changes in risk at the combined bank, the effect of a change in the target's capital on net charge-offs and non-performing loans is negative and significant.

Place Table 6 here

The asset-portfolio-selection hypothesis also makes a clear prediction about how an increase in capital at the combined bank will affect ROE. It says that higher capital causes a shift to less risky assets with lower expected returns, which means the bank's ROE should decline.[24] Thus, the asset-portfolio-selection hypothesis says that an increase in capital at the *combined* bank is expected to have an effect that is the exact opposite of the one documented in this paper based on the increase in capital at the *target* bank. Nonetheless, as an additional robustness check, I rerun the regressions involving ROE and include the overall increase in capital at the combined bank and the change in risk as additional control variables.

Table 6 Panel C presents the results related to ROE. As is evident, an overall increase in capital at the combined bank is associated with a decrease in ROE as suggested by the asset-portfolio-selection effect. Importantly, however, the effect of the change in target capital on the change in ROE remains positive and statistically significant. These results suggest that while the portfolio selection effect may be at work, the predicted screening / monitoring effect is significant even after controlling for the change in capital at the combined bank and the change in risk.

6.4. Checking that the results are not driven by a decline in soft-information lending

The literature argues that larger, more organizationally-complex banking organizations have a comparative advantage in hard-information lending while smaller, less complex banks have a comparative advantage in soft-information lending (e.g., Stein, 2002, Berger and Udell, 2002; and Berger, Miller, Petersen, Rajan and Stein, 2005). Since mergers tend to increase bank size, it is therefore possible that soft-information lending decreases as a result of the merger.[25] This is important to investigate because soft-information lending is riskier than hard-information lending, and hence the documented

[24] Note that this negative effect of capital on ROE adds to mechanical effect of an increase in equity capital. The mechanical effect, which follows directly from the ROE formula, is that higher capital reduces ROE *ceteris paribus* because net income is divided by a higher amount of capital.

[25] The empirical evidence on this issue is mixed. For a discussion, see, for example. Berger, Saunders, Scalise and Udell (1998).

decline in loan default rates could be driven by a decrease in soft-information lending. Note that to some extent, my analyses already control for this: a decline in soft-information lending is most likely to occur with acquirers that are geographically-distant from their targets, and all regressions include an out-of-state acquisition dummy. Nonetheless, I now examine this more rigorously.

As a first check, I examine whether the dollar amount of relationship loans at the merged bank is smaller than that at the pro-forma bank before the merger, as suggested by the soft-information lending hypothesis. This is not the case: the dollar amount of relationship loans is, on average, 5.5% greater. Thus, relationship lending seems to have increased, which is consistent with evidence reported in Strahan and Weston (1998), but inconsistent with the notion that the lower loan defaults documented here are due to a decline in soft-information relationship lending.

As a second check, I analyze whether the dollar amount of soft-information lending divided by gross total assets declines. This does not happen: the fraction of soft-information lending on average increases from 59.1% to 61.6% after the merger.[26]

The evidence provided in this section suggests that a drop in soft-information lending cannot explain the results.

6.5. Checking that the results are not driven by asset contractions

Although mergers and acquisitions are typically size-enhancing, banks sometimes also sell assets as part of the acquisition process or shortly after deal completion. This may be done to shed problem assets and "clean up" the balance sheet, so that the combined bank after the acquisition holds higher-quality assets on its balance sheet. This suggests that improvements in performance may be driven by banks whose post-acquisition asset sizes are smaller than the pre-acquisition asset size of the acquirer and the target combined.

To examine this alternative explanation for the main findings, I construct D-decrGTA, a dummy variable that equals 1 if the banks' GTA is smaller after the acquisition than the combined GTA of acquirer and target before the acquisition. This variable is added as an additional control variable to the regressions. The coefficient on this dummy variable will pick up the effect of asset contractions on

[26] The bank's earnings volatility also increases significantly after the merger, which is consistent with my finding that relationship lending goes up after the merger.

performance. If the main finding is driven by asset contractions, I should find that the coefficients on ΔEQRAT_target are no longer significant or change sign.

Table 7 shows the regression results. The effect of an increase in target capital on net charge-offs and non-performing loans continues to be negative, and the effect on ROE remains positive and significant, with t-statistics that are similar to those reported in Table 2. These results suggest that the positive effect of bank capital on bank performance is not driven by banks shedding their problem assets after the acquisition, which reinforces the conclusion that the documented effect is driven by the monitoring-induced effect of capital.

Place Table 7 here

6.6. Control for the change in market power

Mergers and acquisitions may sometimes lead to increased market power, and this could result in improved post-acquisition bank performance,[27] independently of any capital-induced screening / monitoring effects.

To examine this, the change in market power is now explicitly controlled for. Market power is measured using the bank-level Herfindahl-Hirschman Index (HHI): I first establish the HHI of the markets in which the bank has deposits and then weight these market indices by the proportion of the bank's deposits in each of these markets.[28] The local market is defined as the Metropolitan Statistical Area (MSA) or non-MSA county in which the bank's offices are located.[29] The change in market power, ΔMKTPOWER, is then defined as the acquirer's market power (i.e. HHI) after the acquisition minus the weighted average market power of the acquirer and the target before the acquisition, using their respective deposit shares in the pre-acquisition pro-forma bank's total deposits as weights. Since it is unclear whether the actual increase in market power would matter or the percentage increase, I also construct

[27] Evidence provided in the literature (e.g., Berger and Hannan, 1991; Prager and Hannan, 1998; Sapienza, 2002; Kahn, Pennacchi and Sopranzetti, 2005; and Park and Pennacchi, forthcoming) suggests that increases in market power may lead to lower rates on deposits and higher rates on loans.

[28] The market-level HHI in each market is calculated as the sum of the squares of the deposit market shares of all banks and thrifts in that market. The HHI is based on deposits rather than loans because market-level data for bank loans does not exist.

[29] In some cases, New England County Metropolitan Areas (NECMAs) are used in place of MSAs, but for convenience, the term MSA is used to cover both MSAs and NECMAs.

ΔMKTPOWER%, the change in market power divided by the acquirer and target's combined market power before the acquisition.

Table 8 Panels A and B contain the results based on the actual and the percentage change in market power, respectively. The coefficients on ΔMKTPOWER and ΔMKTPOWER% are not significant, suggesting that changes in market power do not drive the main result. Importantly, consistent with the predictions formulated in this paper, the coefficients on the change in capital continue to have the expected sign and continue to be significant even after controlling for changes in market power.

Place Table 8 here

6.7. Use acquirer and target "excess capital"

The empirical analysis thus far has focused on the post-acquisition change in the target bank's capital ratio. However, one could argue that what might matter most is the change in capital relative to an expected or benchmark level of capital, rather than the actual level of capital. The benchmark could be defined in many ways, including the level at which the bank chooses the efficient level of monitoring. Regardless of how the benchmark is defined, the effect of an increase in capital if one starts with capital below the benchmark level may be quite different from the effect of an increase in capital if one starts with capital above the benchmark level.

It is virtually impossible to pin down precisely how much capital the bank needs for efficient screening / monitoring, because monitoring costs as well as the marginal benefits of monitoring are unobservable. However, we do know some key factors that determine banks' capital ratios, so it is possible to attempt an estimation of a bank's "normal" or benchmark capital ratio which would then permit a calculation of "excess capital". This section takes such an empirical approach to estimate each bank's amount of excess capital, and then uses this calculated excess capital in the analysis instead of the actual amount of capital.

The process to estimate each bank's excess capital involves two steps. In the first step, variables that may drive differences in capital across banks (to be discussed below) are identified. The effects of these variables are purged from the acquirer's and target's capital ratios. This is done by regressing the acquirer's capital ratio the year before acquisition completion on lagged values of these variables and fixed effects, and by then running a similar regression for the targets. The regression residuals from this

step can be viewed as the "acquirer's excess capital ratio" and the "target's excess capital ratio," recognizing that "excess" capital may be positive or negative. In the second step, ΔEXCESSEQRAT_target, the change in excess capital is calculated as (acquirer excess capital ratio minus target excess capital ratio) * (target's pre-acquisition GTA / sum of the acquirer's and target's pre-acquisition GTA). The improvement in performance is regressed on the change in excess capital and all the control variables and fixed effects used before. The coefficients on the change in excess capital are predicted to be negative (positive) and significant when performance improvements are measured using net charge-offs and NPA (ROE). That is, the second-stage regression results should be similar to the results presented so far.

As for the first step, existing theories do not give specific guidance about the variables that drive cross-sectional variations in capital, although they offer some suggestions about where to look. A recent paper by Berger, DeYoung, Flannery, Lee, and Oztekin (2008) uses these suggestions to examine this issue empirically for large BHCs. Recognizing that my sample includes individual banks rather than BHCs, I build on their approach and posit that the following four variables drive differences in capital ratios among banks. The first variable is earnings retention. Banks with higher capital ratios may simply be those that retained a greater fraction of their earnings. RETAINED, measured as net income minus cash dividends divided by GTA, is included in the regressions. The second variable is bank risk. Banks may match their capital ratios to perceived risk exposures, so riskier banks may choose to keep higher capital ratios. To capture the effect of risk, EARNVOL (as defined in section 6.2) is included in the regressions. The third variable is bank size. Larger banks may choose lower capital ratios due to better-diversified investment portfolios and/or their potentially greater ability to raise new equity capital when needed. lnGTA (as defined in Section 4.4) is included as a measure of bank size. The fourth variable is BHC membership. BHC members may hold less capital because U.S. regulations require holding companies to be a source of strength for the banks they own and also require banks in the same BHC to cross-guarantee each other and provide capital when needed. Holding companies may also inject capital voluntarily, thereby giving the entities in the holding company access to internal capital markets when needed. The regressions for acquirers and targets therefore include D-BHC_acq and D-BHC_target (as defined in Section 4.4), respectively.

Table 9 Panels A and B show the first- and second-stage regression results. As shown in Panel A, the effects of retained earnings, risk, and bank size on capital are as expected. Surprisingly, the effect of BHC membership on capital is positive, although not significant. Importantly, Panel B confirms that even when the change in excess capital (calculated using the residuals from the first-stage regressions) is used, the regression results remain unchanged. The change in (excess) capital has a negative and significant effect on net charge-offs and NPLs and a positive and significant effect on ROE.

Place Table 9 here

All of these robustness checks notwithstanding, one could look for alternative explanations for the results here. For example, one might suggest that these results may be due to the fact that expected performance improvements at low-capital banks may lead higher-capital banks to acquire these banks. This may well be true, but the only theories of bank performance improvement linked to capital levels that we have tell us that the source of these improvements is strengthened monitoring / screening incentives due to higher capital. Alternatively, one might argue that better-capitalized banks may have stronger management than lower-capitalized banks. Thus, improvement in management quality may be driving the performance improvement following the acquisition of a low-capital target by a high-capital acquirer. A serious drawback of this alternative explanation is that there is no theory which predicts a systematic relationship between management ability and capital. So we should expect these two variables to not be correlated in the cross section. It is not possible to examine this issue in depth since bank-level data from the Chicago Federal Reserve website is used for the analyses and no information is available about the quality of management at these banks.

7. SUMMARY AND CONCLUSIONS

This paper informally extended Holmstrom and Tirole (1997) in a merger setting in which an acquisition provides a shock to the capital level of the target and alters its screening / monitoring incentives, thereby impacting its post-acquisition performance. Two predictions were extracted. First, the larger the increase in the target bank's capital as a result of the merger, the lower is the post-acquisition loan default rate. And second, the larger is the increase in the target bank's capital as a result of the merger, the greater is the improvement in the merged bank's post-acquisition profitability.

The predictions are tested using data on mergers and acquisitions that occurred between 1986 and 2006 and found to have strong support: the impact of an increase in target capital on net charge-offs and non-performing loans is significantly negative and the impact on ROE is significantly positive. The results are robust to using several alternative specifications.

Improved operating performance after the acquisition (relative to the bank's pro-forma pre-acquisition performance) is consistent with the notion that there are diminishing marginal returns to monitoring (and hence to capital): the improved performance at the low-capital merger partner due to an increase in capital outweighs the deterioration in performance at the high-capital bank due to a drop in capital.

REFERENCES

Allen, Franklin, 1990, The market for information and the origin of financial intermediation, Journal of Financial Intermediation 1: 3-30.

Allen, Franklin, Elena Carletti and Robert Marquez, 2008, Credit market competition and capital regulation, Wharton School working paper.

Anderson, Christopher W., David A. Becher, and Terry L. Campbell II, 2004, Bank mergers, the market for bank CEOs, and managerial incentives, Journal of Financial Intermediation 13: 6-27.

Araujo, Luis, and Raoul Minetti, 2007, Financial intermediaries as markets for firm assets, Economic Journal 117: 1380-1402.

Barth, James R., Gerard Caprio, and Ross Levine, 2004, Bank regulation and supervision: What works best?, Journal of Financial Intermediation 13(2): 205-248.

Berger, Allen N., 1995, The relationship between capital and earnings in banking, Journal of Money, Credit and Banking 27(2): 432-456.

Berger, Allen N., Robert DeYoung, Mark J. Flannery, David Lee, and Ozde Oztekin 2008, Why do large banking organizations hold so much capital?, Journal of Financial Services Research 34:123-149.

Berger, Allen N., and Timothy H. Hannan, 1991, The rigidity of prices: Evidence from the banking industry, American Economic Review 81(4): 938-945

Berger, Allen N., Richard J. Herring, and Giorgio P. Szego, The role of capital in financial institutions, Journal of Banking and Finance 19: 393-430.

Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein, 2005, Does function follow organizational form? Evidence from the lending practices of large and small banks, Journal of Financial Economics 76: 237-269.

Berger, Allen N., Anthony Saunders, Joseph M. Scalise, and Gregory F. Udell, 1998, The effects of bank mergers and acquisitions on small business lending, Journal of Financial Economics 2(1): 187-229.

Berger, Allen N., and Gregory F. Udell, 1994, Did risk-based capital allocate bank credit and cause a "credit crunch" in the United States?, Journal of Money, Credit and Banking 26(3): 586-627.

Berger, Allen N., and Gregory F. Udell, 2002, Small business credit availability and relationship lending: The importance of bank organizational structure, Economic Journal 112: 32-53.

Besanko, David, and George Kanatas, 1993, Credit market equilibrium with bank monitoring and moral hazard, Review of Financial Studies 6: 213-232.

Bhattacharya, Sudipto, 1982, Aspects of monetary and banking theory and moral hazard, Journal of Finance, 37(2): 371-384.

Bhattacharya, Sudipto, Arnoud W.A. Boot, and Anjan V. Thakor, 1998, The economics of bank regulation, Journal of Money, Credit and Banking 30(4): 745-770.

Boot, Arnoud W.A., and Anjan V. Thakor, 2000, Can relationship banking survive competition? Journal of Finance 55(2): 679-713.

Boyd, John H., Stanley L. Graham, and R. Shawn Hewitt, 1993, Bank holding company mergers with nonbank financial firms: Effects of the risk of failure, Journal of Banking and Finance 17: 43-63.

Boyd, John H., and Edward C. Prescott, 1986, Financial intermediary coalitions, Journal of Economic Theory 38(2): 211-232.

Calem, Paul, and Rafael Rob, 1999, The impact of capital-based regulation on bank risk taking, Journal of Financial Intermediation 8: 317-352.

Campello, Murillo, 2002, Internal capital markets in financial conglomerates: Evidence from small bank responses to monetary policy, Journal of Finance, 57: 2773-2805.

Cornett, Marcia M., and Hassan Tehranian, 1992, Changes in corporate performance associated with bank acquisitions, Journal of Financial Economics 31: 211-234.

Coval, Joshua, and Anjan V. Thakor, 2005, Financial intermediation as a beliefs-bridge between optimists and pessimists, Journal of Financial Economics 75(3): 535-570.

Dangl, Thomas and Alfred Lehar, 2004,Value-at-risk vs. building block regulation in banking, Journal of Financial Intermediation 13(2): 96-131.

Decamps, Jean-Paul, Jean-Charles Rochet, and Benoit Roger, 2004, The three pillars of Basel II: Optimizing the mix, Journal of Financial Intermediation 13(2): 132-155.

Dell'Ariccia, Giovanni, and Robert Marquez, 2006, Competition among regulators and credit market integration, Journal of Financial Economics 79: 401-430.

DeLong, Gayle L., 2001, Stockholder gains from focusing versus diversifying bank mergers, Journal of Financial Economics 59(2): 221-252.

Dewatripont, Mathias, and Jean Tirole, 1994, The prudential regulation of banks, MIT Press, Cambridge, M.A.

Diamond, Douglas W., 1984, Financial intermediation and delegated monitoring, Review of Economic Studies 51: 393-414.

Diamond, Douglas W., and Philip H. Dybvig, 1983, Bank runs, deposit insurance, and liquidity, Journal of Political Economy 91: 401-419.

Diamond, Douglas W., and Raghuram Rajan, 2000, A theory of bank capital, Journal of Finance 55: 2431-2465.

Ergungor, Emre O., 2005, The profitability of bank-borrower relationships, Journal of Financial Intermediation 14: 485-512.

Furlong, Frederick T., and Michael C. Keeley, 1989, Capital regulation and bank risk-taking: A note, Journal of Banking and Finance 13: 883-891.

Gorton, Gary, and Frank Schmid, 2000, Universal banking and the performance of German firms, Journal of Financial Economics 58(1-2): 29-80.

Heggestad, Arnold A., and John J. Mingo, 1975, Capital management by holding company banks, Journal of Business 48(4): 500-505.

Hellmann, Thomas F., Kevin C. Murdock, and Joseph E. Stiglitz, 2000, Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough?, American Economic Review 90: 147-165.

Holmstrom, Bengt, and Jean Tirole, 1997, Financial intermediation, loanable funds, and the real sector, The Quarterly Journal of Economics 112(3): 663-691.

Houston, Joel F., James, Christoher M., and Michael D. Ryngaert, 2001, Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders, Journal of Financial Economics 60: 285-331.

Kahn, Charles, George Pennacchi, and Ben Sopranzetti, 2005, Bank consolidation and the dynamics of consumer loan interest rates, Journal of Business, 78(1): 99-133

Kang, Jun-Koo, and Anil Shivdasani, 1995, Firm performance, corporate governance, and top executive turnover in Japan, Journal of Financial Economics 38: 29-58.

Kaplan, Steven, and Bernadette Minton, 1994, Appointments of outsiders to Japanese boards: Determinants and implications for managers, Journal of Financial Economics 36: 225-257.

Mishkin, Frederick, 2007, The Economics of Money, Banking and Financial Markets (8th edition), Addison Wesley – New York.

Millon, Marcia, and Anjan V. Thakor, 1985, Moral hazard and information sharing: A model of financial information gathering agencies, Journal of Finance 40(5): 1403-1422.

Morck, Randall, Masao Nakamura, and Anil Shivdasani, 2000, Banks, ownership structure, and firm value in Japan, Journal of Business 73(4): 539-567.

Morrison, Alan D., and Lucy White, 2005, Crises and capital requirements in banking, American Economic Review 95: 1548-1572.

Park, Kwangwoo, and George Pennacchi, forthcoming, Harming depositors and helping borrowers: The disparate impact of bank consolidation, Review of Financial Studies.

Pilloff, Steven J., 1996, Performance changes and shareholder wealth creation associated with mergers of publicly traded banking institutions, Journal of Money, Credit and Banking 28(3): 294-310.

Pilloff, Steven J., and Anthony M. Santomero, 1998, The value effects of bank mergers and acquisitions, in: Amihud Y. and G. Miller (Eds), Bank mergers and acquisitions, Kluwer Academic Publishers.

Prager, Robin A., and Timothy H. Hannan, 1998, Do substantial horizontal mergers generate significant price effects? Evidence from the banking industry," Journal of Industrial Economics 46(4): 433-452.

Ramakrishnan, Ram T.S., and Anjan V. Thakor, 1984, Information reliability and a theory of financial intermediation, Review of Economics Studies 51: 415-432.

Repullo, Rafael, 2004, Capital requirements, market power, and risk-taking in banking, Journal of Financial Intermediation 13: 156-182.

Rhoades, Stephen A., 1987, The operating performance of acquired firms in banking, In: R.L. Willis, J.A. Caswell, and J.D. Culbertson (Eds), Issues after a Century of Federal Competition Policy, Lexington Books.

Rhoades, Stephen A., 1994, A summary of merger performance studies in banking, 1980-1993, and an assessment of the operating performance and event study methodologies, Staff Study 167 - Board of Governors of the Federal Reserve System.

Rochet, Jean-Charles, 1992, Capital requirements and the behaviour of commercial banks, European Economic Review, 36(5): 1137-1170.

Sapienza, Paola, 2002, The effects of banking mergers on loan contracts, Journal of Finance 57: 329-368.

Shleifer, Andrei, and Robert W. Vishny, 1997, A survey of corporate governance, Journal of Finance 52(2): 737-783.

Stein, Jeremy, 2002, Information production and capital allocation: Decentralized versus hierarchical firms, Journal of Finance 57: 1891-1921.

Strahan, Philip E., and James P. Weston, 1998, Small business lending and the changing nature of the banking industry, Journal of Banking and Finance 22: 821-845.

Thakor, Anjan V., 1996, Capital requirements, monetary policy, and aggregate bank lending: Theory and empirical evidence, Journal of Finance 51(1): 279-324.

Yafeh, Yishay, and Oved Yosha, 2003, Large shareholders and banks: Who monitors and how?, Economic Journal 113: 128-146.

Table 1: Summary statistics

The sample includes 5,090 bank-level mergers and acquisitions that were completed between January 1986 and December 2006. This Table provides summary statistic on the main regression variables (Panel A); the number of acquisitions and target relative size over the sample period (Panel B); the number of acquirers and targets per state (Panel C).

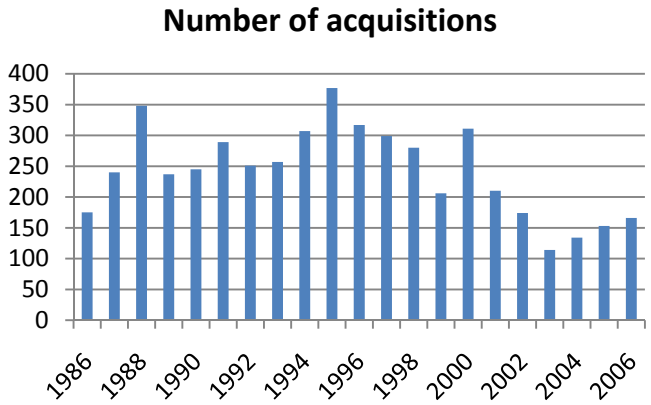
Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

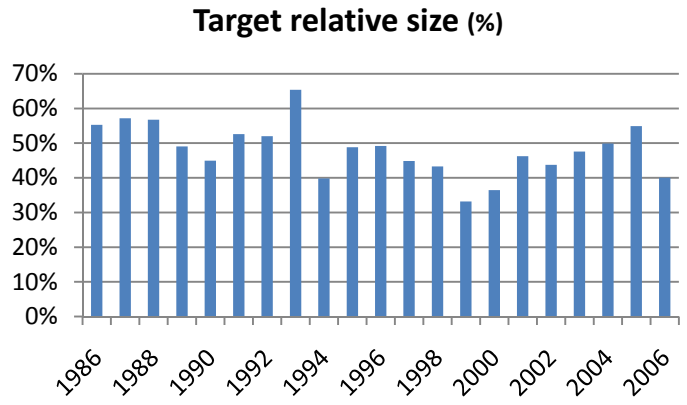
ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). GTA is gross total assets of the acquirer the year before deal completion. RELSIZE is the target's GTA divided by the acquirer's GTA the year before deal completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. INFOSENSELNS_acq (INFOSENSELNS_target) is the acquirer's (target's) informationally-sensitive loan portfolio, measured as gross loans minus loans to other banks, states, and governments, as a fraction of GTA.

Panel A: Summary statistics on the main regression variables

Variable	n	Mean	Standard deviation
Change in CHARGEOFFS (%)	5090	-0.02	0.44
Change in NPL (%)	5090	-0.02	0.86
Change in ROE (%)	5090	-1.03	18.9
ΔEQRAT_target (%)	5090	-0.03	0.77
GTA ($ billions)	5090	3.85	25.01
RELSIZE (%)	5090	0.48	0.65
D-OUT-OF-STATE	5090	0.10	0.30
INFOSENSELNS_acq (%)	5090	0.60	0.13
INFOSENSELNS_target (%)	5090	0.57	0.15

Panel B: Number of acquisitions and target relative size over the sample period





Panel C: The number of acquirers and targets per state

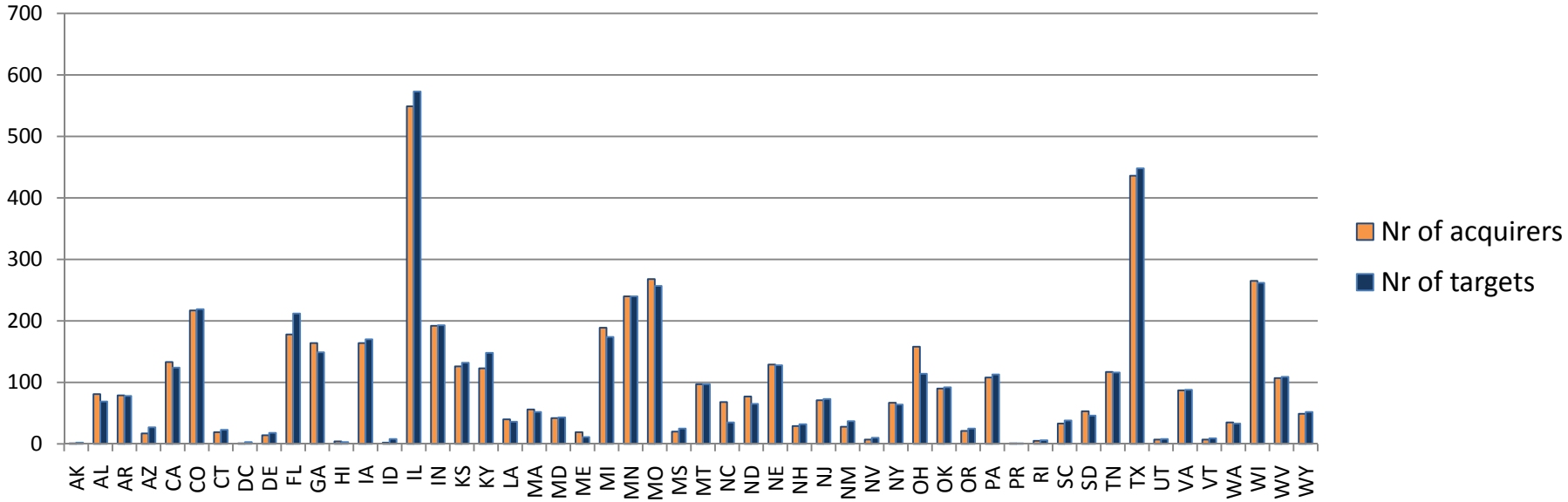


Table 2: Main Regression Results: How the Change in the Target's Capital Ratio Affects Post-Acquisition Performance

This Table regresses the change in performance on ΔEQRAT_target and control variables including bank and year fixed effects. The regression results show that the greater the increase in capital of the target bank, the greater is the decrease in loan defaults as a result of the acquisition and the greater is the increase in profitability of the combined bank relative to the stand-alone banks prior to the acquisition.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments, as a fraction of GTA. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Change in CHARGEOFFS	**Change in NPL**	**Change in ROE**
ΔEQRAT_target	-3.918	-3.951	108.781
	*(-2.50)***	*(-2.10)***	*(2.15)***
lnGTA	0.473	-9.908	2.947
	(0.17)	*(-2.35)***	*(0.02)*
lnRELSIZE	-0.008	-0.016	-0.316
	(-1.31)	*(-1.00)*	*(-1.43)*
D-BHC_acq	0.243	-0.207	-5.828
	*(1.81)**	*(-0.76)*	*(-0.48)*
D-BHC_target	0.015	-0.093	-0.176
	(0.24)	*(-1.03)*	*(-0.08)*
D-OUT-OF-STATE	-0.033	-0.011	1.402
	(-0.83)	*(-0.28)*	*(1.66)**
RELSHIPLNS_acq	0.205	-0.137	-3.406
	(1.03)	*(-0.44)*	*(-0.56)*
RELSHIPLNS_target	0.024	0.178	-1.588
	(0.40)	*(1.61)*	*(-1.03)*
Constant	-0.362	1.637	0.974
	(-1.02)	*(3.26)****	*(0.05)*
Observations	5090	5090	5090
Adjusted R2	0.72	0.78	0.87

Table 3: Regression Results based on *Industry-Adjusted* Performance Measures

This Table regresses the change in industry-adjusted performance on ΔEQRAT_target and control variables. Industry-adjusted performance is calculated by deducting the mean or median performance in the banking sector in a particular year from the bank's performance. The regression results show that the greater the increase in capital of the target bank, the greater is the decrease in *industry-adjusted* loan defaults as a result of the acquisition and the greater is the increase in *industry-adjusted* profitability of the combined bank relative to the stand-alone banks prior to the acquisition.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: Industry-adjust by deducting the *mean* industry performance			**Panel B: Industry-adjust by deducting the *median* industry performance**		
	Change in industry-adjusted CHARGEOFFS	**Change in industry-adjusted NPL**	**Change in industry-adjusted ROE**	**Change in industry-adjusted CHARGEOFFS**	**Change in industry-adjusted NPL**	**Change in industry-adjusted ROE**
ΔEQRAT_target	-3.957	-3.121	106.497	-3.957	-3.102	108.672
	*(-2.51)***	*(-1.82)**	*(2.15)***	*(-2.51)***	*(-1.81)**	*(2.15)***
lnGTA	0.535	-8.518	-0.257	0.535	-8.461	2.217
	(0.19)	*(-2.32)***	*(-0.00)*	*(0.19)*	*(-2.32)***	*(0.02)*
lnRELSIZE	-0.008	-0.028	-0.323	-0.008	-0.028	-0.316
	(-1.27)	*(-1.85)**	*(-1.46)*	*(-1.27)*	*(-1.85)**	*(-1.43)*
D-BHC_acq	0.244	-0.331	-5.643	0.244	-0.332	-5.569
	*(1.82)**	*(-1.07)*	*(-0.47)*	*(1.82)**	*(-1.07)*	*(-0.46)*
D-BHC_target	0.016	-0.059	-0.512	0.016	-0.059	-0.237
	(0.26)	*(-0.79)*	*(-0.21)*	*(0.26)*	*(-0.80)*	*(-0.10)*
D-OUT-OF-STATE	-0.035	-0.005	1.380	-0.035	-0.004	1.397
	(-0.87)	*(-0.17)*	*(1.63)*	*(-0.87)*	*(-0.15)*	*(1.65)*
RELSHIPLNS_acq	0.200	-0.740	-3.505	0.200	-0.748	-3.416
	(0.99)	*(-2.90)****	*(-0.58)*	*(0.99)*	*(-2.95)****	*(-0.56)*
RELSHIPLNS_target	0.022	-0.013	-1.770	0.022	-0.016	-1.621
	(0.37)	*(-0.14)*	*(-1.11)*	*(0.37)*	*(-0.18)*	*(-1.04)*
Constant	-0.306	2.026	16.615	-0.306	1.758	2.190
	(-0.86)	*(3.59)****	*(0.83)*	*(-0.86)*	*(3.13)****	*(0.11)*
Observations	5090	5090	5090	5090	5090	5090
Adjusted R2	0.71	0.76	0.88	0.71	0.76	0.87

Table 4: Regression Results for Targets with Small and Big Changes in Their Capital Ratios

This Table regresses the change in performance on ΔEQRAT_target and control variables separately for targets that experienced a small change (less than one percentage point) versus a big change (at least one percentage point) in their capital ratios. The regression results show that the change in target capital only affects performance if the change in capital is big. This suggests that the main results are not driven by the acquisition per se but are driven by the change in capital at the target bank.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: *Small* change in the target's capital ratio			**Panel B: *Big* change in the target's capital ratio**		
	Change in industry-adjusted CHARGEOFFS	**Change in industry-adjusted NPL**	**Change in industry-adjusted ROE**	**Change in industry-adjusted CHARGEOFFS**	**Change in industry-adjusted NPL**	**Change in industry-adjusted ROE**
ΔEQRAT_target	-3.040	-13.890	180.300	-5.328	-5.426	71.639
	(-0.49)	*(-1.23)*	*(1.22)*	*(-3.01)***	*(-2.63)***	*(1.78)**
lnGTA	-1.364	-8.396	-33.820	1.576	-4.913	-125.072
	(-0.27)	*(-1.52)*	*(-0.38)*	*(0.34)*	*(-0.84)*	*(-1.06)*
lnRELSIZE	-0.008	0.022	-0.453	0.003	-0.024	0.053
	(-0.71)	*(1.28)*	*(-1.70)*	*(0.37)*	*(-1.06)*	*(0.13)*
D-BHC_acq				0.069	-0.230	-21.806
				(0.29)	*(-0.61)*	*(-1.12)*
D-BHC_target	-0.161	-0.173	1.259	-0.049	-0.251	-0.698
	(-1.16)	*(-2.96)***	*(0.73)*	*(-0.69)*	*(-2.54)***	*(-0.24)*
D-OUT-OF-STATE	-0.053	-0.125	2.964	-0.022	0.042	1.315
	(-1.18)	*(-2.33)***	*(3.21)****	*(-0.37)*	*(0.76)*	*(0.97)*
RELSHIPLNS_acq	0.203	-0.671	2.234	0.501	0.248	-5.820
	(0.84)	*(-2.77)***	*(0.58)*	*(1.52)*	*(0.56)*	*(-0.64)*
RELSHIPLNS_target	0.120	0.195	-2.770	-0.053	0.168	-1.932
	*(1.88)**	*(1.41)*	*(-1.70)*	*(-0.69)*	*(1.35)*	*(-0.84)*
Constant	-0.032	1.295	2.351	-0.045	1.671	24.060
	(-0.06)	*(2.07)**	*(0.24)*	*(-0.08)*	*(2.08)**	*(0.89)*
Observations	2106	2106	2106	2984	2984	2984
Adjusted R2	0.83	0.86	0.91	0.76	0.81	0.90

Table 5: Regression Results based on a Sample that Excludes Deals with Equity Issuances

The sample is limited to deals whereby the acquirer did not issue equity around the time of the acquisition. The results are even stronger (larger coefficients and t-statistics) than the main regression results shown in Table 2.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_acquirer is the change in the acquirer's capital, measured as (post-acquisition capital ratio minus the acquirer's pre-acquisition capital ratio) * (acquirer's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Change in CHARGEOFFS	**Change in NPL**	**Change in ROE**
ΔEQRAT_acquirer			
ΔEQRAT_target	-5.576	-6.536	196.449
	*(-2.31)***	*(-2.53)***	*(2.84)***
lnGTA	0.657	-9.173	17.442
	(0.18)	*(-1.64)*	*(0.11)*
lnRELSIZE	-0.011	-0.019	-0.219
	*(-2.05)**	*(-0.97)*	*(-0.99)*
D-BHC_acq	0.372	0.174	-28.481
	*(2.00)**	*(1.60)*	*(-1.93)**
D-BHC_target	-0.072	-0.137	1.535
	(-0.84)	*(-1.48)*	*(0.60)*
D-OUT-OF-STATE	-0.045	-0.022	1.038
	(-1.46)	*(-0.48)*	*(1.81)**
RELSHIPLNS_acq	0.280	0.111	-7.850
	(1.36)	*(0.31)*	*(-1.19)*
RELSHIPLNS_target	0.061	0.164	-3.245
	(0.85)	*(1.56)*	*(-2.32)***
Constant	-0.554	1.072	24.222
	(-1.04)	*(1.79)**	*(1.02)*
Observations	4297	4297	4297
Adjusted R2	0.75	0.79	0.90

Table 6: Asset-portfolio-selection Effect of Capital – Controlling for the Change in Risk and Total Capital in the Combined Bank

This Table regresses the change in performance on ΔEQRAT_target and control variables that include controls for the asset-portfolio-selection effect of capital. The regression results show that the greater the increase in capital of the target bank, the greater is the improvement in performance as a result of the acquisition, even after controlling for the change in risk (as measured by the Z-score and earnings volatility) and the change in total capital in the combined bank. Results are shown for three performance measures: net charge-offs (Panel A); non-performing loans (Panel B); and ROE (Panel C).

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. ΔEQRAT_bank is the change in the merged bank's capital, measured as (post-acquisition capital ratio minus the pre-acquisition capital ratio of the pro-forma bank). RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. ΔZSCORE is the change in the bank's distance to default from the year before acquisition completion to the year after completion. ΔEARNVOL is the change in earnings volatility from the year before acquisition completion to the year after completion. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: Change in CHARGEOFFS		**Panel B: Change in NPL**		**Panel C: Change in ROE**	
ΔEQRAT_target	-6.595	-6.446	-5.324	-4.988	266.469	257.613
	*(-2.74)***	*(-2.65)***	*(-2.22)***	*(-2.05)**	*(4.45)****	*(4.52)****
lnGTA	3.777	4.713	-6.048	-3.743	-34.216	-103.619
	(1.34)	*(1.48)*	*(-1.37)*	*(-0.91)*	*(-0.23)*	*(-0.83)*
lnRELSIZE	-0.007	-0.010	-0.018	-0.025	-0.255	-0.062
	(-1.16)	*(-1.79)**	*(-1.04)*	*(-1.42)*	*(-1.38)*	*(-0.37)*
D-BHC_acq	0.296	0.267	-0.178	-0.232	-13.377	-12.422
	*(1.73)**	*(1.61)*	*(-0.51)*	*(-0.62)*	*(-0.92)*	*(-0.84)*
D-BHC_target	0.035	0.031	-0.071	-0.085	-2.248	-1.594
	(0.54)	*(0.53)*	*(-0.70)*	*(-1.05)*	*(-0.83)*	*(-0.69)*
D-OUT-OF-STATE	-0.049	-0.039	-0.029	-0.014	1.589	1.431
	(-1.24)	*(-1.02)*	*(-0.75)*	*(-0.38)*	*(1.97)**	*(1.82)**
RELSHIPLNS_acq	0.217	0.155	-0.192	-0.317	-4.690	-2.060
	(1.12)	*(0.88)*	*(-0.62)*	*(-1.23)*	*(-0.85)*	*(-0.45)*
RELSHIPLNS_target	0.011	-0.004	0.170	0.135	-1.816	-0.919
	(0.20)	*(-0.08)*	*(1.59)*	*(1.35)*	*(-1.15)*	*(-0.73)*
ΔEQRAT_bank	2.114	2.064	1.080	1.009	-123.793	-123.745
	*(2.16)***	*(2.01)**	*(0.82)*	*(0.88)*	*(-4.37)****	*(-4.63)****
ΔZSCORE	0.000		-0.001		0.010	
	*(4.60)****		*(-4.15)****		*(3.80)****	
ΔEARNVOL		68.604		136.399		-2802.009
		*(4.75)****		*(6.13)****		*(-4.83)****
Constant	-0.797	-0.862	1.160	0.978	14.843	21.114
	*(-2.14)***	*(-2.20)***	*(2.07)**	*(1.69)*	*(0.61)*	*(0.94)*
Observations	4926	4926	4926	4926	4926	4926
Adjusted R2	0.72	0.73	0.76	0.77	0.85	0.87

Table 7: Controlling for Post-Acquisition Asset Contractions

This Table regresses the change in performance on ΔEQRAT_target and control variables. Post-acquisition asset contraction has been added as an additional control variable. The regression results show that the greater the increase in capital of the target bank, the greater is the decrease in loan defaults as a result of the acquisition and the greater is the increase in profitability of the combined bank relative to the stand-alone banks prior to the acquisition, even after controlling for post-acquisition asset contractions.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. D-decrGTA is a dummy variable that equals 1 if the bank's GTA decreased relative to the combined GTA of acquirer and target the year before acquisition completion. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Change in CHARGEOFFS	**Change in NPL**	**Change in ROE**
ΔEQRAT_target	-3.901	-3.936	108.833
	*(-2.52)***	*(-2.09)***	*(2.15)***
lnGTA	0.995	-9.426	4.604
	(0.38)	*(-2.24)***	*(0.03)*
lnRELSIZE	-0.006	-0.015	-0.311
	(-1.16)	*(-0.95)*	*(-1.45)*
D-BHC_acq	0.241	-0.209	-5.834
	*(1.90)**	*(-0.77)*	*(-0.48)*
D-BHC_target	0.013	-0.094	-0.181
	(0.22)	*(-1.03)*	*(-0.08)*
D-OUT-OF-STATE	-0.031	-0.010	1.407
	(-0.82)	*(-0.25)*	*(1.67)*
RELSHIPLNS_acq	0.195	-0.146	-3.438
	(0.98)	*(-0.47)*	*(-0.56)*
RELSHIPLNS_target	0.025	0.179	-1.585
	(0.43)	*(1.64)*	*(-1.03)*
D-decrGTA	-0.047	-0.043	-0.149
	(-0.84)	*(-0.44)*	*(-0.09)*
Constant	-0.405	1.598	0.840
	(-1.17)	*(3.25)****	*(0.04)*
Observations	5090	5090	5090
Adjusted R2	0.72	0.78	0.87

Table 8: Controlling for Changes in Market Power

This Table regresses the change in performance on ΔEQRAT_target and control variables. Panels A and B control for the actual and the percentage change in market power, respectively. The regression results show that the greater the increase in capital of the target bank, the greater is the decrease in loan defaults as a result of the acquisition and the greater is the increase in profitability of the combined bank relative to the stand-alone banks prior to the acquisition, even after controlling for merger-related changes in market power.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

ΔEQRAT_target is the change in the target's capital, measured as (post-acquisition capital ratio minus the target's pre-acquisition capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnGTA is log of GTA of the pre-acquisition pro-forma bank. lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. ΔMKTPOWER and ΔMKTPOWER% are the actual and the percentage change in market power, where the change in market power is defined as the acquirer's post-acquisition HHI minus the weighted average HHI of the acquirer and target combined pre-acquisition. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: Controlling for the actual change in market power			**Panel B: Controlling for the percentage change in market power**		
	Change in CHARGEOFFS	**Change in NPL**	**Change in ROE**	**Change in CHARGEOFFS**	**Change in NPL**	**Change in ROE**
ΔEQRAT_target	-5.145	-4.879	158.649	-5.147	-4.887	158.468
	*(-2.70)***	*(-2.10)**	*(2.65)***	*(-2.70)***	*(-2.12)***	*(2.66)***
lnGTA	1.264	-11.450	25.138	1.289	-11.401	22.804
	(0.40)	*(-2.35)***	*(0.16)*	*(0.41)*	*(-2.34)***	*(0.15)*
lnRELSIZE	-0.007	-0.018	-0.192	-0.007	-0.018	-0.192
	(-1.04)	*(-1.00)*	*(-0.83)*	*(-1.05)*	*(-1.00)*	*(-0.83)*
D-BHC_acq	0.229	-0.150	-12.971	0.230	-0.146	-13.023
	(1.50)	*(-0.49)*	*(-1.04)*	*(1.51)*	*(-0.49)*	*(-1.04)*
D-BHC_target	0.073	-0.053	-2.732	0.073	-0.054	-2.698
	(1.05)	*(-0.48)*	*(-0.94)*	*(1.05)*	*(-0.48)*	*(-0.93)*
D-OUT-OF-STATE	-0.020	0.000	1.774	-0.020	0.001	1.762
	(-0.45)	*(0.00)*	*(1.84)**	*(-0.44)*	*(0.01)*	*(1.83)**
RELSHIPLNS_acq	0.145	-0.275	-4.886	0.142	-0.282	-4.679
	(0.65)	*(-0.88)*	*(-0.74)*	*(0.64)*	*(-0.89)*	*(-0.71)*
RELSHIPLNS_target	0.054	0.248	-1.869	0.053	0.246	-1.891
	(0.85)	*(2.13)***	*(-1.11)*	*(0.85)*	*(2.12)***	*(-1.13)*
ΔMKTPOWER	-0.049	-0.157	-3.215			
	(-0.29)	*(-0.52)*	*(-0.64)*			
ΔMKTPOWER%				0.003	0.000	-1.238
				(0.09)	*(0.01)*	*(-0.94)*
Constant	-0.456	1.779	7.811	0.003	0.000	-1.238
	(-1.19)	*(3.17)****	*(0.34)*	*(0.09)*	*(0.01)*	*(-0.94)*
Observations	5090	5090	5090	4595	4595	4595
Adjusted R2	0.72	0.78	0.87	0.73	0.79	0.87

Table 9: How the Change in the Target's *Excess* Capital Ratio Affects Post-Acquisition Performance

This table contains regression results from a two-stage approach that purges the effects of other variables from the acquirer's and target's capital ratio. Panel A contains first-stage regression results. In these regressions, EQRAT_acq and EQRAT_target, the acquirer's and target's total equity capital as a proportion of GTA, respectively, are regressed on variables that may drive variations in capital. The residuals of these two regressions are the acquirer's and target's "excess capital" and are used to calculate the change in excess capital (see below). Panel B shows second-stage regression results. In these regressions, the change in operating performance is regressed on the change in excess capital (calculated using the residuals from the first stage) and all the control variables. The regression results show that the greater the increase in *excess* capital of the target bank, the greater is the decrease in loan defaults as a result of the acquisition and the greater is the increase in profitability of the combined bank relative to the stand-alone banks prior to the acquisition.

Performance measures: (1) CHARGEOFFS, the net charge-offs divided by GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). (2) NPL, the non-performing loans divided by GTA. (3) ROE, return on equity, equals net income divided by total equity capital.

RETAINED is net income minus cash dividends divided by GTA. EARNVOL is earnings volatility multiplied by 100. lnGTA is log of GTA of the pre-acquisition pro-forma bank. D-BHC_acq (D-BHC_target) is a dummy variable that equals 1 if the acquirer (target) is part of a BHC in the year before acquisition completion. ΔEXCESSEQRAT_target is the change in excess capital, measured as (the acquirer's excess capital ratio minus the target's excess capital ratio) * (target's pre-acquisition GTA / sum of the target's and acquirer's pre-acquisition GTA). lnRELSIZE is the log of the target's GTA divided by the acquirer's GTA the year before deal completion. D-OUT-OF-STATE is a dummy that equals 1 if the acquirer and target are headquartered in a different state. RELSHIPLNS_acq (RELSHIPLNS_target) is the acquirer's (target's) relationship loan portfolio, measured as gross loans minus loans to other banks, states, and governments. All regressions include bank and year fixed effects.

The sample period is 1986-2006. t-statistics based on robust standard errors clustered by year are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level,

	Panel A: First-stage regression results	
	EQRAT_acq	**EQRAT_target**
RETAINED	0.248	0.137
	*(4.84)***	*(3.56)***
EARNVOL	1.611	0.599
	*(4.55)***	*(1.46)*
lnGTA	-0.002	-0.003
	(-1.62)	*(-3.75)***
D-BHC_acq	-0.002	
	(-0.29)	
D-BHC_target		0.007
		(1.46)
Constant	0.123	0.136
	*(6.79)***	*(11.19)***
Observations	4727	4684
Adjusted R2	0.93	0.77

	Panel B: Second-stage regression results		
	Change in CHARGEOFFS	**Change in NPL**	**Change in ROE**
ΔEXCESSEQRAT_target	-4.382	-5.113	129.560
	*(-1.98)**	*(-2.22)**	*(4.44)***
lnGTA	3.479	-5.918	16.509
	(1.50)	*(-1.35)*	*(0.11)*
lnRELSIZE	-0.016	-0.024	-0.026
	*(-2.79)**	*(-1.55)*	*(-0.17)*
D-BHC_acq	0.293	0.148	-35.291
	(0.98)	*(1.03)*	*(-1.69)*
D-BHC_target	0.046	-0.110	-0.104
	(0.81)	*(-1.34)*	*(-0.06)*
D-OUT-OF-STATE	-0.021	-0.008	1.282
	(-0.68)	*(-0.23)*	*(2.11)**
RELSHIPLNS_acq	0.088	-0.164	-3.508
	(0.44)	*(-0.48)*	*(-0.52)*
RELSHIPLNS_target	0.018	0.169	-1.177
	(0.35)	*(1.47)*	*(-0.84)*
Constant	-1.177	0.591	41.710
	*(-2.86)***	*(1.25)*	*(1.30)*
Observations	4642	4642	4642
Adjusted R2	0.72	0.77	0.86