Preemptive Distress Resolution through Bank Mergers

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Abstract

This paper suggests a motive for bank mergers that goes beyond alleged and typically unverifiable scale economies: preemptive resolution of banks' financial distress. Such "distress mergers" can be a significant motivation for mergers because they can foster reorganizations, realize diversification gains, and avoid public attention. However, since none of these potential benefits comes without a cost, the overall assessment of distress mergers is unclear. We conduct an empirical analysis to provide evidence on *consequences* of distress mergers.

The analysis is based on comprehensive data from Germany's savings and cooperatives banks sectors over the period 1993 to 2001. During this period both sectors faced significant structural problems and superordinate institutions (associations) presumably have engaged in coordinated actions to manage distress mergers. The data comprise 3640 banks and 1484 mergers.

Our results suggest that bank mergers as a means of preemptive distress resolution have moderate costs in terms of the economic impact on performance. We do find strong evidence consistent with diversification gains. Thus, distress mergers seem to have benefits without affecting systemic stability adversely.

JEL Classification: G21, G28, C33
Keywords: bank mergers, financial distress, systemic stability

1 Introduction

Banking sectors around the world have been facing a strong consolidation wave since the early 90's. Many explanations for this phenomenon have been analyzed in the literature, with surprisingly little success.[1] One explanation that has received only little attention is the association between bank mergers and financial distress. Yet, financial status and a bank's merger involvement are systematically related. For example, 1484 mergers occurred within the cooperatives and savings banks sectors in Germany (representing 95% of all German mergers, from 1993-2001). One quarter of these mergers involved banks that were likely in financial distress, as we will show below.[2] This is a surprising pattern simply because it is not obvious that financially sound banks are interested in merging with distressed banks.

One possible explanation is that certain institutions have enforced these mergers as a preemptive measure to ensure systemic stability of the banking system (or single sectors). Since maintaining systemic stability is the primary objective of banking regulation, the regulators are a prime candidate for such an institution.[3] There is indeed anecdotal evidence suggesting that regulators foster bank mergers to resolve financial distress of banks. Furthermore, in some countries legal provisions explicitly provide for mergers if banks are troubled. For example, the FDIC Improvement Act in the U.S. requires supervisors to prompt a merger (or the infusion of capital) if banks are "significantly undercapitalized" (see Jones and King (1995)). The obvious benefit of such an approach is that it may reduce the likelihood that a bank actually fails, which avoids spill-over effects and the associated risk of a bank-run.

This explanation raises two questions: First, to what extent do forced mergers to resolve financial distress of banks (henceforth: distress mergers) actually exist? Second, if distress mergers exist, what are the associated consequences? This paper makes an initial attempt to learn about these issues. We confront the second question of which consequences are associated with bank mergers as a means of preemptive distress resolution. We address the question empir-

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[1] Parties involved in bank mergers often emphasize expected scale economies as the motivation. However, most empirical studies fail to find corresponding evidence (for an overview see Berger, Demsetz, and Strahan (1999)).

[2] Financial distress is defined as banks with a critically high likelihood of default, including actual default.

[3] Banking crises are costly. For example, a recent cross-country study by Hoggarth, Reis, and Saporta (2002) estimates direct resolution costs (e.g. expenditures for bank recapitalisation, payments to depositors, and so forth) to be 4.5 % of annual GDP on average. Their estimate of indirect costs (i.e., welfare losses that arise from opportunity costs due to the crises) is even higher with about 15% of annual GDP.

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ically by using a large sample of bank mergers from Germany. German data is suitable because the institutional framework allows us to assume that distress mergers did indeed occur. The two largest sectors of the German banking system (comprising savings banks and cooperatives banks) have superordinate institutions, the so-called *associations*. Associations exert supervision of banks belonging to their sector, and it is widely accepted in Germany that they encourage troubled banks to merge. We do not intend to test this assumption rigorously. However, the mere facts that i) no bank failure has occurred in either the savings banks or cooperatives banks sector over the last decades and ii) a large number of financially distressed banks was involved in mergers, are suggestive. [4] Furthermore, as we will show below, a German bank's likelihood of being involved in a merger is systematically related to its financial status. Hence, the German experience probably allows to observe distress mergers directly.

The underlying rationale for distress mergers is simple: as a remedy to financial distress, one may want to merge a "bad" bank with another bank to lower the risk that a default occurs and to increase the efficiency of the "bad" bank through a reorganization. A merger can decrease default risk because of the additional equity that buffers losses of the stricken bank (capital infusion). This would imply to merge the "bad" bank with a "good" bank. However, default risk can also decrease if two "bad" banks merge because of a diversification effect that reduces credit risk. [5] The reorganization might also lead to an enhanced quality structure of the loan portfolio (e.g. by eliminating risk clusters) and to better risk management by the "bad" bank.

Yet, it is neither obvious that distress mergers are an efficient means of distress resolution, nor that they are effective. They might be associated with higher deadweight costs than alternative means of resolution (like a liquidation), [6] and the reorganization might fail. Moreover, as emphasized by Shih (1999), diversification can exacerbate rather than decrease default risk of a merged bank, beyond the default risk of the separate banks.

Overall, consequences of distress mergers are unclear and ultimately an empirical question. The conjecture that mergers are driven by managed pre-

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[4] We will provide further anecdotal evidence in Section 2.

[5] Diversification might also affect operational and other business risks, but we believe that in the context of regulatory intervention and small banks the credit risk effect is pivotal.

[6] The corporate finance literature strongly advocates that a firm internal restructuring can be inefficient due to managerial discretion, agency problems, and incomplete contracts. Some authors even argue that these problems are more pronounced in banking because of an allegedly weaker degree of control over management in general (see Berger, Demsetz, and Strahan (1999)).

emptive corrective actions has several testable empirical implications: i) The worse financial status of a bank (i.e., the higher the default risk) the more likely should be its involvement in a merger. ii) A credit portfolio enhancement is to be expected, either as a credit risk diversification or a quality enhancement in conjunction with a change in the risk-taking policy. In principle, any such effect should be stronger for those mergers where distressed banks are involved than for "normal" mergers. [7] iii) If the reorganization of inefficient business operations works out, there should be efficiency gains from distress mergers beyond those of "normal" mergers.

Our empirical analysis provides direct tests of these implications. [8] The analysis is based on the period 1993-2001 and uses comprehensive German data on 3640 banks and 1484 mergers. [9] We find that a bad financial status systematically increases the likelihood of a bank to be involved in a merger. This is a necessary condition for distress mergers to exist. Further, we find evidence that loan loss provisions decrease tremendously for several years after a distress merger. There is only a temporary decrease in profitability and no apparent change in the structure of the credit portfolio. Hence, these findings are consistent with diversification gains by distress mergers. We find no sustained enhancement in cost efficiency relative to non-distress mergers. Overall, distress mergers seem to have benefits without affecting systemic stability adversely.

The remainder of the paper is organized as follows. In Section 2, we provide a brief overview over the German banking system and anecdotal evidence regarding bank mergers as a means to resolve financial distress. Section 3 describes our data, discusses proxies to identify potentially distressed banks, and relates these indicators to the incidence of mergers. Section 4 examines the consequences of distress mergers. Section 5 discusses policy implications of our evidence and concludes.

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[7] Penas and Unal (2004) and Benston, Hunter, and Wall (1995) are concerned with diversification but focus on large banks. They argue that bank mergers might be motivated by an attempt of becoming "too big to fail". The argument is not likely to hold for either savings banks, which are state-guaranteed, or very small cooperative banks in Germany.

[8] We like to emphasize that the third aspect of efficiency gains due to the reorganization is only of second order importance in the context of our analysis. The focus is on financial status and default risk.

[9] Note that the analysis of savings and cooperatives banks is interesting in general since thrift institutions and cooperative banks represent a significant fraction of banking markets in many countries (e.g. in the United States and many European countries like Germany, France, Spain etc.).

2 The German Experience

Only anecdotal evidence exists that regulators encourage distress mergers. However, Goodhart and Schoenmaker (1993) provide some evidence that regulatory agencies are reluctant to resolve bank failures by straight liquidation. [10] James (1991) analyzes the costs of bank failures in the US during the savings and loans crises in the 80's. He finds that "whole bank" purchase and assumption transactions (which are fairly similar to a bank merger) impose the lowest losses realized in bank failures. James' analysis differs in one major point from ours. We focus on *preemptive* corrective actions and are, therefore, not primarily concerned with banks that actually failed.

We refrain from providing a complete review of the vast amount of empirical studies that consider consequences of bank mergers and refer instead to the survey by Berger, Demsetz, and Strahan (1999). We are not aware, however, of any study addressing distress mergers, or any study that compares bank mergers where only financially sound banks are involved to mergers where troubled banks are involved.

German data is particularly suitable for an analysis of distress mergers for three reasons: The banking system was subject to severe shocks, numerous bank mergers occurred, and the institutional framework provides for institutions with strong incentives and the power to foster and manage distress mergers. [11]

Three major shocks occurred in the 90's. First, the German central bank allowed for the first time money market funds in 1994. This reduced the availability of core deposits dramatically and put a lot of pressure on deposit margins. Second, the process of harmonization and integration of the EU lead to deregulation and free entry into banking markets within all member states. Finally, the German economy faced severe downturns in the business cycle, giving rise to a large bankruptcy wave of small and medium-sized firms.

These shocks have given rise to structural problems within the German

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[10] Mailath and Mester (1994) analyze incentive problems faced by the regulator regarding his decision on whether to close a bank or to choose forbearance. They show that closure may not be a credible threat in general, which in turn may adversely affect bank risk-taking.

[11] In Germany, the Federal Banking Regulatory Office BAKred has the power by law (i.e. §46 "Kreditwesengesetz" KWG) to take distinct measures if a bank is "in danger" of not being able to meet its obligations against claimants. In particular, the BAKred is allowed i) to give directives to the banks' management, ii) to prohibit specific transactions (like granting loans etc.), iii) to dismiss bank managers on short notice, and iv) to install a supervisor at the bank. Hence, mergers are not an explicit measure. But the regulators are obviously very powerful, similar to the U.S. and most other countries.

banking sector, putting several banks in financial trouble. In particular the savings and cooperatives bank sectors, which consist primarily of small banks, have been hit hardest. Yet, there has been virtually no case of actual bank failure in Germany over the last decades, and in particular no savings or cooperative bank failed.[12] However, roughly 1800 bank mergers within the German banking system occurred from 1992-2001, and 84% of them took place within the cooperative bank sector. It appears straightforward to conjecture a relation between bank mergers and financial distress in this context.[13]

In fact, the German Federal Banking Supervisory Office (BAKred) discusses in a recent annual report the merger wave within the German banking sector. When discussing Germany's cooperative banks sector, the BAKred relates the merger wave to "*the ongoing and alarming claims against the sector's financial insurance facility*" (see BAKred (2001), p. 67). Moreover, the BAKred states explicitly that in the year 2000 four cases of troubled savings banks were resolved by mergers (BAKred (2001), p. 64).

As outlined before, distress mergers might require an institution to promote, enforce and manage these mergers, simply because "good" banks might not be willing to merge with "bad" banks. It is likely that the associations of the savings banks and cooperatives banks sectors have played this role. These associations provide central services to their members (i.e. all savings banks and all cooperatives banks, respectively), like joint IT services, marketing, and consulting. Of more importance is that associations conduct monitoring and auditing of member banks because they are related to each sector's private deposit insurance facility. These private insurance facilities are explicitly acknowledged by German regulation because their intended purpose according to the statutes is to ensure the continuity of member banks (*Institutssicherung*). Hence, the primary objective of insurance facilities in Germany is explicitly to avoid the failure of banks.

To further illustrate that associations engage in preemptive corrective actions, it is particularly enlightening to observe that the BAKred states that the frequent and significant claims against the cooperative sector's insurance facility served the purpose to finance risk provisions of these troubled banks

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[12] Nevertheless, some major and publicly known crises occurred. For example, in 1997 *Sparkasse Mannheim* and in 2001 *Bankgesellschaft Berlin* faced severe losses in their credit portfolios. However, in both cases no suspension of business operations or even a failure to meet withdrawals occurred. Both crises were resolved first by capital infusions and eventually by mergers.

[13] Note that these mergers are not associated with any direct payments. That is, the leader does not buy the target. As we will discuss below, it is possible, however, that the leader receives some nonpecuniary or indirect remuneration when merging with a troubled bank.

(see BAKred (2001), p. 78). Notably, the insurance facility did not compensate losses of depositors or other claimants because of actual bank failures. Rather, financial support was concerned with expected losses. Clearly, financing risk provisions is a preemptive measure to avoid bank failures. [14]

In summary, associations have significant influence on member banks and strong incentives to act in the collective interest of their whole sector. Furthermore, given the institutional framework and the anecdotal evidence, it seems very likely that associations have indeed fostered and *managed* distress mergers. Therefore, the German financial system appears to be an ideal place to learn about consequences of distress mergers.

3   The Ex ante-Relation between Mergers and Financial Status

3.1   Data

The empirical analysis is based on comprehensive data from the German savings and cooperatives bank sectors over the period 1993 to 2001. The data are provided by the German central bank (Deutsche Bundesbank), and consist of mandatory reports from all licensed banks in Germany. Mandatory reports are not publicly available and include

- monthly reports of banks regarding balance sheet items and yearly profit and loss statements ("Bankbilanzstatistik"),
- monthly reports regarding regulatory capital and risk weighted assets according to the 1988 Basle Accord, and
- quarterly reports including information on the gross industry structure of loan portfolios ("Kreditnehmerstatistik").

The Bundesbank also provided a comprehensive list of all bank mergers within the German financial system from 1992 to 2001. Since data from profit and loss statements is only available on an annual basis, all tests are conducted using annual data.

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[14] A single bank might be interested in exploiting such an implicit insurance scheme via risk-shifting at the expense of other banks within the same sector. If the bank increases risk and a bad state realization occurs, the other banks of the sector effectively bear a major part of the costs, either directly at the bail-out or via the premia they pay to the insurance facility. However, audits by the associations and the long lasting history of the German institutional framework render this issue unlikely to have a systematic effect in the context of our study.

The sample comprises cooperatives and savings banks only.[15] We exclude all banks from our sample that are for-profit banks,[16] foreign or specialized banks (like building and loan associations), or apex institutions of the savings bank and cooperatives bank sectors.[17] Excluding the for-profit banks and the apex institutions mitigates problems of bank heterogeneity and ensures that our analysis of distress mergers is not affected by "too big to fail" issues.[18]

Table 1 provides summary statistics by sectors (Panel A), the type of merger involvement of the banks (Panel B), and the time of merger (Panel C). As of December 1992, 3640 banks are included. This number is significantly lower at the end of our observation period. As of December 2001, 1484 mergers reduced the sample to a total of 2156 banks. Interestingly, there is not a single case of bank failure (or liquidation) during the observation period.

Table 1 highlights that the majority of mergers occurred within the co-operatives sector. Panel B differentiates four types of merger involvement by banks: *Without* indicates that the bank was not involved in a merger during the period 1992-2001.[19] *Target (only)* indicates that banks in this group were involved in a merger once, and ceased to exist afterwards. *Leader (only)* indicates that banks in this group were involved in mergers and that their corporation continued afterwards. 393 out of 937 banks in this group were repeatedly involved in mergers. Multiple merger involvement occurred also for the fourth group of banks (*Target & Leader*), who were first leader but became target in their last merger. 20 out of these 132 banks were also more than once a leader before becoming target.[20]

There are two further characteristics of the sample which are noteworthy but cannot be seen from the table. First, all mergers in the sample occurred within the respective sector, i.e. cooperatives banks merge only with coopera-tives banks. Second, bank mergers generally occurred between banks that are

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[15] Note that savings bank belong to the state-sector because they are owned by federal institutions like counties and cities. Cooperatives banks are also non-profit organizations owned by members who are at the same time customers (i.e. depositors and creditors).

[16] These comprise either extremely large banks (like Deutsche Bank) or very specialized small banks (like Bankhaus Aufhäuser & Co.).

[17] The apex institutions comprise in particular 12 Landesbanken as well as DZ Bank and WGZ Bank, which belong to the savings and cooperatives bank sector, respectively.

[18] For example, total assets of the largest Landesbank, WestLB, were 432 billions Euro in 2001. In comparison, the average size of a savings banks in the same year was roughly equal to 1 billion Euros.

[19] Our data contains complete merger information for the year 1992, but P&L information was not available for east German banks in 1992.

[20] Note that by definition a bank can be a target only once.

Table 1

Frequency Distribution of Banks and Mergers

The table provides descriptive statistics on the sample size and the frequency distribution
and type of mergers. The principal observation period is from 1993 to 2001; the sample
comprises savings and cooperatives banks within the German banking system, excluding
apex institutions. # denotes number of banks. *Without* indicates that banks in this group
were not involved in a merger during the period 1992-2001; banks in the *Target (only)*
group were only once involved in a merger and ceased to exist as an corporation, banks
in the *Leader (only)* group were involved in mergers and always continued as corporation
afterwards; banks in the *Leader & Target* group first were involved in mergers as leader
but were target in their last merger. In Panel B, numbers in brackets indicate number
of banks that were involved in multiple merger events during the observation period. In
Panel C, the number of mergers is reported over the period 1992-2001. Note that much
of the subsequent analysis will exclude 1992.

Panel A: Sample Size and Sector Affiliation				
Date	Savings	Cooperatives	Sum	
1992:12	723	2917	3640	
2001:12	537	1619	2156	

Panel B: Type of Mergers				
Banktype	Without	Target (only)	Leader (only)	Leader & Target
Savings	391	181	146	7
Cooperatives	828	1171	791	125
Sum	1219	1352	937 [393]	132 [20]

Panel C: Time Pattern				
year	1992	1993	1994	1995
#	216	159	159	106
year	1996	1997	1998	1999
#	100	98	168	237
year	2000	2001		
#	259	198		

in some geographic proximity. [21]

Finally, it is important to stress that the differentiation between types of
merger involvement is a priori unrelated to any qualitative characteristic of the
underlying bank mergers, besides the criterion of whose name and corporation
continued to exist. Hence, there is no *a priori* reason to expect that distressed
banks belong specifically to one of these groups.

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[21] These characteristics are certainly related to the principle of regional ties that are man-
dated for most savings banks (but which describes the cooperatives structure as well). In
the context of distress mergers, proximity may foster the realization of scale economies
both in terms of technology and information on local markets. It may also allow for closer
monitoring in the case of a reorganization.

Throughout the paper, we base identification of troubled banks on loan loss provisions (standardized by total loans to non-financial institutions). Loan loss provisions are directly linked to credit risk, which is the major source of business risk of small banks. [22] Furthermore, we know from the statements of the German regulatory authority BAKred that interventions by sectors' insurance facilities to support troubled banks mainly consisted of financing loan loss provisions. High loan loss provisions are therefore directly associated with (expected) default risk and preemptive corrective actions.

We do not identify distressed banks as banks having difficulties meeting regulatory capital requirements for two reasons. First, cross-sectional and time-series variation of regulatory capital is fairly small and most banks exceed the 8% ratio of regulatory equity to risk weighted assets by far (see Table 3 and Flannery and Rangan (2002)). Second, if insurance facilities support troubled banks by financing loan loss provisions, regulatory capital will be biased upwards in particular for those banks we want to identify. Accordingly, loan loss provisions appear to be a more suitable measure to identify banks potentially subject to distress mergers. However, we will use the information on capital requirements (more precisely, risk weighted assets) in the subsequent analysis to control for banks' risk-taking behavior. This serves to disentangle risk-taking and diversification effects in the analysis of merger consequences in Section 4.

To identify the group of banks most likely subject to distress mergers, we construct deciles of loan loss provisions in the cross-section of banks on a yearly basis. We define a distressed bank as one which is in the two highest deciles of loan loss provisions in two subsequent years. This reflects persistently high default risk and provides some robustness against transitory effects due to random shocks or earnings management. Distress mergers are then defined as mergers where distressed banks are involved, i.e., where at least one bank had loan loss provisions in the two highest deciles in the two years preceding the merger event. [23]

German accounting standards grant discretion with respect to loan loss provisions, since banks are allowed (see §340 f.3 HGB) to specify general and specific provisions on loan depreciations, and to cross-net losses and gains be-

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[22] Although all German banks are eligible to engage in investment banking, most savings and cooperatives banks do very little.

[23] We experimented with variations of this definition. For example, we defined a distressed bank as one in the highest decile of loan loss provisions in only one year. These exercises did not affect our qualitative results, see the discussion in Appendix B.

tween loan and securities portfolios. Nevertheless, provisions and write-offs on loans represent the major part of the profit and loss item "Loan Loss Provisions" simply because of the business structure of savings and cooperatives banks. Therefore, we believe it to be an unbiased (though possibly lagged) indicator of default risk.

Jones and King (1995) provide some evidence on the predictive quality of different accounting items and other variables with respect to potential financial distress. [24] Their findings suggest that accounting-based measures do have a high Type-I error, i.e., tend to categorize banks as well-capitalized ("good") if in fact they are distressed. On the other hand, accounting-based indicators have a fairly *low* Type-II error. That is, only rarely are banks classified as being distressed if in fact they are not. Our analysis of consequences of distress mergers will be based on the group of banks that are most likely to be in financial distress based on the loan loss provision criterion. Hence, given the results of Jones and King (1995), if we follow this group of banks and assess consequences of mergers they are involved in, we can be quite reassured that these banks were in fact troubled. A potential bias from using such an accounting-based measure is in the direction of finding no distress effect.

3.3   Ex Ante Determinants of Mergers

3.3.1   Model Design

Our study is not the first that relates bank characteristics to the incidence of a merger (see for example the survey by Berger, Demsetz, and Strahan (1999), and the recent study by Focarelli, Panetta, and Salleo (2002)). These studies generally show that bank performance predicts merger activity, which is the necessary condition for the distress merger hypothesis. We conduct a similar analysis to establish that this condition is met in our sample of German bank mergers as well.

The general approach is to run a regression of a limited dependent variable indicating a merger on a set of pre-event bank characteristics. The regression model is described by equation (1),

$$y = f(\text{Control variables, Efficiency, Financial status}), \tag{1}$$

where the dependent variable y is the merger indicator, *control variables* represents variables that control for general heterogeneity between banks (and

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[24] The authors base their analysis on non-public information from US regulators (like for example CAMEL ratings and the watch lists for troubled banks).

observations), *efficiency* includes proxies for the efficiency of banks to control for the most frequently mentioned merger motivation, and *financial status* comprises our primary variables of interest, i.e., proxies for the expected default risk of banks.

To allow for some flexibility regarding the impact of bank characteristics on the probability of a merger, we group banks according to their status within the merger. [25] Hence, we differentiate whether the bank "survived" in the merger (the leader case), or whether its corporation ceased to exist (the target case). Since there are also banks that were first leader before becoming target, we have to differentiate three types of merger involvement. Adding the group of banks not involved in a merger yields the four groups in Table 1, Panel B. The indicator variable MERGER equals zero if a bank was not involved in a merger over the observation period, one if a bank was only a target, two if a bank was only a leader, and three if a bank was first a leader and then a target. Since MERGER is the dependent variable, we have to estimate a multinomial logit regression.

Control variables are standard measures used in the related literature. Their construction is described in Table 2. Control variables comprise time dummies to control for different macro-conditions before the merger event, and variables reflecting the business structure of banks. These include the variable SIZE, as a general proxy for bank heterogeneity, INVESTMENT as a proxy for the business structure regarding commercial banking versus investment banking activities, LOANS as a measure of the relative importance of loan provision in operating business, COREDEPOSITS as a measure of the availability of non-interest-rate-sensitive core deposits (i.e. savings accounts, time deposits, and so forth), INTERBANK as a measure of the net financing resulting from interbank transactions, LIQUIDITY as a measure of the liquidity stock of a bank, and SME as a measure of the share of small firm financing of a banks credit portfolio, reflecting portfolio structure and credit risk. [26]

To consider efficiency as a merger determinant we use the cost-income ratio, as is standard in the literature (see e.g. Focarelli, Panetta, and Salleo (2002)). The corresponding variable is labeled COSTINCOME.

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[25] Certain characteristics, like profitability, might have different impacts on the merger likelihood depending on the type of merger involvement. For example, under the distress merger hypothesis, a higher profitability might increase the probability that a "good" bank gets involved in a merger, while for a bad bank exactly the opposite should hold.

[26] The respective statistic of the Bundesbank (i.e., "Kreditnehmerstatistik") does not explicitly differentiate loan or firm size. Therefore, we rely on loans to a specific industry that comprises only small and medium sized businesses (the so-called *Handwerk* which means small manufacturers and skilled tradesman).

Finally, and of primary interest to our analysis of distress mergers, we include three variables related to the default risk of banks as regressors. The first is the equity ratio EQRATIO, defined as equity over total assets. The second is profitability PROFIT, measured as the result from ordinary operations standardized by total assets (return on assets). The third and key variable regarding the financial status, LOANLOSS, is loan loss provisions standardized by loans to nonfinancial institutions. As explained above, to identify the group of banks that are most likely subject to distress mergers, we further construct the binary variable BAD, which indicates that a bank is in the two highest deciles of loan loss provisions in two subsequent years.

Table 2 summarizes all mentioned variables and provides details on their construction. Table 3 provides descriptive statistics, differentiated for the four types of merger involvement. The most striking features are that *Leaders (only)* are the largest among all groups, and that Targets have the highest loan loss provisions and the lowest profitability. As a general pattern, *leader & target* banks are closer to *target only* banks for all variables except loan loss provisions. Overall, these univariate statistics seem to point to the conclusion that distressed banks are more likely to be in the target group rather than in the leader group. The next section presents the multivariate analysis.

Table 2

Definition of Variables

The table describes definitions and construction of all variables used in the empirical analyses of this study. All ratios are measured in percentage points. NFI and FI abbreviate "nonfinancial institutions" and "financial institutions", respectively.

Variable	Definition	Construction
BAD	Indicator for a bank in financial distress	Dummy, bank was in the 9th or 10th highest decile of loan loss provisions in the cross-section of banks in two subsequent years
REGCAPITAL	Regulatory capital according to 1988 Basle Accord	(regulatory equity) / (risk weighted assets)
COREDEPOSITS	Availability of non-interest-sensitive refinancing	(savings deposits + time deposits from NFI)/(total assets)
COSTINCOME	Cost-income ratio, efficiency proxy	(total administrative costs) /(revenues)
EQRATIO	Equity ratio	(Book value equity)/(total assets)
GROWTH	Annual growth	(total assets (t)-total assets (t-1))/(total assets(t-1))
INTERBANK	Net financing in the interbank market	(accounts receivables FI - liabilities FI)/(total assets)
INVESTMENT	Relevance of investment banking versus commercial banking operations	(fee-based revenues)/(interest-based revenues)
LIQUIDITY	Liquid assets	(liquid assets)/(total assets)
LOANS	Operational relevance of loan provision	(loans to NFI)/(total assets)
LOANLOSS	Loan loss provisions	(loan loss provisions)/(loans to NFI)
MERGER	Type of merger involvement	"0" if bank was not involved in merger, "1" if bank was only target, "2" if bank was only leader, "3" if bank was first leader and then target
PROFIT	Bank profitability	(result from ordinary operations) / (total assets)
RISKASSETS	risk weighted assets according to 1988 Basle Accord	(risk weighted assets) / (total assets)
SIZE	Bank size	ln(total assets)
SME	Small business financing in credit portfolio	(loans to crafts industries)/(total loans to NFI)

Table 3. Pre-event Descriptive Statistics of Bank Mergers

The table provides descriptive statistics on all variables used in this study. Grouping according to the variable MERGER. For variable definitions see Table 2. All observations of banks involved in a merger (i.e., MERGER > 0) are measured in the year preceding the event, i.e. time $\tau = -1$ in event time.

Type of Merger	Without N=10,950		Target (only) N=1,289		Leader (only) N=1,012		Leader and Target N=169	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev.	Mean	Std.Dev.
COREDEPOSITS [%]	9.72	14.70	12.77	17.28	11.33	15.81	13.40	17.30
COSTINCOME [%]	9.89	3.38	11.99	3.91	11.17	3.60	12.64	4.11
EQRATIO [%]	4.45	2.26	4.62	2.29	4.40	1.03	4.49	0.91
GROWTH [%]	5.90	5.79	3.77	7.01	5.32	6.49	2.68	6.10
INVESTMENT [%]	8.71	3.84	10.14	8.39	10.74	4.31	11.77	4.69
LOANS [%]	58.91	11.52	56.05	14.37	59.38	12.81	57.00	12.35
LOANLOSS [%]	0.63	0.65	0.81	1.35	0.73	0.98	0.73	0.85
PROFIT [%]	1.25	0.54	1.01	0.64	1.18	1.04	1.01	0.55
REGCAPITAL [%]	11.13	3.41	11.56	6.20	10.78	2.02	10.87	2.08
SIZE	12.07	1.48	11.15	1.06	12.26	1.04	11.75	0.87
SME [%]	2.73	2.05	2.69	2.15	2.56	2.01	2.20	1.69

Before turning to estimation results of the multinomial logit analysis, two methodological issues have to be addressed: overweighing of banks without mergers and multiple mergers.

The ex ante analysis is based on variable values in the year preceding the merger event. The multinomial logit model is estimated for two samples. One is the full sample of banks. We also rely on state-base sampling to control for the problem of overweighing banks without merger involvement (which do not have event dates), as suggested by Manski and McFadden (1981). That is, we randomly select a sample of 35% of banks from the group of banks without merger for each year of the observation period (with replacement). Though the 35% fraction is an arbitrary choice, it approximately reflects the overall ratio of banks with and without bank merger and leads thus to a more balanced sample. [27] In the case of the balanced random sample descriptive statistics are virtually the same as in Table 3.

Multiple mergers of one bank can lead to overlapping event windows. [28] Therefore, to examine pre-event characteristics that are unaffected by preceding mergers, we include in our ex-ante analysis only cases where no merger of the same bank occurred within two years before the merger. [29] Table 4 shows estimation results of the multinomial logit regression. We exclude the group of banks that were leader and target because of the small sample size. Results are reported only for the balanced random sample. None of the qualitative results reported in the table depend on these choices.

The coefficients reported in Table 4 are marginal effects at the unconditional medians of explanatory variables. This serves to overcome the difficulties in interpreting estimated coefficients in multinomial logit models, which reflect changes in odds ratios. [30] The table shows results for the groups of target and leader banks, such that banks without merger serve as the reference group. [31]

We report two models. Model 1 uses loan loss provisions as the key variable of interest, while Model 2 uses the dummy variable BAD. Since estimation

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[27] Note that we draw with replacement, such that in the overall sample a bank without merger may be included more than once because it was chosen in more than one year.

[28] If, for example, a given bank has been involved in two mergers, one in 1994 and one in 1995, there is in fact only one observation reflecting pre-event characteristics, i.e. 1993. Variable values in 1994 would be affected by the merger event in the same year.

[29] At the beginning of the observation period, 1993, we can only trace back this criterion for one year because we don't know about mergers that occurred in 1991.

[30] See the discussion in Greene (2003), chapter 21.

[31] Reported values indicate the marginal change in the probability of becoming either target or leader if the regressor changes its value by a marginal unit, c.p.

results are similar, we focus the discussion on Model 2. Table 4 reflects many of the stylized facts known from the literature, so that we focus the discussion on the impact of financial status.

All measures related to bank performance significantly affect the probability of being involved in a merger, though signs of effects and significance differ between leaders and targets. A higher book value of equity to assets (EQRATIO) significantly decreases the probability of merger involvement. The coefficient is negative and significant for both leaders and targets. A lower profitability in terms of return on assets (PROFIT) increases the probability of becoming a target and decreases the probability of becoming a leader. Finally, if a bank is in the two highest deciles of loan loss provisions in two subsequent years (BAD equal to one), the likelihood of becoming a target increases significantly. For the median bank, BAD does not affect the probability of becoming a leader. [32]

Taken together, these results suggest that a bad financial situation systematically affects the probability of merger involvement for banks, which is the necessary condition for the distress merger conjecture. The result from the univariate analysis is confirmed, that financially distressed banks belong predominantly to the group of target banks.

Further, loan loss provisions contain information not included in profitability or the equity ratio. This follows because loan loss provisions are significant in the regressions of Table 4, although we included the two other factors simultaneously. [33] Moreover, the economic impact of being in the two highest deciles of loan loss provisions in two subsequent years (BAD) is significant: The probability of the median firm to become a target is 11.4%. According to the marginal effect, this probability increases by 13.1 percentage points to 24.5 % if the bank's status becomes BAD. [34] Overall, the results justify our usage of loan loss provisions to identify distressed banks and strongly support the conjecture that financial status is a determinant of bank mergers.

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[32] This is the only difference in significance between estimated coefficient and marginal effects, because in terms of the logit coefficient, BAD is significantly positive for leaders. Hence, the odds ratio of becoming a leader instead of being not involved in a merger increases, the higher loan loss provisions, albeit the change in probability of being a leader for the median firm is insignificant.

[33] Unreported joint tests of significance for LOANLOSS or BAD over all groups of merger involvement are highly significant.

[34] Note that marginal effects in for dummy variables are measured for the discrete change from 0 to 1.

Table 4. Ex-ante Analysis of Merger Determinants

The table reports estimates of a multinomial logit regression of the categorical variable MERGER (taking value zero if a bank was not involved in a merger, value one if a bank was only a target, and value two if a bank was only a leader) on a set of explanatory variables. For definitions of regressors see Table 2. The table only reports estimates for two groups where banks actually were involved in mergers, i.e., the case of no merger involvement serves as the reference group. The third group of banks that were leader and target are excluded. All reported coefficient values represent marginal effects calculated at the unconditional medians of the regressors. Regressors include a constant and a set of calendar year dummies, but coefficients are omitted. All variables are measured at the time before a merger took place, i.e., at t= -1 in event time. To include an observation for banks with multiple mergers we require that no merger occurred in the two preceding years. Observation for banks without merger are randomly chosen to balance the ratio of banks with and without mergers. For each year of the observation period, we randomly select a sample of 35% of banks from the group of banks without merger. p-values are in parentheses. *, **: significance at the 5%-, and 1%-level, respectively.

Expl. Variables	Model 1		Model 2	
	MERGER = 1	MERGER = 2	MERGER = 1	MERGER = 2
	(Target only)	(Leader only)	(Target only)	(Leader only)
SIZE	-0.168 (0.000)**	0.096 (0.000)**	-0.097 (0.000)**	0.154 (0.000)**
LIQUIDITY	0.006 (0.001)**	-0.005 (0.026)*	0.003 (0.000)**	-0.003 (0.199)
INVESTMENT	0.003 (0.376)	0.015 (0.000)**	0.003 (0.011)*	0.013 (0.000)**
INTERBANK	0.001 (0.309)	0.001 (0.343)	0.002 (0.000)**	-0.005 (0.000)**
LOANS	0.001 (0.76)	0.002 (0.026)*	0.001 (0.001)**	0.002 (0.018)*
COREDEPOSITS	-0.000 (0.898)	-0.004 (0.093)	-0.001 (0.456)	-0.002 (0.185)
COSTINCOME	-0.002 (0.619)	0.016 (0.000)**	-0.000 (0.845)	0.018 (0.000)**
EQRATIO	-0.032 (0.001)**	0.010 (0.263)	-0.016 (0.000)**	-0.002 (0.815)
PROFIT	-0.103 (0.000)**	0.033 (0.110)	-0.048 (0.000)**	0.053 (0.017)**
LOANLOSS	0.088 (0.000)**	0.012 (0.3332)	—	—
BAD	—	—	0.1311 (0.000)**	0.027 (0.367)
N	5329		5329	
Pseudo-R^2	0.114		0.143	
LR-test model	0.000		0.000	

4 Consequences of Distress Mergers

4.1 Methodology

4.1.1 Testable Implications

The results of the preceding section support that a bad financial status of banks increases the likelihood of their merger involvement. This is a necessary condition for the claim that bank mergers serve to resolve financial distress of banks preemptively (distress mergers) and supports our assumption that distress mergers are observable in Germany. In this section, we try to exploit this feature and compare mergers between only "good" banks and mergers between "good" and "bad" banks. With distress mergers proxied by the latter group, one should expect to find differences between the two groups in post-merger performance.

In particular, the primary potential benefit of distress mergers is the credit portfolio enhancement effect. This may arise along two dimensions. First, one can purge the credit portfolio from "bad" characteristics like risk clusters or low quality borrowers and one can tighten criteria for granting new loans. This corresponds to a change in the risk-taking policy of the bank. There is no reason to expect similar effects of credit portfolio enhancement for mergers between good banks only. Empirically, one should then expect to observe decreasing loan loss provisions because of the enhancement in the average borrower quality. It is important to emphasize that under German accounting rules, loan loss provisions consist of charge-offs on already impaired loans and provisions for expected losses. The quality enhancement does not affect actual charge-offs on already troubled loans, but provisions to buffer future expected losses will be lowered. A change in the bank's risk-taking should also be reflected in lower risk premia charged on loans (lowering profitability) and a decrease in risk weighted assets.

Second, the merger can simply lead to a diversification of credit risk. Here, loan loss provisions against future defaults will be lower (as a fraction of total loans) and the volatility of loan loss provisions should decrease. The structure of the credit portfolio (risk premia and risk weighted assets) should remain the same, however.

By definition, only distress mergers are intended to improve financial status of a distressed bank.[35] Hence, there is no reason to expect similar effects of

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[35] Schrand and Unal (1998) examine thrift conversions to stock charters in the US, and find that these savings banks are even interested in *in*creasing their business risk, though in a trade-off with reduced interest rate risk.

credit portfolio enhancement for mergers between good banks only.

A second implication of managed distress mergers is that they might be associated with efficiency gains in the medium- and long-run. If financial distress is due to inefficient management policies or business operations, and mergers foster reorganization, efficiency gains should be more pronounced for the group of distress mergers than for normal mergers. However, *any* merger of small banks might be due to efficiency considerations.[36] The particular motivation of distress mergers renders efficiency gains more likely to occur, however.

4.1.2 Empirical Design

The ex-post analysis is focused on credit portfolio enhancement and the efficiency issue. To identify mergers where financially distressed banks are involved, we rely on the variable BAD. The results of Section 3 have shown that these are banks most likely to be subject to preemptive mergers as a corrective action.

The objective of the ex post analysis is to compare merger impacts for mergers between good banks (normal mergers) and mergers where bad banks are involved (distress mergers). This requires an estimate of the merger impact for both groups. Hence, one has to compare normal mergers to banks not involved in a merger, and distress mergers to normal mergers. Further, the objective is inherently dynamic because one wants to compare diversification and efficiency before and after the merger.

This is achieved by running an event study-type regression of the variable of interest on indicator variables for "normal" mergers and distress mergers. To differentiate short-term, medium-term, and long-run effects, the set of dummies is expanded to reflect the corresponding post-event periods.

The corresponding regression model is

$$y_{it} = \alpha_i + \nu_t + \sum_{j=1,2} \lambda_j \, y_{i,t-j} + \beta D_\tau + \gamma(D_\tau \, BAD_\tau) + \qquad (2)$$
$$\eta_1 SIZE + \eta_2 SIZE^2 + \epsilon_{it}$$

According to equation (2), we regress y_{it} on a set of explanatory variables, where $y_{i,t-j}$ is a lagged dependent variable, and λ, β, γ, and η are coefficients to be estimated. The set of dummy variables D_τ indicates merger events

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[36] Although the apparent lack of evidence on efficiency gains in previous studies might indicate that looking at all mergers is not a sufficiently focused approach.

in event time. We consider short-run effects by using a dummy for $\tau = 0$, medium-run effects by using a dummy for the time period $\tau \in [1-3]$, and long-run effects by using a dummy for $\tau \geq 4$. We further include the interaction terms of the indicator for mergers and the variable BAD, indicating the involvement of a bank that was in the two highest deciles of loan loss provisions in the two years preceding the event. Hence, $D_\tau \cdot BAD$ measures the difference of the impact of the merger on y between mergers with and without involvement of a distressed bank.

The panel specification consists of firm specific effects α_i, and (T-1) calendar year dummies ν_t. Finally, SIZE and SIZE^2 control for general bank heterogeneity. [37]

The empirical design of equation (2) facilitates a dynamic analysis and takes four methodological issues into account: i) adjustment processes occur over time, ii) banks are observed at several points in time, iii) target banks are not observed after the merger, and balance sheets of the leader reflect both banks afterwards, and iv) the existence of multiple mergers. The first two issues are taken into account by estimating a panel model, which controls for the fact that the data consists of N individuals (banks) over T periods of time. Dynamic adjustments to the variables of interest are controlled by including lagged dependent variables. This is necessary whenever adjustments to shocks can not be achieved instantaneously. Standard panel models like the fixed-effects or random-effects model are biased in this case and we apply the dynamic panel estimator according to Arellano and Bond (1991), a GMM estimator using instrumental variables techniques.

The inherent problem of mergers is that characteristics of the involved parties can not be observed separately afterwards. One bank corporation ceases to exist (the target), and accounting information on the leader will reflect both banks after the event. A suitable way to conduct a dynamic analysis of bank characteristics before and after the merger is to form a portfolio of the involved banks and estimate whether the event affects the time series development of portfolio characteristics. [38] We consolidate the balance sheet data by backwards aggregation, i.e., adding any pre-event accounting variable of portfolio banks over time. This procedure results in a single time series for

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[37] The inclusion of additional control variables does not affect reported results. Other controls like INVESTMENT, LOANS etc. have little explanatory power and deteriorate the overall model specification. Note that through the inclusion of lagged dependent variables the full history of any determinant of y is included, such that other regressors represent innovations only, see Greene (2003), p. 307.

[38] The post-merger portfolio is automatically reflected in the accounting data of the leader bank, but the pre-event portfolio must be constructed by consolidation of balance sheets.

each portfolio and is illustrated in Figure 1.

Another complication arises when some banks were first leader and eventually became targets. The issue is illustrated by Figure 1, where four fictitious banks, A-D, merge over the observation period. According to our terminology, banks A and D are target banks, while bank C is leader & target, and bank B is leader. The consolidation of balance sheet data for banks A+B and C+D is straightforward, the problem is consolidation of bank B. After t=3 in Figure 1, bank B consist of all banks, A-D, while before, accounting data reflects bank A+B, or B alone. Hence, to achieve a consistent time series of the development of (say) profitability for bank B, accounting information for all four banks must be consolidated. The procedure leads eventually to a single time series incorporating three merger events.

The drawback of this approach is that the merger event between e.g. C+D is observed with noise because the consolidated data comprises information on A and B, which were not involved in the merger at t=1. However, an analysis of B requires a full consolidation over all banks (it comprises all four banks in the final period), and constructing a similar time series for the bank portfolio C+D would lead to double-counting. We decide to base our analysis only on fully consolidated time-series over the observation period to avoid double-counting and accept therefore the increased noise for some merger events. Note, however, that we do use *all* available information on mergers and banks, and that the problem is relevant for a rather small sub-sample of our data only, because the majority of mergers did not involve leader & target banks. Note that our results are unaffected when excluding multiple mergers, as discussed in Appendix B.

Fig. 1. Structure of Mergers and Balance Sheet Consolidation

Illustrative example of a series of subsequent mergers that constitute one "merger portfolio". The consolidation of balance sheet data proceeds by backwards aggregation and summing key items (measured in levels) of all banks that at some point during the observation period became part of the surviving bank (as of December 2001). In the example, a single time series from t_0 to t_4 for Bank B (the leader) results; incorporating three merger events: D+C in t_1, A+B in t_2, and B+C in t_3.
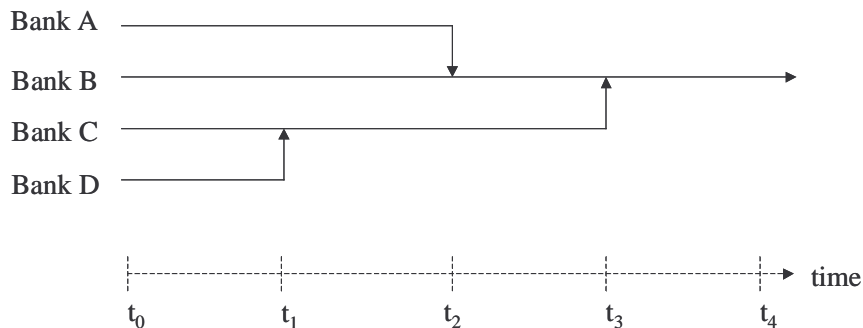
Finally, Table 5 provides summary statistics of observations in event time

to illustrate that there is sufficient time series information to differentiate medium-term and long-run impacts throughout.

Table 5
Sample Distribution in Event Time

The table provides summary statistics on the distribution of observations for consolidated bank data in event time (τ) used in the ex-post analysis. $D_\tau \cdot BAD$ denotes the interaction term between a dummy indicating a merger event and event time (D_τ), and a dummy indicating that at least one of the involved banks in the merger was in the 9th or 10th highest decile of loan loss provisions in the two years preceding the event (BAD).

Panel A: Number of Observations in Event Time			
Event time	$D_t \cdot BAD$		Banks without
	0	1	merger
$\tau \leq -4$	1047	217	—
$\tau \in [-1, -3]$	1591	451	—
$\tau = 0$	964	320	—
$\tau \in [1, 3]$	1939	545	—
$\tau \geq 4$	1137	222	—
Sum	6678	1755	—
# Banks	742	195	1219

4.2 Dynamic Effects of Distress Mergers

4.2.1 Credit Risk

Table 6 shows estimation results of a dynamic panel regression according to equation (2). To test the empirical implications of distress mergers, we use COSTINCOME, PROFIT, RISKASSETS, and LOANLOSS as dependent variables for which merger impacts are measured. The table reports regressions for a data set where the upper and lower 0.5% percentiles of the dependent variables were discarded to increase the robustness against outliers (Panel A). In Panel B, we do not eliminate outliers but measure the dependent variables in percentiles (i.e. taking values from 1 to 100) on a yearly basis across all banks. This methodology is another way to achieve robustness against outliers used in the literature (see for example Berger (1998) and Focarelli, Panetta, and Salleo (2002)), and it is our preferred approach, since it uses all available information. The qualitative results of the regressions do not depend on the choice of measurement. Finally, for ease of exposition, the table reports coefficient estimates for the merger dummies only. Note that lagged dependent variables and SIZE are always highly significant. [39]

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[39] Estimation according to Arellano and Bond (1991) proceeds in taking first differences of equation (2). Hence, one looses three time series observations per individual: one for taking

Table 6 provides strong evidence in support of a credit portfolio enhancement effect from distress mergers. Both in Panel A and B, there are significant differences between normal and distress mergers. For example, in Panel A for the regression of LOANLOSS, the coefficient on the merger event dummy D_0 is positive and significantly different from zero with a value of 0.103. Hence, in the year of the event a significant increase in loan loss provisions for normal mergers occurs (the reference group are banks without mergers). This increase in provisions remains significant over the next three years, since the coefficient on $D_{[1-3]}$ is also positive and significant. There is no effect in the long-run since for event periods $\tau \geq 4$ the coefficient is insignificant. [40]

Coefficients on the interaction terms of event dummies and the variable BAD measure the *difference* in the merger impact on loan loss provisions for distress mergers. In Panel A of Table 6, these coefficients are all highly significant and negative. Hence, the change in loan loss provisions differs between normal mergers and distress mergers at all post-event periods. The observed increase for normal mergers in the year of the event is roughly offset (the coefficient is -0.144 as compared to 0.103, a net effect for distress mergers of -0.041). The medium-term coefficient for normal merger is positive and significant (0.078). The estimated difference for distress mergers is a significant coefficient of -0.165, showing that loan loss provisions decrease in the three years following a distress mergers on average by 0.087 percentage points (0.078-0.165) in each period. The long-run effects are even stronger because loan loss provisions of normal mergers do not differ from banks without mergers (the coefficient of 0.049 is insignificant). In contrast, the difference for distress mergers is a significant coefficient of -0.268. Hence, loan loss provisions are lower for distress mergers than for normal merger even more than 3 years after the event.

The corresponding coefficients in Panel B show that this decrease in loan loss provisions of distress mergers is also economically significant. For example, in the medium-term $\tau \in [1-3]$, the average net improvement in loan loss provisions in terms of percentile ranks is equal to 5.3 in each period (the deterioration by 3.5 percentiles for normal mergers is off-set by an improvement of 8.8 percentiles per post-event year for distress mergers).

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first differences and two for the lagged dependent variables.

[40] Due to the large sample size, we consider only results on a 5%-level as significantly different from zero.

Table 6. Ex-post Analysis of Distress Mergers

The table reports estimates of a dynamic panel regression

$$y_{it} = \alpha_i + \nu_t + \sum_{j=1,2} \lambda_j \, y_{i,t-j} + \beta D_\tau + \gamma(D_\tau \, BAD) + \eta_1 SIZE + \eta_2 SIZE^2 + \epsilon_{it}$$

where y_{it} denotes the variable of interest (LOANLOSS, RISKASSETS, PROFIT, COSTINCOME), a_i are bank individual effects, ν_t are calendar year fixed effects, ϵ_{it} is the regression error term, and λ, β, γ, and η are coefficients to be estimated. D_τ denotes a set of dummy variables indicating the occurrence of a merger. The subscript τ indicates event time. The variable BAD equals one if at least one bank involved in the merger had loan loss provisions in the 9th or 10th decile in the two years before the merger. For definition of the other variables see Table 2. The dynamic panel regression is estimated by GMM according to Arellano and Bond (1991). All estimates are based on the two-step estimator. The last column reports the p-value of a test for serial correlation in the first-differenced regression residuals. Consistency of the GMM estimator requires lack of second-order autocorrelation. Coefficient estimates for the lagged dependent variables and SIZE variables are omitted; they are in every regression highly significant. *Panel A* reports estimation results based on data adjusted for outliers at the upper and lower 0.5% percentile. In addition, a minimum number of 6 observations is required after winsorizing. *Panel B* reports estimation results for the full sample, where the dependent variables are measured in percentiles (i.e. taking values between 1 and 100) in the cross section of all banks on a year-by-year basis. p-values are in parentheses. *, **: significance at the 5%-, and 1%-level, respectively.

Dependant	Short-term $\tau = 0$		Medium-term $\tau \in [1-3]$		Long-term $\tau \geq 4$		N	Serial Correlation
	Normal Mergers	Distress Mergers	Normal Mergers	Distress Mergers	Normal Mergers	Distress Mergers		Lag 2 (p-value)
Panel A: Sample adjusted for outliers								
LOANLOSS	0.103**	-0.144*	0.078**	-0.165*	0.049	-0.268*	11,322	(0.047)*
	(0.000)	(0.027)	(0.002)	(0.012)	(0.171)	(0.020)		
RISKASSETS	0.399**	-0.899*	-0.160	-0.486	-0.204	0.284	11227	(0.085)
	(0.006)	(0.031)	(0.320)	(0.156)	(0.382)	(0.577)		
PROFIT	-0.039**	0.021	0.048**	-0.075**	0.023	-0.048	11,322	(0.650)
	(0.000)	(0.392)	(0.000)	(0.003)	(0.189)	(0.254)		
COSTINCOME	0.358**	-0.251*	-0.282*	0.159	-0.206*	0.209	11,319	(0.092)
	(0.000)	(0.025)	(0.000)	(0.215)	(0.045)	(0.327)		
Panel B: Dependent variables measured in percentiles								
LOANLOSS	5.609**	-11.132**	3.486*	-8.775**	2.508	-9.849*	12,936	(0.154)
	(0.000)	(0.000)	(0.020)	(0.004)	(0.260)	(0.050)		
RISKASSETS	2.096**	-4.566**	-0.197	-0.750	-0.470	-1.514	12,936	(0.341)
	(0.000)	(0.000)	(0.739)	(0.462)	(0.575)	(0.295)		
PROFIT	-2.974**	4.699*	4.124**	-4.276*	2.564	-4.901	12,936	(0.163)
	(0.001)	(0.025)	(0.000)	(0.032)	(0.073)	(0.140)		
COSTINCOME	4.087**	-3.444**	-2.441**	1.015	-2.303*	3.260	12,933	(0.025)*
	(0.000)	(0.001)	(0.000)	(0.407)	(0.024)	(0.131)		

4.2.2   Portfolio Structure and Risk Taking

Controlling for the dynamic impacts of mergers on banks' profitability and risk-taking behavior allows to assess whether the change in loan loss provisions is due to diversification gains or due to a change in the banks' risk-taking policy. The dummy coefficients in the RISKASSETS regression indicate that the improvements in loan loss provisions are not due to a change in the credit portfolio structure. RISKASSETS are risk weighted assets according to the 1988 Basle Accord, normalized with total assets. Panel A of Table 6 shows that mergers have an impact on banks' risk taking behavior only in the event year. While for normal mergers an increase in risk weighted assets indicates more risk-taking (the coefficient is 0.399), this effect is overcompensated for distress mergers (with a difference in the impact of -0.899). However, neither normal nor distress mergers lead to a significant change in the credit portfolio structure in the medium- or long-run. The corresponding coefficients are insignificant both in Panel A and B. Panel B further shows that the event period effect is fairly small, equaling a two percentiles increase for normal mergers and a two percentile decrease for distress mergers.

A similar pattern occurs for profitability. There is an initial decrease in profitability in the event year for both groups, because the event year coefficient is negative and significant (-0.039) and the respective coefficient measuring the difference for distress mergers is insignificant. This effect is compensated only for normal mergers in the medium term, where profitability is significantly positive (and the difference for distress mergers negatively significant with a similar magnitude of the coefficient). There are no long-run effects on profitability. Apparently, the risk premia on loans, which are included in profitability do not indicate a systematic decrease in bank risk-taking, which is consistent with the pattern of the risk weighted assets.

Taken together, these results suggest that the banks do not alter the riskiness of their credit portfolio by changing the portfolio structure or reducing the level of risk-taking. Neither the risk weighted assets seem to change, nor does a fundamental decrease in profitability occur. Hence, the improvements in loan loss provisions most likely reflect diversification gains. A simple test to substantiate the diversification interpretation is to compare the variance of loan loss provisions before and after the event. One should expect to find a decrease in volatility when comparing the pre- and post-event period in the case of distress mergers (but not for normal mergers).

Table 7 shows the results from this exercise. For distress mergers the volatility of loan loss provisions significantly decreases after the merger. The opposite holds for normal mergers. Here, volatility of loan loss provisions significantly

increases after the merger. This provides strong support for the diversification interpretation.

Table 7

Volatility of Loan Loss Provisions Before and After the Event

The table shows a univariate comparison of loan loss provision before and after a merger, differentiating between distress and normal mergers. A distress merger occurs if at least one bank involved in the merger had loan loss provisions in the 9th or 10th decile of loan loss provisions in the two years preceding the merger. *Before* uses observations from four periods preceding the event ($\tau \in [-4, -1]$), *After* uses observations from four periods following the event ($\tau \in [1, 4]$). τ denotes event time. *Equal Variances* shows the p-values of a Bartlett test (*parametric*) and a Levene test (*non-parametric*) of homogenous variances before and after the event for each type of merger.

	Distress Merger		Normal Merger	
	Mean	Std.Dev.	Mean	Std. Dev.
Before $\tau \in [-4, -1]$	1.305	1.320	0.551	0.455
After $\tau \in [1, 4]$	1.074	0.782	0.795	0.817
Equal Variances (parametric)		0.000		0.000
Equal Variances (non-parametric)		0.015		0.000

4.2.3 Efficiency and Robustness

Finally, the regression results for COSTINCOME can be used to test for different merger impacts on cost efficiency. [41] With respect to the cost-income ratio, the dummy for the merger event is positive and significant in Panel A of Table 6. This indicates efficiency losses for normal mergers as compared to banks without merger in the event year. This result is quite intuitive, due to the transaction and deadweight costs of the conduct of the merger process itself. In the medium-term, these initial losses are roughly recovered since the respective coefficient is negative and significant. In the long-run, some further improvements result, since the coefficient on the dummy $D_{\tau \geq 4}$ is significantly positive. The effect is small in terms of the economic magnitude with two percentiles per year.

Distress mergers do not suffer from the efficiency deterioration in the event

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[41] There is a large literature analysing the effects of bank mergers on the efficiency of banks. There are three different methodologies to measure efficiency: The stochastic frontier approach, non-parametric Data Envelope Analysis (DEA), and the financial ratio approach. There seems to be no agreement which approach is generally superior because they all have specific deficiencies (for surveys see Berger and Humphrey (1997) and Rhoades (1994)). We use the financial ratio approach (i.e. the cost-income ratio as an efficiency proxy) because it fits well to our overall methodology and does no require to introduce another, completely different methodology. A similar approach is used for example by Focarelli, Panetta, and Salleo (2002) and Houston, James, and Ryngaert (2001). Also, we'd like to emphasize that the efficiency issue is not at the heart of our analysis.

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period (the coefficient is significantly negative and offsets the effect for normal mergers). They have a similar positive development in the medium-term and the long-run because the dummies that measure the difference to normal mergers are insignificant. However, it is noteworthy that our robustness checks indicate that the long-run efficiency effect for normal mergers is not very robust against changes in the model's estimation.

To summarize our findings: The evidence is consistent with strong diversification gains by distress mergers in contrast to normal mergers. Loan loss provisions decrease significantly in the aftermath of a merger if and only if a troubled bank is involved. In contrast, a normal merger even results in an increase of loan loss provisions. Since the risk-taking behavior of the banks remains rather constant in post-merger years and volatility of loan loss provisions significantly decreases for distress mergers, this effect can be interpreted as a diversification gain. We find slight improvements in cost efficiency, but the magnitude is moderate and there is no effect for distress mergers that goes beyond that of normal mergers. Finally, the costs of distress mergers are a three-year period of lower profitability.

We report an extensive set of robustness tests in Appendix B. First, and most importantly, we address a potential concern with our test design. The potential problem is that in the first step, we identify distressed banks based on high loan loss provisions, and then measure the merger impact using again loan loss provisions. If for example loan loss provisions were mean reverting, we would potentially measure a technical adjustment rather than a merger induced economic effect. To address this concern, we perform simulations to test the size of our test design, i.e., the frequency of rejecting the null hypothesis that there is no merger effect on loan loss provisions, if the null is in fact true. To this end, we use the sub-sample of banks that have not been involved in a merger in our observation period and simulate artificial mergers by drawing random samples from normal banks and banks that had loan loss provisions in the 9th or 10th decile in two subsequent years. The details of the simulation procedure and the results are described in Appendix B. The results clearly show, however, that banks meeting the BAD criterion and not participating in an actual merger do not induce significant post-merger changes to loan loss provisions in our regressions. Hence, we can safely conclude that the diversification results are not driven by any technical adjustment rather than an effect induced by the distress merger itself.

As further robustness tests, we included RISKASSETS as an explanatory variable into the loan-loss-regressions to control explicitly for contemporaneous changes in the credit portfolio structure. Also, we varied the regression models'

specifications, using alternative measures for banks' risk-taking and for the identification of distressed banks. We repeated all regressions but excluded banks with multiple mergers to control for adverse effects of our balance-sheet consolidation procedure. We employed different estimation techniques to avoid potential problems of the Arellano/Bond estimator. Finally, we differentiated explicitly between savings banks and cooperatives banks by running separate regressions for each sector. None of these exercises affected our qualitative results.

5 Conclusions

This paper is concerned with bank mergers as a preemptive measure for distress resolution. The question we confront is: What consequences are associated with such distress mergers?

We address this question empirically by examining bank mergers in Germany. The German financial systems features institutions - the associations of the savings and the cooperatives banks sectors - that are known to foster bank mergers to resolve financial distress. Correspondingly, no actual bank failure has occurred over the last decade and about one quarter of mergers in the German cooperatives and savings banks sectors included troubled banks. We therefore assume that consequences of distress mergers are observable in Germany. Comparing mergers including only financially sound banks to mergers where troubled banks are involved then allows to assess consequences of distress mergers. These are measured in terms of loan losses (actual charge-offs and provisions for future losses), risk-taking behavior, and cost efficiency.

We find that a bad financial status systematically increases the likelihood of a bank being involved in a merger. This is a necessary condition for distress mergers to exist. Further, we find evidence that loan loss provisions decrease significantly after the merger, but *only* for mergers where troubled banks are involved. Distress mergers cause some negative effects on profitability in the medium-term after the merger and no change in risk weighted assets. Hence, banks' risk-taking behavior cannot account for the sustained improvement in loan loss provisions. Also, we do not find an enhancement in cost efficiency for distress mergers relative to normal bank mergers.

The finding with respect to the loan loss provisions has two possible interpretations. The first is strong diversification benefits as emphasized throughout most of our discussion. However, there is at least one other explanation consistent with the evidence. One of the potential caveats to distress mergers is to find a bank that is willing to merge with a stricken bank. Given the

limitations of our data, we cannot exclude that our findings of strong improvements in loan loss provisions are due to the regulators providing "good" banks incentives to merge with bad banks. For example, the banks could have been granted exceptional accounting flexibility regarding loan loss provisions. Alternatively, the insurance facility could have bought impaired loans to clean the books, which are in turn substituted by new, unimpaired loans. Since our credit portfolio structure variables are rather coarse, this effect may be not be reflected adequately in the data. However, loan loss provisions decrease significantly over a fairly long period of time, i.e., more than 4 years after the merger event. This renders the "merger incentive" reasoning at least less likely.

Given that our results do reflect strong diversification gains, they potentially have important policy implications. Bank mergers are an official instrument of distress resolution of failed and troubled banks under many international regulations. Our results may provide a justification for these rules. Overall, the costs associated with distress mergers are moderate while diversification effects are strong. Hence, from a regulators perspective, distress mergers at least do not endanger systemic stability. And since they are "quiet", i.e. are conducted without public attention, additional benefits arise from keeping public faith in the system.

However, it is hard to assess the overall *efficiency* of distress mergers since we could not directly compare consequences of distress mergers to those of other means of distress resolution like liquidations. This issue must be left for future research.

A   The German Banking System

A.1   Overview

Figure A.1 provides a stylized view of the German banking sector. In the context of the current study, it is important to emphasize the existence of the "associations" within both the savings and cooperatives bank sectors and to provide a discussion of the German deposit insurance framework.

The figure shows that banking supervision is exerted by the Federal Banking Supervisory Office (BAKred) [42] and the central bank, Deutsche Bundesbank. One can differentiate three sectors: the private, savings, and cooperatives bank sectors. Private banks are for-profit institutions, comprising large, exchange-listed banks like Deutsche Bank, and very small and specialized institutions, as well as foreign banks.

Both the cooperatives and savings banks sector are organized in layers, where the apex institutions are superordinate, and cooperation follows a principle of subsidiarity. Apex institutions ("Landesbanken" for savings banks, and "Genossenschaftszentralbanken" for cooperatives banks) provide special services to the subordinated small savings and cooperatives banks, in terms of interbank financing, FX-transactions, and so forth.

Associations are at the top of sectoral pyramids, providing IT-services, consulting, strategy coordination, and joint marketing services. Further, they are engaged in monitoring and auditing of member banks due to their relation to the private insurance facility.

Nevertheless, each savings and cooperatives bank is an independent corporation, and general sectoral services (excluding deposit insurance and auditing) do not necessarily have to be used, though quite generally they are.

A.1.1   Savings Banks

Savings banks belong to the state-sector. Owners include federal states, counties, and even cities. They are non-profit institutions. Most of them are not allowed by their statutes to expand their branches beyond the region of their registered seat (typically county districts). All savings banks are, however, eligible to provide services to non-inhabitants of their region. There do

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[42] The official name of the banking regulatory agency recently changed from BAKred to BAFIN ("Bundesanstalt für Finanzdienstleistungsaufsicht") when all regulatory authorities of insurance, banking, and securities were merged into one institution. We keep the old and internationally more familiar name for simplicity.

exist few savings banks that are not tied to a particular region, e.g. the Landesbanken or Frankfurter Sparkasse (the third largest savings bank excluding apex institutions).

The governance structure of savings banks is rather similar to German commercial banks and industrial firms. The executive board, *Vorstand*, reports to a supervisory board, called *Verwaltungsrat*. Two-thirds of the seats of the supervisory board are determined by the founding entity as the owner of the bank (the municipal entities), one third is elected by the employees (co-determination). A third body, the credit committee, consists of at least three members of the supervisory board and is involved in large credit decisions by the bank. The supervisory board can ordinarily and extraordinarily dismiss managers.

Since savings banks are state-owned and the legal notions of "Anstaltslast" and "Gewährträgerhaftung" enforce that the owners are liable for all claims against their bank, there is virtually no loss risk for depositors and creditors from bank failures. Following a lawsuit filed by German private banks, however, the European Commission has recently ruled that the unrestricted liability of the state-owners leads to a distortion of competition vis-a-vis privately-owned for-profit banks. Consequently, the Commission forced the German Government to abandon guarantees for state-sector banks between 2005 and 2015.

A.1.2   Cooperatives Banks

The third group are cooperative banks. These are in principle private banks, but they are non-profit corporations owned by members that are at the same time the bank's customers (i.e. depositors or debtors). Their legal form is comparable to credit unions in the U.S., despite the fact that becoming a member does not require a common bond.

Cooperatives banks have three bodies. The executive board, *Vorstand*, the supervisory board, *Aufsichtsrat*, and the general owners meeting, *Vertreterversammlung*, where (conditional on a sufficiently large number of owners) elected representatives of the owners elect the supervisory board and, for example, decide on extraordinary dismissals of members of the executive board. The supervisory board can dismiss managers and it can suspend them temporarily.

Fig. A.1. The German Banking System

The figure provides a sketch of the German banking system, differentiating the essential pillars: The Federal Banking Supervisory Office (BAKred) and the central bank (Deutsche Bundesbank) conduct supervision. The system can be divided into three sectors: private, cooperatives, and savings banks. The distinguishing feature is that only banks in the private sector are for-profit banks. Savings-banks are non-profit organizations which are state-owned. Cooperatives banks are in principle private banks, but they are non-profit institutions. The cooperatives and savings sector each have a superordinate association, providing central services (IT, marketing, etc.), and coordinating activities within the sector. Associations audit and monitor their member banks since they are related to the sector's private insurance facility. Each of the two sectors is organized in layers, where one or more apex institution superordinate the smaller regionally tied cooperatives or savings banks. In contrast to the private sector, to some extent even operative business is shared between the sectors' layer, following some kind of a secondary liability principle. This holds in particular for the cooperatives sector. Finally, each of the three sectors maintains its own private insurance facility. The savings banks and cooperatives sectors account jointly for about 50% of the German banking market in terms of total assets.
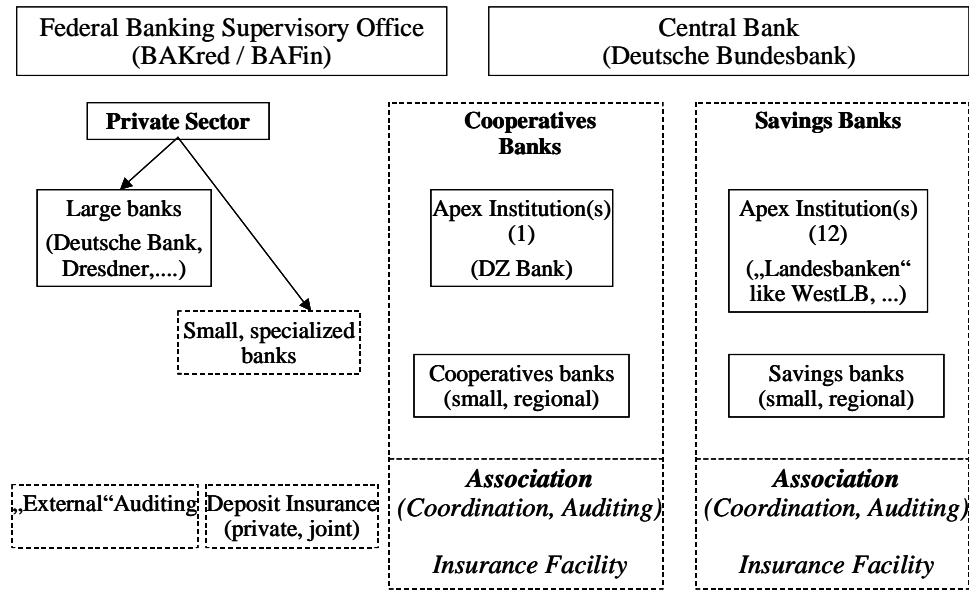
A.2 Deposit Insurance

German deposit insurance had never been mandatory until a recent change in law due to European harmonization. Therefore, each sector (i.e. private, savings and cooperative banks) invented a private insurance facility. [43]

In 1998, a European directive forced the German legislature to enact a law that established for the first time mandatory membership of any bank in a deposit insurance facility. At the same time a federal deposit insurance company has been founded. Since each of the private, cooperatives and savings banks sectors have been relying for many years on their private and unsolicited

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[43] Cooperatives banks did so in 1937, while the private sector and savings banks followed in the 60s.

insurance facilities, the legislator allowed an exemption from the mandatory membership in the federal insurance if banks are members of a similar private institution, as long as the stated purpose is to ensure the continuity of the bank. Note that the exemption is *not* based on securing claimants rather securing survival of member banks.

As stated in section 2, the statutes of all insurance facilities explicitly put the assurance of member continuity as the primary objective. In fact, neither banks nor depositors have a legal claim on insurance that can be enforced. However, whenever single bank crises occurred after World War II, all claims of depositors have been repaid in full.

B   Robustness of Results

B.1   Simulation Evidence on the Employed Methodology

One potential problem of our methodology is that in the first step, we identify distressed banks based on high loan loss provisions, and then measure the merger impact using again loan loss provisions. If for example loan loss provisions were mean reverting, we would possibly measure a technical adjustment rather than a merger induced economic effect, since loan loss provisions would tend to decline after being in the highest deciles even without the occurrence of a merger.

The basic idea of the simulations is that if we artificially generate mergers between "good" and "bad" banks that actually have never been involved in mergers, we should not systematically find any "post-merger" effect for loan loss provisions if our empirical design according to equation 2 is well behaved. Hence, we should not expect to find any systematic merger effect if in fact no merger occurred. In contrast, if the test design is flawed by some technical adjustment towards the mean that is picked-up by our post-event dummies, we should still observe that the post-event dummies are frequently significant. In statistical terminology, this approach corresponds to testing the size of our test design, i.e., the frequency of rejecting the null hypothesis that there is no merger effect on loan loss provisions, if the null is in fact true.

The simulations are based on the sub-sample of banks that have never been involved in a merger in our observation period. We simulate artificial mergers by drawing a random sample from normal banks (300 banks as leaders, 240 banks as normal targets) and banks that had loan loss provisions in the 9th

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or 10th decile in two subsequent years (60 banks).[44] We then employ the same methodology as outlined in Section 4.1, i.e., aggregate annual reports of "pseudo-merging" banks and run the dynamic panel regressions of model 2. The size of the methodology is measured by the fraction of 100 such simulation runs where the estimated coefficients on the merger dummies are significantly different from zero at the 10%-significance level. If the test design is well behaved, we should not expect to find too many significant merger dummies. The statistical significance (one-sided test) of the difference between the fraction of random samples rejecting the null of a zero coefficient and the theoretical value of 10% is determined using the normal approximation to the binomial distribution. Table B.1 reports the corresponding results.[45]

Table B.1
Simulated Evidence on the Size of the Event-Study Methodology

The table shows the frequency of cases where the t-statistic indicated a significant coefficient on the merger dummies over 1000 simulation runs. Each random sample of pseudo-merging banks is drawn from the sub-sample of banks that have not been involved in actual mergers from 1992-2001. Out of 1219 such banks, 353 banks had loan loss provisions in the 9th or 10th decile in two subsequent years (BAD). For each simulation run, we draw 300 leader banks and 240 target banks taken from the sub-sample of banks that never met the BAD criterion. 60 target banks are drawn from the sub-sample of BAD banks. We then run the dynamic panel regressions according to model 2 with loan loss provisions as the dependent variable and count the frequency of coefficients significantly different from zero (the true null hypothesis) at a 10%-significance level. The statistical difference between the fraction of random samples rejecting the null and the theoretical value of 10% is measured by a one-sided test determined using the normal approximation to the binomial distribution. τ denotes event time, # denotes number of observed cases, *prob* denotes probability, p denotes the observed cases divided by the number of simulation runs.

Coefficient on Dummy indicating ...	t-statistics			Significance
	# < 1.645	# > 1.645	Total	prob(p < 10%)
Merger $\tau = 0$	5	8	13	1
Merger $\tau \in [1,3]$	8	3	11	1
Merger $\tau \geq 4$	7	6	13	1
Distress Merger $\tau = 0$	26	15	41	1
Distress Merger $\tau \in [1,3]$	23	17	40	1
Distress Merger $\tau \geq 4$	25	32	57	1

The results shown in the table demonstrate that there is no tendency to over-reject the null hypothesis of no merger impact for either normal merg-

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[44] Note that there are 1219 banks without merger involvement from 1992-2001. Out of these, 353 banks have met the criterion BAD, i.e., had loan loss provisions in the 9th or 10th percentile in two subsequent years.

[45] We allow randomly selected mergers to occur only in the years 1993-1998 to ensure a sufficient number of pre- and post event observations. Also, we do not allow for multiple bank mergers within one random sample. However, random samples are drawn with replacement.

ers (coefficients denoted by *Merger*) or distress mergers (coefficients denoted *Distress Merger*). Out of 1000 simulation runs, we observe at most 31 false rejections of the true null hypothesis. Hence, the post-merger dummies are not affected by any potential mechanic adjustment of loan loss provisions towards the mean. [46]

B.2 Further Robustness Tests

As further robustness tests of our results, we examine how variations in the model design and the estimation technique affect the results. We also consider to what extent the results are different between the savings banks sector and the cooperatives banks sector.

Model Design and Estimation

We varied the specification of the regression model with regard to the following issues.

- *Changes in LOANLOSS*: We repeated all regressions and based the indicator variable for distressed banks on deciles of adverse changes in loan loss provisions.
- *Multiple Mergers*: We excluded all mergers that contained target&leader banks to check for the robustness of our consolidation approach.
- *Risk Proxy*: We used the share of loans to small and medium-sized firms (SME) as an alternative proxy for bank credit risk or the loan portfolio structure.

These exercises did not affect our qualitative results.

Panels A and B of Table B.2 report estimation results from two further robustness checks. Panel A shows the dummy coefficients for the LOANLOSS and PROFIT regressions when RISKASSETS is included as an explanatory variable. Comparing the estimates to those reported in Panel B of Table 6 shows that explicitly controlling for credit risk has virtually no effect on the estimated coefficients and their statistical significance. Similarly, the unaffected results regarding profitability support the effect is not driven by a change in banks' risk-taking. This implies again that the strong reduction of loan loss provisions for distress mergers is not accommodated by a structural change of the loan portfolios and therefore probably due to diversification.

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[46] The simulation rather indicates that the test design has a too low type-I error. Unreported variations of the simulations show that this effect depends on the choice of the instrument matrix in the GMM procedure and the used dependent variable. We nevertheless prefer to report simulation results based on the exact model specification underlying the results of Section 4.2.

One potential problem with the Arellano/Bond-estimation is that the Sargan-test of over-identifying restrictions always rejects the null hypothesis of no specification error. However, the Sargan-test does not test for a specific type of mis-specification. Common issues in the context of the Arellano/Bond GMM estimator are heteroscedasticity and the number of lags of the dependent and independent variables used as instrumental variables. Since the estimation results do not differ when using the one-step or the two-step estimator, the underlying problem is unlikely to be heteroscedasticity.

The number of instruments increases dramatically with the number of time periods in the Arellano/Bond estimator. It is unclear how much useful information is thereby brought to bear on the estimation, since the farther apart in time the instruments the less information is likely to be present (see Greene (2003), pp. 307-314). Hence, our results might be affected by the "weak instruments" problem of instrumental variable estimators. [47]

To overcome these concerns, we re-estimate equation (2) using either a fixed effects panel regression including lagged dependent variables or a simple fixed effects regression where the error term is assumed to follow an AR1-process. The fixed effects model including lagged dependent variables leads to potentially biased coefficients. However, the model may nevertheless serve as a benchmark because for $t \to \infty$ the model is consistent, and Monte Carlo simulations show that the bias is often small both in absolute magnitude and relatively when compared to the adverse impact of weak instruments on the GMM estimator. The fixed effects model with an AR1-process for the error term takes only one lag of the dependent variable into account. However, the potential improvement is that the huge number of potentially weak instruments is avoided and that the coefficient on the lagged dependent variable is (implicitly) allowed to vary with the merger effect.

Estimation results are reported in Panel B of Table B.2. [48] The coefficients on the dummies and the significance patterns remain similar to the results reported in Table 6, Panel B. According to both fixed effects estimators, there is a strong decrease in loan loss provisions for distress mergers which cannot be accounted for by changes in banks' risk-taking. Hence, the evidence strongly supports diversification gains from distress mergers.

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[47] Experimenting with the lag-structure used as instruments shows that the Sargan-statistic very much depends on the specific instruments used, although results for the LOANLOSS and the RISKASSETS regressions are generally unaffected.

[48] Dependent variables are measured in percentiles to ensure robustness against outliers.

Table B.2. Robustness Regressions

The table reports estimates of a dynamic panel regression

$$y_{it} = \alpha_i + \nu_t + \sum_{j=1,2} \lambda_j\, y_{i,t-j} + \beta D_\tau + \gamma(D_\tau\, BAD) + \eta_1 SIZE + \eta_2 SIZE^2 + \epsilon_{it}$$

where y_{it} denotes the variable of interest, a_i are bank individual effects, ν_t are calendar year fixed effects, ϵ_{it} is the regression error term, and λ, β, γ, and η are coefficients to be estimated. D_τ denotes a set of dummy variables indicating the occurrence of a merger. The subscript τ indicates event time. The variable BAD equals one if at least one bank involved in the merger had loan loss provisions in the 9th or 10th decile in the two years before the merger. For definition of the other variables see Table 2. All dependent variables are measured in percentiles (i.e. taking values between 1 and 100) in the cross section of all banks on a year-by-year basis to ensure robustness against outliers. Panel A shows estimation results based on the dynamic panel estimator according to Arellano and Bond (1991), and includes a control variable for credit risk (RISKASSESTS) as regressor. Arellano/Bond estimates are based on the two-step estimator. The last column reports the p-value of a test for serial correlation in regression residuals. Consistency of the Arellano/Bond GMM estimator requires lack of second-order autocorrelation. Panel B shows estimation results for a fixed effects estimator with lagged dependent variables, and a fixed effects estimation that assumes an AR1-process for the error term (*FE with AR1*). Panel C reports estimation results using the Arellano/Bond estimator but differentiating for the sector affiliation of banks. p-values are in parentheses. *, **: significance at the 5%-, and 1%-level, respectively.

Type	Dependant	Short-term $\tau = 0$		Medium-term $\tau \in [1-3]$		Long-term $\tau \geq 4$		N	Serial Correlation
		Normal Mergers	Distress Mergers	Normal Mergers	Distress Mergers	Normal Mergers	Distress Mergers		Lag 2 (p-value)
Panel A: RISKASSETS Included as Explanatory Variable									
Arellano/Bond	LOANLOSS	5.411**	-10.261**	3.366*	-8.214**	2.754	-10.281*	12,936	(0.410)
		(0.000)	(0.000)	(0.024)	(0.007)	(0.216)	(0.040)		
Arellano/Bond	PROFIT	-3.120**	4.932*	4.007**	-3.898*	2.473	-4.994	12,936	(0.231)
		(0.001)	(0.018)	(0.000)	(0.050)	(0.082)	(0.131)		
Panel B: Alternative Estimators									
Fixed Effects	LOANLOSS	5.581**	-6.851**	6.239**	-13.734**	7.132**	-17.433**	15,092	—
		(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)		
Fixed Effects	RISKASSETS	1.959**	-3.213**	0.578	-1.797*	-0.123	-0.734	15,092	—
		(0.000)	(0.000)	(0.100)	(0.014)	(0.815)	(0.488)		
FE with AR1	LOANLOSS	5.390**	-6.954**	5.972**	-13.221**	5.698**	-15.867***	17,248	—
		(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)		
FE with AR1	RISKASSETS	1.374**	-2.120**	1.326**	-2.332**	0.500	-0.776	17,248	—
		(0.000)	(0.002)	(0.001)	(0.005)	(0.405)	(0.549)		
Panel C: Savings versus Cooperatives Banks									
Savings	LOANLOSS	2.717	-13.148	7.313	-21.289*	0.801	-19.371	3213	(0.992)
		(0.567)	(0.153)	(0.113)	(0.023)	(0.900)	(0.090)		
Cooperatives	LOANLOSS	5.625**	-10.496**	3.332*	-8.138**	3.738	-6.231	9714	(0.507)
		(0.000)	(0.001)	(0.034)	(0.013)	(0.119)	(0.265)		

Sector Specific Results

A final robustness test is to differentiate merger consequences by sector affiliation of banks. As discussed in Section 2, the anecdotal evidence indicates that the sectoral crises is more severe for cooperatives banks. Also, pooling savings and cooperatives banks can be problematic because savings banks are on average larger than cooperatives banks, which might affect the conduct of business, risk-taking behavior and so on.

Panel C of Table B.2 shows the estimation results according to the Arellano/Bond-estimator when differentiating for the sector affiliation. The results differ slightly between savings banks and cooperatives banks. There is no impact of normal mergers on loan loss provisions of savings banks, but distress mergers lead to a significant decrease in the three years period following the merger. Normal mergers of cooperatives banks lead to an increase in loan loss provisions in the event year and the three following years. Distress mergers by cooperatives banks significantly decrease loan loss provisions over the same period of time. Overall, the patterns are comparable to the results of the pooled sample. [49]

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[49] An unreported examination of profitability shows that savings banks have a more pronounced decrease in profitability in the three years following the merger. This holds for mergers where only financially sound banks are involved, and for distress mergers. Hence, savings banks are more likely to reduce risk-taking following any type of merger, since the profitability pattern corresponds to the pattern of loan loss provisions.

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