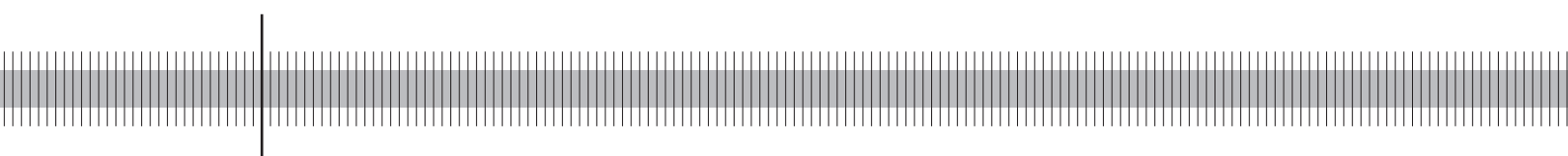DEUTSCHE
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Evaluating the German bank merger wave

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Abstract

German banks experienced a merger wave throughout the 1990s. However, the success of bank mergers remains a continuous matter of debate. In this paper we suggest a taxonomy as how to evaluate post-merger performance on the basis of cost efficiency (CE). We categorise mergers a success that fulfill simultaneously two criteria. First, merged institutes must exhibit CE levels above the average of non-merging banks. Second, banks must exhibit CE changes between merger and evaluation year above efficiency changes of non-merging banks. We employ this taxonomy to characterise (successful) mergers in terms of various key-performance and structural indicators and investigate the implications for three important policy issues. Our main conclusions are twofold. First, approximately every second merger is a success. Second, the margin of success is narrow, as the CE differential between merging and non-merging banks is one percentage point.

Non-technical summary

Since the early 1990s the number of banks declined substantially in most financial systems. Ongoing consolidation is a global phenomenon. However, it has been most remarkable in the largest banking market in Europe: Germany. According to the most recent report on EU banking structures by the ECB the number of credit institutions in Germany declined by approximately 35 percent between 1997 and 2003, by far the largest reduction in the EU. Yet, Germany still hosts most banks in Europe and exhibits the most fragmented market in this comparison. This may explain why for example the ECB expects further bank mergers especially among relatively small savings and cooperative banks.

An evaluation of the success of past merger activity is therefore crucial. In this paper, we assess mergers from an efficiency point of view. We estimate a stochastic cost frontier to measure the cost efficiency (CE) of banks. On the basis of a comparison of both efficiency *levels* and *changes* of merging versus non-merging banks we distinguish successful from non-successful mergers. Only those banks that exhibit simultaneously higher levels and changes in efficiency after a transaction are deemed a success.

Our main result is that approximately every second merger is a success according to this taxonomy. However, the mean difference between merging and non-merging banks is slim. On average, CE levels of the former are around a mere percentage point higher compared to the according cohort of non-merging banks in a given year. This difference remains fairly stable for a range of one to nine years that elapsed after a deal.

We use this grouping to investigate if mergers that are subject to three deal-specific characteristics are more or less often a success (or a failure). The first deal-specific characteristic is the size of pre-merger CE differentials between targets and acquirers to capture the potential for learning benefits due to the transfer of managerial skills. Our results indicate that only in the short run larger differentials lead more often to efficieny gains. In the long run, akin partners succeed more frequently in terms of CE.

The second deal-specific characteristic refers to the usefulness of mergers as a tool to resolve bank distress. Our results indicate that banks emerging from a deal that involved a distressed target are approximately as often in the success group as non-distressed mergers. However, those deals where the acquiring institute is distressed exhibit less frequently CE levels and changes above the benchmark set by non-merging banks.

The third characteristic refers to the regional proximity of merger partners. Savings bank mergers among institutions from the same municipality are in the short and medium run less frequently a success compared to cooperatives. Potentially, the lower frequency of successful savings mergers may be due to the lack of optimal partners that are geographically close by.

Nichttechnische Zusammenfassung

Seit 1990 ist die Anzahl von Banken weltweit massiv zurückgegangen. Insbesondere die Konsolidierung im größten Bankenmarkt der EU, Deutschland, ist bemerkenswert. Gemäß dem aktuellen Report der EZB zur Struktur des europäischen Bankwesens ist die Anzahl deutscher Kreditinstitute zwischen 1997 und 2003 um etwa 35 Prozent gesunken. Trotz dieser mit Abstand stärksten Abnahme bleibt das deutsche Bankwesen fragmentiert und die Anzahl an Banken ist nach wie vor die höchste in der EU. Dies mag erklären, weshalb zum Beispiel die EZB auch für die nahe Zukunft weitere Bankfusionen, speziell im Sparkassen- und Genossenschaftsbankensektor, erwartet.

Eine Bewertung bisheriger Bankfusionen ist daher von großer Bedeutung. In dieser Studie bewerten wir Fusionen nach Effizienzgesichtspunkten. Wir schätzen eine *stochastic cost frontier*, um die Kosteneffizienz (CE) einzelner Institute zu messen. Wir identifizieren erfolgreiche Transaktionen, indem wir *Effizienzniveaus* und *-änderungen* von fusionierenden und nicht fusionierenden Banken vergleichen. Nur jene Banken, welche nach einer Fusion gleichzeitig höhere Effizienzniveaus und -änderungen zeigen, werden als Erfolg gewertet.

Unser Hauptergebnis ist, dass gemäß dieser Einteilung etwa jede zweite Fusion einen Erfolg darstellt. Der durchschnittliche Effizienzunterschied zwischen fusionierenden und nicht fusionierenden Banken ist jedoch gering und beträgt etwa einen Prozentpunkt. Diese Differenz ist stabil für Zeiträume zwischen ein bis neun Jahren, nachdem eine Transaktion vollzogen wurde.

Wir untersuchen weiterhin, ob jene Bankfusionen besonders häufig erfolgreich bzw. nicht erfolgreich sind, welche durch drei bestimmte Charakteristika gekennzeichnet sind. Wir betrachten erstens die Effizienzunterschiede zwischen Banken eine Periode vor der Fusion. Große Unterschiede deuten auf ein hohes Potenzial zum Transfer von Managementfähigkeiten nach einer Verschmelzung hin. Die Ergebnisse zeigen, dass große Unterschiede nur unmittelbar nach einer Fusion häufiger zu höheren Effizienzgewinnen führen. Auf mittlere und längere Sicht sind eher jene Fusionen erfolgreich, welche zwischen ähnlich effizienten Banken erfolgen.

Wir betrachten zweitens, wie häufig Fusionen mit problembehafteten Banken ein Erfolg sind. Unsere Ergebnisse zeigen, dass Fusionen, in welchen das übernommene Institut sich in einer problematischen Situation befand, in etwa genauso häufig in der Erfolgsgruppe vertreten sind wie Fusionen zwischen Banken ohne gravierende Problemanzeichen. Es zeigt sich auch, dass Transaktionen mit problembehafteten Banken als aufnehmendes Institut selten zu einer erfolgreichen Transaktion führen.

Die dritte Eigenschaft betrifft die regionale Nähe der Partner einer Fusion. Fusionen zwischen Sparkassen innerhalb einer politischen Gemeinde sind seltener ein Erfolg als Genossenschaftsbankfusionen. Die geringere Häufigkeit von erfolgreichen Sparkassenfusionen deutet unter Umständen einen Mangel an geeigneten, geografisch nah liegenden Partnern an.

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Evaluating the German Bank Merger Wave[1]

1 Introduction

Time and again, practitioners and regulators claim that increased competition in the financial industry triggered profound changes in Germany's banking landscape. The drastic and continuous decline of the number of competitors since the early 1990s is one of the lighthouse cases put forward as an illustration of this claim. In fact, the number of banks constituting the three pillars of German banking declined from 4,177 to 2,160 due to mergers and acquisitions between 1991 and 2003.[2]

Research on the dynamics of US banking markets is fairly abundant, but our knowledge of the effects of German bank mergers remains limited. This is cumbersome because bankers, regulators and the public all have an interest to evaluate the effects of bank mergers.

A clear understanding of post-merger performance can, for example, facilitate decision making of bankers on the one hand, and successful future supervisory work on the other. To our knowledge, this study is the first to analyse the consolidation effects of the merger wave among all German cooperative and savings banks. In this paper we suggest a taxonomy to evaluate bank mergers. The analytical workhorse is cost efficiency (CE) as measured by stochastic frontier analysis. We pursue three objectives. First, we want to identify successful mergers on the basis of CE. Second, we want to characterise successful as opposed to unsuccessful mergers. Third, we want to apply the taxonomy to evaluate the influence of potential skill transfers between merger partners, the success of mergers as a means of resolving distress and the impact of prevailing regulation on geographical limitations for merger success.

We organise the paper as follows. In section 2 we employ data provided by the Bundesbank to supply an extensive description of market dynamics in these two important bank pillars. This descriptive analysis serves as the fundament to section 3 where we formulate a set of questions to address three particularities in German banking. Section 4 explains the methodology for measuring CE and how we identify successful mergers. In section 5 we present results on characteristics of merging and non-merging banks. We further investigate the effects of skill transfer, distress and regulation on the success of mergers. We provide recommendations with regard to previously raised issues on the basis of fresh empirical evidence. Section 6 supplies some final thoughts.

[2]The three pillars are commercial, savings and cooperative banks.

2 The German Bank Merger Wave

Our starting point in this paper is a stylised fact - German banks merged. The literature on bank mergers suggest a variety of possible reasons for this observation.[3] But as put forward by Amel et al. (2004), the majority of motives advocated are not mutually exclusive and thus rather reflect *attempts to rationalise* as to why banks merge instead of representing exclusive explanations.

This indeterminacy of merger motives notwithstanding, the causal chain of events is according to many scholars surprisingly similar, see for example Berger (2003). Decreased information asymmetries of investors, lower switching costs for borrowers, non-bank intermediaries venturing into traditional banking activities and more leeway for incumbent banks to expand operations both in terms of geographic and product scope all lead to increasing competitive pressure.

To counter these pressures, banks engage in mergers in order to utilise resources more efficiently. Likewise, a profound lack of efficient operations can lead banks to face financial distress. To resolve distress, banks may exit the market through mergers.[4]

Hence, the effects of mergers should ideally affect efficiency in a positive way. Therefore, many studies on merger effects focus on a comparison of the productive efficiency of banking firms. We follow this notion and provide in this section a description of the major characteristics accompanying the German merger wave.

2.1 Competitive Pressure

We have at our disposal data on all savings and cooperative banks for the period from 1993 until 2003. We focus on these two pillars for three reasons. First, they account for more than a third of total assets managed in the German banking system and represent more than 80 percent of all banks in terms of number. Second, the vast majority of mergers occurred among these institutes. While a number of studies focus on mergers among publicly listed banks, this study provides to our knowledge the only evidence on the (lack of) success of mergers for these banking sectors as a whole. Third, Hackethal (2004) points out that savings and cooperative banks are vital to the backbone of Germany's economy, namely the *"Mittelstand"*. Therefore, we are particularly concerned about the success of bank mergers in these banking groups.

The data were obtained from the Bundesbank. All banks operating in Germany annually report balance sheet and profit and loss account data. To grasp the dynamics of competitive pressure during the last decade, consider table 1.

Profitability as measured by return on equity (ROE) more than halved in this period. If competition increases, prices are driven down to marginal cost. As markets approach perfect competition, textbook economic theory predicts that no additional rents above marginal cost can be realised. We cannot observe marginal cost. But the development of ROE indicates in any case that comfortable profit bolsters during the early 1990s no longer prevail among German banks.

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[3]For example, the OECD (2000) lists technical change, globalisation and deregulation as three major triggers for mergers in the financial industry.

[4]Koetter et al. (2005) find that banks with weak financial profiles are more likely to merge.

Table 1: Key performance indicators of German banking 1993-2003

Year	ROE [1]	CI [2]	NIM [3]	HHI [4]	Banks
1993	19.5	70.6	3.2	2,976	3,464
1994	15.7	67.1	3.3	3,080	3,305
1995	18.3	69.6	3.1	3,142	3,203
1996	16.5	70.2	3.1	3,199	3,103
1997	14.5	70.5	3.0	3,263	3,004
1998	12.2	72.6	2.7	3,350	2,833
1999	10.9	73.6	2.7	3,514	2,597
2000	9.3	74.2	2.7	3,656	2,347
2001	7.3	75.8	2.6	3,788	2,147
2002	7.9	72.8	2.7	3,967	1,999
2003	9.3	71.6	2.8	4,110	1,868
Total	13.6	71.4	2.9	3,389	29,870

[1] Return on equity; [2] Cost-income ratio; [3] Net interest margin;

[4] Hirschman-Herfindahl Index between 1 and 10,000 per county.

Note: ROE, CI and NIM of savings and cooperative banks in percent.

The fact that cost-income ratios (CI) stayed fairly constant in the course of events signals to us that the deterioration of profitability cannot be explained by poor bank management alone. In such a case, administrative expenses as a share of operating revenue should have soared in lock-step. However, with the exception of the period involving stock market crashes around the turn of the century, we observe that mean CI ratios seem to have been kept in check on an ongoing basis.

At the same time, deteriorating net interest margins (NIM) could reflect how spreads between lending and borrowing are competed away. Seemingly, ongoing consolidation, as illustrated by the declining number of banks, did not result in banks seeking monopoly rents. Individual cooperative and savings banks might still be too small to exercise market power. The mean size of banks increased for our sample from around € 300m to a still fairly small scale of operations of € 820m. We interpret our findings as indication that despite increasing mean size banks continued to face considerable competition. Consequently, excessive market power is at first sight a minor concern.

Not a single bank exited the market due to outright failure during the observation period. The consolidation nonetheless left a profound imprint on Germany's banking structure. Local market concentration increased by more than 25 percent.[5] Measured by total assets under management per county and year we record an increase in the Hirschman-Herfindahl Index from just below 3,000 to 4,110 points between 1993 and 2003.

In sum, simple key performance indicators (KPI) convey in line with Bikker and Bos (2005) that competitive pressures increased among German banks during the last decade despite increasing concentration. A massively reduced number of institutes bears witness to a changing bank market structure. The brunt of these changes is in fact borne by mergers. The massive reduction of the number of banks demands an evaluation of the success of mergers and the implications for

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[5]Note, that we do not attempt here a formal investigation of the causal relation between market power, concentration and prices. We rather restrict ourselves to simply acknowledge that market structure changed substantially in terms of markedly fewer banks managing increasingly larger volumes of assets.

the industry in a more detailed fashion.

2.2 Consolidation

The Bundesbank collected data on 1,417 targets that were acquired during the period from 1994 to 2002.[6] We have information about both acquirer and target at our disposal for each of these transactions.[7] Table 2 provides data on the mean size of acquiring, target and non-merging banks in the year prior to the merger. We depict these measures by banking group. Additionally, we supply both the total volume and the number of acquirer and targets.

Table 2: Size and number of mergers per sector

Savings banks

Merger year	Acquirer[1]	Targets[1]	Non-merging[1]	Total TA[2]		N Acquirer[3]	N Target
1994	770	295	1,166	13,900		36	47
1995	504	317	1,253	9,200		22	29
1996	1,630	384	1,329	6,530		13	17
1997	1,660	764	1,411	6,120		7	8
1998	1,890	683	1,493	2,730		4	4
1999	1,320	576	1,585	8,640		12	15
2000	1,560	863	1,605	12,900		13	15
2001	2,090	743	1,651	17,800		20	24
2002	3,810	567	1,705	9,630		16	17
Mean	1,520	497	1,523	11,400	**Sum**	143	176

Cooperative banks

1994	180	53	160	5,700		104	108
1995	209	65	173	4,380		65	67
1996	321	68	187	5,290		72	78
1997	382	79	200	6,590		79	84
1998	355	95	211	15,100		141	159
1999	427	134	224	28,000		174	209
2000	394	112	234	26,700		202	238
2001	384	115	239	19,400		147	169
2002	455	155	252	20,000		114	129
Mean	362	106	220	18,000	**Sum**	1,098	1,241

[1] Mean total assets in mn Euro one year prior to transaction; [2] Sum of acquired assets in mn Euro
[3] Multiple acquirers only included once per year; serial acquirers included in each merger year.

In accordance with Lang and Welzel (1996), we observe that most mergers occurred among cooperative banks. While the number of German savings banks declined by approximately 20 percent from 654 banks in 1994 to 519 banks at year end of 2003, the corresponding decline of cooperative banks is 45 percent, reflecting a reduction in the number of banks from 2,651 to 1,480 in the same period. Consequently, the merger process in the two sectors might differ. For example, regulation and/or government ownership potentially shelters savings banks to a larger extent from competition compared to cooperatives. We then would expect market structure and profitability measures to exhibit these differences. We therefore investigate in the next subsection some simple performance and structural indicators per sector in the year of a merger.

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[6]The total number of targets is 1,465 in the reference period, representing a decline from 3,464 institutes in 1993 to 1,999 institutes in 2002. We had to discard 48 mergers due to missing data on either the acquirer or the target. We lack information prior to 1994 and after 2002.

[7]The number of acquirers is below the number of targets due to, first, serial acquirers and, second, multiple acquisitions in a given year by the same acquirer.

Because we focus in this paper on an evaluation of the (lack of) success of bank mergers, we are less interested to add another, to put it in terms of Amel et al. (2004), rationalisation to the literature as to why banks merged. We limit ourselves to extend our set of KPI introduced in section 2.1 by three additional indicators. In doing so we aim to assess the plausibility of three frequently raised motives by simple characteristics per bank. Let us briefly discuss the three motives mentioned before we turn to the ratios in the next section.

A first reason as to why banks might merge is to enhance productivity of labour. An intuitive illustration of this motive relates to technical advances in banking. For example, Valverde et al. (2004) provide evidence that the increased use of automatic teller machines and electronic payment systems fostered the reduction of (labour intensive) branch offices. It is conceivable that banks aim to enhance the productivity of labour by means of mergers. As German labour laws are restrictive, restructuring the branching network of two banks operating with considerable overlap is easier compared to simply laying off employees and substituting them with technology.

Secondly, time and again practitioners hypothesise that merging banks aim to realise economies of scale.[8] Table 2 illustrates the small size especially of co-operative banks. Cost pressures due to squeezed interest margins and too small operations to spread fixed costs fuel the (perceived) need to expand the asset base of these banks. The popularity of this notion among practitioners is vividly illustrated by a quote from Wolfgang Arnold, vice president of the German Bankers Association:

> "[...] Ein alter ökonomischer Lehrsatz befasst sich mit den Economies of Scale. Wenn man erforderliche Größenordnung nicht selbst erreichen kann, schließt man sich zusammen und optimiert über die Volumina kostenträchtige Abläufe. [...]"[9]

While we point out that the academic literature fails consistently, somewhat stubbornly, to find evidence in favour of economies of scale, we devise below a simple indicator variable to learn if successful mergers exhibit characteristics that support this motive.[10]

For an illustration of a third popular motive, consider the number and volume of deals depicted in table 2. The second peak of merger activity around the turn of the century is associated with turmoil in security markets.[11] Banks that expanded their securities business during rallying stock markets may have fallen victim to mergers after the stock market crashed. Struggling banks with relatively

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[8]According to Amel et al. (2004) this is probably one of the most popular potential motives.

[9]Press conference held in Frankfurt am Main on September 18, 2002. Available at http://www.bdb.de. The unofficial translation is: *"[...] An established economic proposition concerns economies of scale. If one cannot achieve the required size of operations individually, one combines these operations to optimise cost-intensive workflows by means of higher quantities processed. [...]"*

[10]Importantly, we do not claim here to conduct a formal investigation of the issue. An example ofa European study that estimates economies of scale is Lang and Welzel (1996).

[11]After a period of rallying stock markets, the stock market index DAX tumbled from an annual average of 6,164 points in 1999 to 3,967 points in 2002.

large non-interest income shares potentially turned prey to banks that aimed to diversify income sources at comparably favourable conditions.[12]

As noted throughout we do not assume that any of these rationales is solely "responsible" for mergers to occur. However, if these frequently encountered merger motives - productivity, scale and scope enhancement - indeed drive mergers, we expect to observe that our simple descriptives reflect these goals and improve after a merger. We turn next to these characteristics across merging and non-merging banks to obtain the stylised facts on bank characteristics after a merger.

2.3   Characteristics

If we assume that increased competition is indeed a major driving force of mergers and therefore changing market structures, we are interested in learning about the immediate implications for bank's post-merger profitability and costs. In table 3, we depict mean KPI to compare merging and non-merging banks across bank sectors in the year a deal occurred.[13]

Table 3: Mean characteristics of merging versus non-merging banks

KPI	Savings banks			Cooperative banks		
	Non	Merger	p-value[6]	Non	Merger	p-value[6]
ROE	15.6	8.4	0.000	13.7	8.7	0.000
CI	65.6	70.4	0.000	71.8	75.9	0.108
NIM[1]	2.7	2.8	0.213	2.9	2.8	0.000
HHI[2]	3,685	5,305	0.000	3,239	3,589	0.000
Prod[3]	0.29	0.33	0.000	0.33	0.34	0.000
UC[4]	5.8	5.7	0.755	6.0	6.1	0.001
INC[5]	7.7	7.7	0.941	8.8	10.4	0.000
N	4,294	143		8,508	1,098	

[1] Net interest margin in percent; [2] Hirschman-Herfindahl Index in points; [3] Productivity approximated as FTE per mn Euro of total assets; [4] Unit cost in cents of total operating cost per Euro of total assets; [5] Income structure as fee over total revenue in percent; [6] Test for equality of means
Note: Excluding pre-merger observations of ultimately merging banks.

Profitability differed significantly for both banking groups between merging and non-merging banks by 5 to 7 percentage points of ROE. Likewise, cost pressure is higher for banks that just merged, as measured by higher CI ratios. However, comparably poor KPI may result from a recent transaction, for example, due to the integration of a new sales force or from incurring additional advisor fees during the transaction.

Local concentration, measured by HHI, is higher among those banks that merged, especially for savings banks. Those banks that merged are thus operating in local markets with at times markedly fewer competitors. This can imply market power. But at the same time mean NIM do not differ a lot between merging and non-merging banks. Furthermore, for savings banks mean NIM is not significantly

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[12]This motive indicator variable relates to the literature that seeks to estimate economies of scope. An example of studies along this strand is Lang and Welzel (1998).

[13]This is in contrast to table 2, where mean KPIs refer to pre-merger years.

different despite substantially higher concentration among merging savings banks. Rent seeking therefore seems to be an issue of less importance in our sample.

But while we find only limited evidence for rent seeking, higher concentration may still imply that market discipline is lacking and therefore banks fail to monitor costs carefully. Foregone cost savings imply unnecessary reductions of producer surplus and are thus undesirable. This line of thought is supported by higher CI ratios for merging banks of both sectors, when paired with higher mean concentration.[14]

In section 2.2 we collected three potential motives as to why banks merge. These are to enhance labour productivity, to reduce fixed costs relative to total assets and to diversify income sources. While we abstain from a formal investigation of these motives due to reasons mentioned above and in Amel et al. (2004), we devise three simple indicators to gain some insight.

To grasp the labour productivity of merging and non-merging banks, *Prod*, we relate the number of full time equivalent employees (FTE) per bank to total assets. While the difference in table 3 is small, we find that merging banks employ significantly more FTE per million Euro of total assets than non-merging banks. According to this rough measure, non-merging banks use labour more productively.

To investigate if economies of scale are a plausible merger motive, we relate banks' operating costs to total assets to approximate unit costs, UC. Our data indicate that among small cooperative banks the difference between merging and non-merging banks is significant but small. For each Euro of total assets cooperative banks incur roughly 6 Euro cent in costs. Somewhat lower unit costs of savings banks are in line with larger mean sizes reported in table 2. But minuscule differences between merging and non-merging banks indicate that scale economies are not a primary reason to merge.[15]

A third potential motive is the notion that banks merge to diversify their income sources. We test if fee income as a share of total revenue, INC, differs significantly between merging and non-merging banks. While we reject the null hypothesis of different mean fee income shares for savings banks, we find evidence that merging cooperative banks exhibit an earnings structure significantly different from non-merging banks. The relatively large difference suggests that tapping alternative income sources could be a reason for (cooperative) bank mergers.

To sum, we find that merging and non-merging banks differ with respect to profitability and cost management both in the savings and cooperative banking sector. These KPI measures indicate that merging banks perform worse than non-merging ones in the transaction year. Regarding interest margins, market concentration, labour productivity, unit costs and income sources, we receive mixed signals depending on the banking sector. Merging savings bank operate in significantly higher concentrated local markets and suffer from lower labour

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[14]Note that the high p-value for the difference in mean test for cooperative banks may be due to outliers in the data. As we intend in this section to describe the stylized facts we included all banks which submitted data to the Bundesbank and were thus in operation. When estimating the efficient cost frontier we conducted robustness checks by excluding extreme observations. Results remained qualitatively unaffected.

[15]While we are aware of the crudeness of our measure, this simple plausibility check is in line with studies that consistently fail to identify scale economies gains due to mergers.

productivity; merging cooperative banks exhibit a higher share of fee income. Regarding market concentration, differences between merging and non-merging banks are either minuscule and/or insignificant.

In line with Koetter et al. (2005), the described characteristics indicate that merging banks perform at best mediocre. But with regard to the evaluation of the success of mergers, we argue that all of the discussed measures suffer from two major limitations.

The first caveat refers to the development of KPI over time. For example, lower labour productivity in the transaction year itself may merely reflect the rigidity of German labour laws. Adjustments of the labour force are time-consuming as, for example, numerous employees at savings banks are protected by civil servant status. Hence, large scale labour force reduction is only possible by using natural fluctuation rather than Anglo-Saxon style lay-off waves. Therefore, it is in our view crucial to track the performance of merged institutes over some time.

The second caveat is that any of the above mentioned measures provide little information about what the optimal KPI could have been for banks operating under potentially markedly different circumstances. After all, the share of the difference between mean ROE for merging and non-merging banks that is attributable to poor management of the bank versus deteriorating economic conditions or sheer bad luck remains unclear. We simply cannot state by observing some increased post merger ROE whether the firm performed optimally - a higher return after the merger might still be far from what could have been attained.

An alternative strand in the literature therefore suggests benchmarking banks according to their ability to convert inputs into outputs.[16] We employ cost efficiency (CE) to measure the success of mergers. This approach ranks firms relative to an optimal industry cost function.

The appeal of this measure is that we evaluate mergers on the basis of simple textbook microeconomic theory. We assume that banks operate on markets that are appropriately described by perfect competition.[17] We expect a cost minimising firm to produce its outputs by demanding required inputs subject to prevailing input prices. We then estimate an optimal cost function under the assumption that deviations from best practice are, first, due to random noise and, second, due to inefficient allocation of inputs. Intuitively, no bank can incur systematically higher costs compared to competitors. To avoid being driven out of the market any bank has to demand inputs in optimal proportions to produce a given output vector. We argue that this also holds for banks which potentially pursue alternative objectives - in the long run no firm can afford systematically higher costs for identical production factors employed.[18]

We postpone a formal introduction of our empirical model as to measure cost efficiency to section 4. Beforehand, we discuss three characteristics that may foster or hamper successful mergers in German banking.

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[16] See for example Vannder Vennet (1996, 2003), DeYoung (1997) and Peristiani (1997).

[17] For the validity of this assumption see also Bikker and Bos (2005).

[18] In contrast, it may very well be possible that German savings and cooperative banks may not strictly maximise their revenues as to maximise profits. Therefore, ROE and other traditional performance measures may fall short to assess the success of bank mergers. But even with these philanthropic co-objectives it is plausible that while revenues may not be maximised any bank has to optimise its costs when allocating resources to provide financial services.

3   Facilitators and Obstacles to M&A Success

The preceding subsection shows that we have to, first, distinguish between successful and unsuccessful mergers. Second, we are interested in the development of bank-specific characteristics as measured by the previously introduced KPI over time. As opposed to these bank-specific characteristics, merger success might crucially depend on characteristics related to both how the deal is conducted and the environment in which it takes place. We refer to these as deal-specific characteristics and we investigate the following three:[19]

1. Transfer of skills between merging banks

2. Mergers as distress resolution tool

3. Influence of regional demarcation

With the exception of the influence of regional demarcation on merger success, we regard these deal characteristics as endogenous to merger management. That is, we assume that regulation cannot be influenced by the management in charge of conducting the merger. Rather, investigation of the relation between regional demarcation and merger success intends to shed light on the costs and benefits of this arrangement. In contrast, the former two characteristics are the result of decisions made by management, i.e. if and how to transfer skills or to merge with another bank in order to resolve distress. In fact, our merger data allows us to classify mergers according to these three criteria and thus learn if deals with particular characteristics are more or less frequently a success (or a failure).

Subsequently, we motivate each of the three either by means of evidence from the literature or on the basis of merger data available. In addition to the development of merging banks' KPI, these three deal characteristics will serve later on as a guideline to structure the discussion of our results in section 5.

3.1   Transfer of Skills

Lang and Welzel (1998) investigate merger effects for a sample restricted to cooperative banks in the state of Bavaria. They find that in 53% of all mergers the acquirer is more cost efficient than the target. However, only 18% of all merged banks with higher ex ante acquirer CE managed to exhibit above average efficiency growth after the merger. In contrast, they find that 35% of all mergers with positive ex ante CE differences yield below average CE growth after the merger. They conclude that these acquirers failed to transfer their superior CE skills to the target.

This finding reflects that the transfer of cost management skills matters a lot to determine success but that it can be difficult to accomplish. If banks with superior CE performance manage to lift the merged units' overall CE, mergers are

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[19]Clearly, there is a virtually infinite number of additional factors that may matter, for example board compositions or local macroeconomic environments. Our choice here is motivated by the availability of data and the policy relevance of the deal characteristic from our point of view.

a desirable because they improve the competitive position of a bank and thereby strengthen the stability of the whole banking system.[20]

Whether a beneficial transfer of skill is successful depends on two major factors. First, the size of the ex ante differential. On the one hand, a larger differential can indicate that cost management skills of one of the partners are clearly below those of the other partner. Then, potential for improvement is easily identified. Relatively large gains may be quickly realised by simple imitation. An example is that one bank pursues excessive spending on real estate resulting in excessive office capacities. Switching to facilities closer to market cost then entails a quick win if switching costs are low enough. On the other hand, a large differential can indicate that one partner suffers from substantial problems that cannot be easily remedied. An example is a funding structure incurring too high interest payments. If these are stipulated in contracts there is presumably little a new management team can do in the short run.

The second factor refers to whether it is the target or the acquirer that exhibits higher CE. Acquirers that are dominant in terms of CE may very well command sufficient power to enforce their management procedures on the target. However, we have no reason to expect ex ante that the acquirer is indeed superior. Because of the respective government and member ownership structure of savings and co-operative banks (see Altunbas et al. 2001), we know that ownership shares are not freely traded. Consequently, majority stakes cannot be accumulated in a hostile fashion. The absence of a full-fledged market for corporate control may imply that objectives other than value maximisation are important for determining the acquirer and target in a merger. If it is indeed to some extent a political process that determines the role in a merger, it may turn out that a large but potentially less efficient bank is the acquirer. Then, it can be less likely that best practise from the target is wholeheartedly embraced by the new organisation.

Whether such scenarios prevail and whether we can observe particular combinations of pre-merger CE differentials to yield systematically more (or less) successful mergers remains an empirical question that we address below. This way, bankers, head organisations and regulators can evaluate pending mergers on the basis of pre-merger CE differentials to promote beneficial combinations that are likely to improve CE.

3.2 Mergers and Distress

As no single bank went into outright bankruptcy it is reasonable to expect that a number of bank mergers served the purpose to remedy distress. Table 4 underpins that around 100 mergers are identified as distressed transactions.

We follow Porath (2004) and Koetter et al. (2005) and retrieve data on distressed banks from the Bundesbank's database on default information. We focus here only on those events that represent restructuring efforts by means of mergers.[21] As can be seen in table 4, distressed mergers are not limited to cases where a bank becomes a *target*. In fact, it occurred equally often that distress resulted in

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[20]How far such joint CE must be lifted depends on the definition of a successful merger. We discuss that matter at length in the next subsection.

[21]Detailed definitions of distress can be found in Porath (2004) and Koetter et al. (2005).

Table 4: Distressed merger partners

Year	None	Target	Acquirer	Both	Total
1994	155	n.a.	n.a.	n.a.	155
1995	91	1	4	0	96
1996	90	2	3	0	95
1997	85	2	3	2	92
1998	141	12	10	0	163
1999	199	14	9	2	224
2000	233	12	7	1	253
2001	176	4	12	1	193
2002	146	n.a.	n.a.	n.a.	146
Total	1,316	47	48	6	1,417

Note: Savings and cooperative banks.

the bank *acquiring* a non-distressed bank. Only in six cases, both parties involved in the merger were classified as distressed by Bundesbank records.

In sum, our data permit identification of mergers that received regulatory attention due to distress as opposed to transactions involving banks that are not identified by Bundesbank records as distressed mergers. We want to examine if mergers are a successful instrument to ensure financial stability and soundness. To this end, we analyse below if distressed mergers are relatively more or less frequently identified as a success.

3.3 Mergers and regional proximity

The process of merging involves additional important institutions next to the Bundesbank and the Federal Institute for Financial Services Supervision (*"Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin"*). These are the respective head organisations of the savings and cooperative bank sectors, *DSGV* and *BVR*, respectively (Reifner and Evers 1998, Maselli 2000).

While supervision authorities adhere to principles of financial soundness and stability, representatives of these head organisations guard what is known as the principle of regional demarcation (*"Regionalprinzip"*).[22] This principle is de facto enforced among both cooperative and savings banks. It stipulates that regional banks of these sectors must not conduct operations beyond the borders of their assigned region. The objective of this regulation is to ensure that rural and economically weak areas are also supplied with financial services in Germany.

Consequently, many mergers among savings and cooperatives involve banks which are geographically close to each other. Table 5 depicts the number of mergers where both target and acquirer originate from the same region.

In 64 percent of the events, mergers among savings banks involve targets and acquirers that originated from the same county (*"Kreis"*).[23] Approximately 15 percent of all mergers in this group concern banks from the same municipality

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[22]Legal definitions of financial soundness and stability, to which both Bundesbank and *BaFin* adhere, are outlined in a series of laws. The German Banking Act (*"Kreditwesengesetz, KWG"*) is the most important one and is complemented by a number of regulations.

[23]Equal to the sum of county and municipality mergers over total, i.e. (86+26)/176, as one county is distinguished into multiple municipalities.

Table 5: Regional origin of merging banks

Region	County		Municipality		Total	
Year	*Savings*	*Coop's*	*Savings*	*Coop's*	*Savings*	*Coop's*
1994	28	60	3	29	47	108
1995	15	34	7	19	29	67
1996	6	35	4	30	17	78
1997	4	44	2	25	8	84
1998	1	91	1	41	4	159
1999	5	129	1	36	15	209
2000	6	136	4	50	15	238
2001	13	88	3	36	24	169
2002	8	77	1	22	17	129
Total	86	694	26	288	176	1,241

(*"Gemeinde"*).[24] For cooperative banks regional proximity of merger partners is even more evident. In almost 80 percent of all the cases, both parties are from the same county. A quarter of all cooperative bank mergers involve banks from the same municipality.

There are two main reasons why mergers in the same region can be superior. First, it is possible that these transactions serve the purpose of reaching some required minimum size to operate efficiently. If two banks serve the same community with considerable overlap in their customer base, joined operations can help reduce unit costs if excess capacities, for example branches or employees, are reduced. Second, mergers among banks from the same vicinity may be superior because the acquirer is presumably familiar with local market conditions, for example weaknesses and strengths of local corporate firms, local politics or customer habits.

On the other hand, it is possible that the *Regionalprinzip* implies a lack of potential partners in a given region. Then it is more likely that target and acquirer may fail to complement each other, e.g. in terms of product range or funding structure. Mergers of banks located fairly close to each other might merely reflect restrictions imposed by regulation. Another reason why close regional proximity can result in inferior post merger performance is a lack of regional (income) diversification. The merged institute's revenue basis will be further concentrated within confined boundaries, thus exposing the bank to a larger degree to local macroeconomic conditions.[25]

In this paper, we abstain from a full-fledged analysis of the costs and benefits of regional demarcation. However, we investigate whether mergers between nearby banks are more often a success or not.

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[24]Ideally, we investigate the geographical distance between target(s) and acquirer given the prevailing regional demarcation issued by the head organisations. Alas, this information is not available and we have to resort to publicly available regional indicators of counties and municipalities where banks are located. The number of counties with banks is 438 and the according number of municipalities is 2,333.

[25]Note an important caveat. Regions assigned to banks are not publicly available. Therefore, we have to resort here to available regional identifiers, namely counties and municipalities. Hence, our approach to investigate the relation between regional proximity and successful mergers should be understand as a crude approximation of the implications of the principle of regional demarcation only.

4 Methodology

Our first objective is to measure cost efficiency in a consolidating bank landscape taking mergers explicitly into account. As noted by Lang and Welzel (1999), this requires in a panel setting to model merged banks as new entities. This allows banks after a transaction to follow a new efficiency path over time. Therefore, we outline first our efficiency model.

Next, we suggest a taxonomy to define successful mergers that takes into account both efficiency development *and* the efficiency of non-merging banks.

4.1 Cost Efficiency

We estimate cost efficiency (CE) with stochastic frontier analysis.[26] We use the intermediation approach and assume that banks produce three outputs. These are interbank and commercial loans, y_1 and y_2, respectively, and securities, y_3. To this end banks utilise three inputs, which are demanded subject to prevailing prices, w_i, and the technology constraint, depicted by a transformation function $T(y, x, z)$. A bank employs fixed assets, x_1, labour, x_2, and borrowed funds, x_3. In addition, we include equity capital, z, to account for alternative funding sources and heterogeneous risk-preferences among banks. Our sample includes all savings and cooperative banks operating in Germany between 1993 and 2003.[27]

To estimate an optimal cost frontier for this unbalanced panel, we follow Greene (2005) and use a bank-specific fixed effects stochastic frontier model with time-variant inefficiency. Non-random differences in size, sector and regional location of banks are now captured by the bank-specific fixed effects. To account explicitly for ongoing consolidation, we follow the approach suggested by Lang and Welzel (1999). A merging bank is treated as a new bank. We allow a merged bank to follow a different optimal cost path inasmuch as each bank involved in a merger is treated with a separate fixed effect α_k.

This approach is markedly different from, say, including a dummy variable for mergers in the cost frontier specification. Such a model boils down to estimating one identical intercept for all banks that merge, which might be different from the cost functions intercept of non-merging banks. However, it is a strong assumption that the cost intercept is identical for all merging banks. The reduced form of optimal cost is specified using the translog functional and takes the following form:[28]

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[26] We focus on CE as cost pressure is more frequently cited as one of the major reasons in German banking to merge. A natural extension is to examine profit efficiency (PE). Given the limited scope of this paper this approach is postponed for further research.

[27] To account for technological change we also include a time trend and interaction terms.

[28] We impose homogeneity and symmetry restrictions as in Lang and Welzel (1996).

$$\ln C_{kt} = \alpha_k + \sum_{i=1}^{3} \alpha_i \ln w_{ikt} + \sum_{m=1}^{3} \beta_m \ln y_{mkt} + \delta_0 \ln z_{kt} \qquad (1)$$

$$+ \frac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} \alpha_{ij} \ln w_{ikt} \ln w_{jkt} + \sum_{i=1}^{3} \sum_{m=1}^{3} \gamma_{im} \ln w_{ikt} \ln y_{mkt}$$

$$+ \frac{1}{2} \sum_{m=1}^{3} \sum_{n=1}^{3} \beta_{mn} \ln y_{mkt} \ln y_{nkt} + \frac{1}{2} \delta_1 (\ln z_{kt})^2$$

$$+ \sum_{i=1}^{3} \omega_i \ln w_{ikt} \ln z_{kt} + \sum_{m=1}^{3} \zeta_m \ln y_{mk} \ln z_{kt} + \eta_0 t + \frac{1}{2} \eta_1 (t)^2$$

$$+ \sum_{i=1}^{3} \kappa_i \ln w_{ikt} t + \sum_{m=1}^{3} \tau_m \ln y_{mkt} t + \varepsilon_{kt}.$$

In any year t, a bank k can deviate from optimal cost due to random noise, v_{kt}, or inefficient use of in- and outputs, u_{kt}. To distinguish these two effects, we specify a composed total error, ε_{kt}. For a cost frontier inefficiency leads to above frontier costs. Therefore, the total error is $\varepsilon_{kt} = u_{kt} + v_{kt}$. The random error term v_{kt} is assumed $i.i.d.$ with $v_{kt} \sim N(0, \sigma_v^2)$ and independent of the explanatory variables. The inefficiency term is $i.i.d.$ with $u_{kt} \sim N|(0, \sigma_u^2)|$ and independent of the v_{kt}. It is drawn from a non-negative distribution truncated at zero. Greene (2005) further notes that the α_k's are allowed to be correlated with the cost function variables, y_{kt}, w_{kt} and z_{kt}. Any systematic deviations from the frontier due to heterogeneity across banks are captured by the fixed effect.

Note that inefficiency can vary over time but, apart from the distributional assumption, is not further specified to follow any particular trend over time. This approach has the virtue that efficiency can, for example, deteriorate in the immediate aftermath of a merger but is able to "recover" after some time has elapsed. At the same time, the cost frontier and the associated development of inefficiency is bank-specific, as it depends to some degree on the fixed effect.

To allow banks to enter a new efficiency path, we assign a new identifier to each bank after a merger. To illustrate this approach consider figure 1.

We assume for the sake of expositional ease that all banks A through D exhibit a positive, linear trend of efficiency over time.[29] Subject to its fixed effect, α_D, bank D illustrates a bank that is not merging during the observation period and exhibits continuously improving CE. Assume now that compared to the non-merging bank D two relatively less efficient banks A and B merge. Let the relatively more efficient bank A acquire the relatively less efficient, but faster improving, bank B in period 5. Then, efficiency differentials discussed in section 3.1 can be measured as the CE differential one year prior to merging. To adequately evaluate the CE effects of merging, Lang and Welzel (1999) stress the importance to treat the merged banks as if it is a new entrant to the market. Following their suggestion we therefore assign a new identifier to this merged institute, C. Estimated optimal cost, and hence efficiency, for this "new" bank are then subject to

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[29]We stress again that such a development is by no means pre-determined by our specification of the frontier. It exclusively serves the purpose of graphical illustration.

Figure 1: Treatment of merging banks
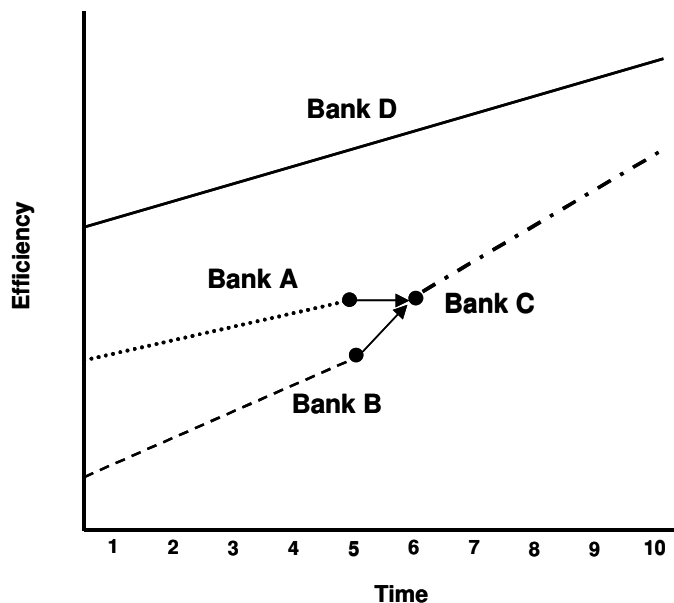
a new separate fixed effect. Put differently, the location of the optimal frontier for this new emerged bank C is different from that of bank A and bank B. Thereby, we allow efficiency to develop over time on a different path compared to that of the two banks prior to the merger.

We are interested not only in a comparison to non-merging banks but especially to distinguish successful and unsuccessful mergers. Let us therefore turn to our definition of successful mergers on the basis of cost efficiency.

4.2 Successful Mergers

Identification of successful mergers on the basis of the level of efficiency alone might be misleading. Consider as an example a bank that merged in 1995. Assume it exhibits CE of 80 percent in 1997 relative to an average CE of non-merging banks of 75 percent. On this basis alone the merger may then be considered a success. But if the bank exhibited cost efficiency of 85 percent in the year of the merger, 1995, the decline by 5 percent is hardly an achievement.

We therefore compare mergers along two dimensions. The first dimension is the acquirer's change in CE in year t relative to the year of the merger. The second is the level of CE of the merged institute in year t after the merger.

The first dimension captures changes in CE. As many practitioners point out, potential gains require some time until they materialise. Therefore, we report efficiency changes for a range of time t from 1 until 9.[30] To evaluate whether a particular merger was successful, we use as a benchmark the average efficiency change of those banks that never merged, i.e. mean CE of all banks like D in

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[30] We have information about merger acivities between 1994 and 2002. Hence, the maximum number of post-merger years available is nine years, namely from 1995 to 2003.

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figure 1 in year t.[31] Hence, a decline in efficiency need not necessarily imply a bad merger. If a bank suffered, for example, from a five percent drop in CE but the group of non-merging banks experienced a drop of ten percent, the merger helped to offset the negative trend. For example, we compare the two-year CE change of a bank that merged in 1995 in 1997 with the CE change of non-merging banks in the same two years.

The second dimension is the level of CE of merging and non-merging banks. For example, along this second dimension, we compare a bank that merged in 1995 two years after the merger relative to the level of mean CE of non-merging banks in 1997.[32] Consider as an example figure 2.

We define mergers in the north-eastern quadrant, group I, as a success. These transactions yield, first, higher CE levels compared to non-merging banks in the year examined and, second, enjoyed an increase in CE since the merger above the mean CE change of non-merging banks during the same time period. Below, we examine if these successful mergers also exhibit other favourable KPI, e.g. higher profitability and lower CI ratios. Likewise, we examine if successful (as well as unsuccessful) mergers exhibit a clear profile in terms of deal-specific characteristics in terms of transferring skills, regional proximity of partners, distress and learning effects.
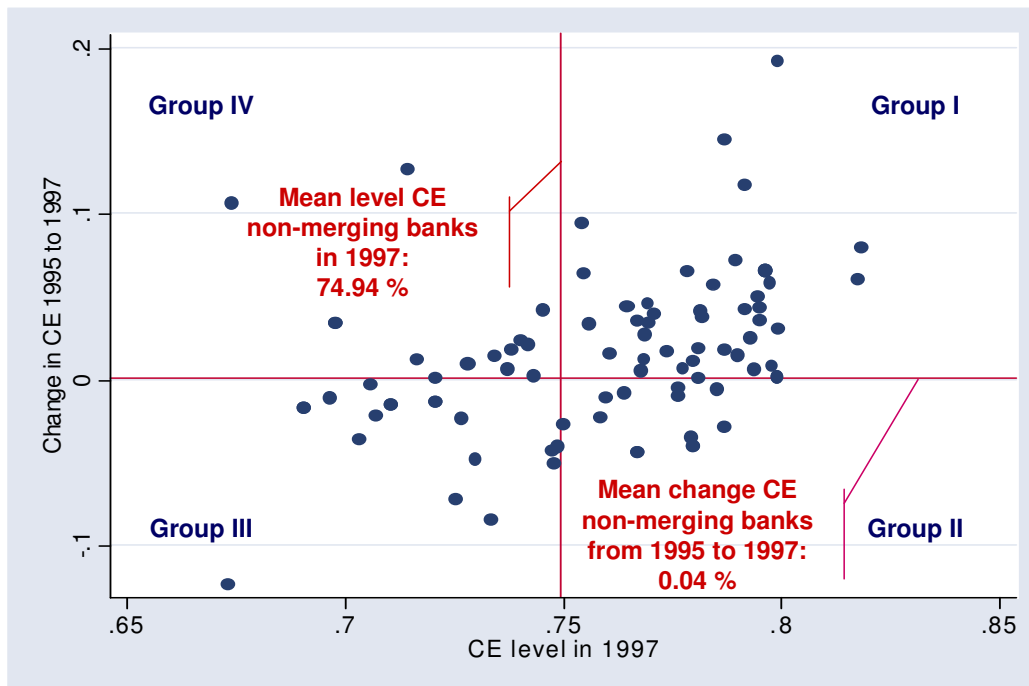
The south-eastern quadrant, group II, is deemed unsuccessful. Merged banks exhibit above non-merging average CE two years after the transaction. But the change in CE is lower compared to the mean change of non-merging banks. Such mergers are unsuccessful because, for the example of an increasing industry trend in CE, the bank failed to match positive market developments. This could be the case if the acquiring bank was already highly cost efficient prior to the merger leading to high levels of CE in the merger year itself.[33] A high level of CE could have led to a too relaxed attitude towards rolling out superior cost management skills at the target quickly. We expect to obtain an indication if banks with extreme pre-merger differentials fall relatively more often into this (or other) merger groups, reflecting either inability or sheer neglect of transferring knowledge.

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[31]We refer henceforth to those banks that never merged as non-merging banks. Thereby, we avoid to compare in a given year merging bank's performance to a benchmark that includes some banks which may merge later on. In fact, a banks' CE one year prior to merger may already differ markedly from CE of banks never merging and can thus constitute a poor benchmark sample. By excluding bank-year observations of institutes that eventually merge we avoid furthermore a potential upward bias in the benchmark if successful banks merge early. Including these successful early movers in the merger wave would then constitute a too high benchmark for those relatively poor performing banks that follow suit at later stages of the merger wave.

[32]Note that our formulation of a benchmark is quite conservative as it requires successful mergers to outperform non-merging banks simultaneously along two dimensions. Alternative and less rigorous benchmarks are conceivable. For example, Vander Vennet (2003) compares on the one hand pre- and post-merger efficiency rankings within the group of merging banks and on the other he compares these measures between merging banks and those of a peer group selected on the basis of institutional form, country and size. Here, we prefer to explicitly allow the merger event to enter the fixed effect of the frontier and thereby influence the relative benchmark more directly. Regarding the alternative of a peer group comparison we acknowldege here that our sample already is much more homogenous compared to a cross-country study. Given the large number of mergers we argue that the choice of relevant peer groups would be hard to achieve and is likely to result in arbitrary selection criteria.

[33]Note, however, that we do not consider here how efficient the bank was in the year of the merger but compare it to the benchmark t years after the merger.

Figure 2: Performance of 1995 mergers two years after transaction

The south-western quadrant, group III, depicts the worst mergers. In the above example, mergers conducted in 1995 resulted two years later in CE levels below those of non-merging banks in 1997, i.e. 74.94 percent. Moreover, these banks exhibit a change in CE below the average of non-merging banks, namely 0.04 percent. We expect to see that these banks do also perform poorly in terms of traditional KPI as they exhibit in terms of CE neither high levels of cost management skill nor above average improvements.

Finally, the north-western quadrant, group IV, depicts banks with below non-merging banks' mean CE but with above average changes in CE. Consequently, these transactions are not univocally a success. But they may have the largest potential as promising changes in CE may indicate above average efficiency after some more time. We are interested below if, for example, especially those mergers are a success where one partner suffered from clear deficiencies as reflected by distress. While turning around a distressed bank could imply below average levels of CE for a while, focused restructuring efforts could show up in our taxonomy as above average improvements of CE.

Before turning to an assessment of the German merger wave on the basis of our results let us briefly point out a potential caveat. The two dimensions on which our grouping is based, namely the level and change of CE, respectively, are not entirely independent from each other. A bank that exhibits above average CE changes after up to nine years after the merger is also more likely to end up with a level of CE above the average CE of non-merging banks. However, we argue that most alternative approaches that rely either on levels of CE or, for that matter, other KPI do suffer from even more severe problems as these approaches neglect the development of the chosen performance ratio entirely.

5 Results

We present first the efficiency effects of merging banks according to the taxonomy described in section 4.2.[34] Compared to the group of non-merging banks we define as a success those transactions that yield both (i) higher levels of cost efficiency after the merger and (ii) exhibit above average changes in efficiency. Based on this categorisation we subsequently investigate the issues raised.

5.1 Identification of Successful Mergers

In table 6 we depict for each cohort of merger years the difference between mean CE of merging versus non-merging banks. We do so for both the level of and the change in CE.

Table 6: Cost efficiency differentials between merging and non-merging banks

		Years elapsed								
Merger	Differential[1]	1	2	3	4	5	6	7	8	9
1994	CE Level	1.4***	0.3	0.7*	1.2***	0.5	1.6***	1.2**	1.6**	0.9
	CE Change	2.1***	1.1**	1.0**	1.7***	1.0***	2.2***	2.0**	2.4***	1.4
1995	CE Level	0.1	0.7	0.3	0.5	1.6**	1.0	0.9	0.9	
	CE Change	0.9**	1.6***	1.3**	1.7**	2.7***	1.9**	2.0*	2.5**	
1996	CE Level	0.7	1.3***	1.4***	0.5	0.8	0.3	0.8		
	CE Change	-0.4	0.2	0.5	-0.5	-0.1	-1.0	-0.6		
1997	CE Level	1.5***	1.3**	0.7	0.4	1.3	0.6			
	CE Change	0.9**	0.7	0.2	-0.1	0.9	0.3			
1998	CE Level	0.9**	0.1	0.5	1.9***	2.0***				
	CE Change	-0.2	-1.0*	-0.4	1.2*	1.2				
1999	CE Level	0.4	1.3***	1.3***	0.9*					
	CE Change	-0.9**	0.2	0.3	0.0					
2000	CE Level	1.6***	1.2***	1.3***						
	CE Change	0.6	0.3	0.4						
2001	CE Level	1.0**	2.1***							
	CE Change	0.9***	2.0***							
2002	CE Level	1.9***								
	CE Change	0.8**								
Total	CE Level	1.1	1.1	1.0	1.0	1.2	1.0	1.0	1.3	0.9
	CE Change	0.6	0.7	0.7	0.5	1.1	1.2	2.1	2.3	1.2

[1] Differentials calculated as merging less non-merging bank efficiency in percentages.

Note: ***,**,* depict significant differences at the 1, 5 and 10 percent level, respectively.

Savings and cooperative banks.

On average, the post-transaction level of merging banks' CE is higher compared to non-merging banks. In addition, the change in CE compared to the respective year of the merger is also above the mean CE change among non-merging banks. Except for those mergers occurring in 1996 and 1998, most level and change differentials are positive and significantly different from zero. Thus, mergers have on average been a success in Germany's cooperative and savings bank sectors.

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[34]We conserve on space and do not provide parameter estimates and general descriptive statistics on efficiency. They are available upon request from the author.

However, this success is on average modest regarding the level of improvements, namely around a mere percentage point. The change of CE is more favourable after considerable time has elapsed, say between seven and eight years after the merger. Then, efficiency changes compared to the year of merger are slightly larger compared to quick wins just one or two years after the merger. But even a two percent increase can hardly be called a splendid performance. Interestingly, for those mergers that were executed around the time of booming equity markets in Germany, 1998 and 1999, the change of CE has been below the average of non-merging banks up to three years after the transaction. This could indicate that managers did not focus on keeping production cost efficient. In times when the temptations to realise quick gains in new business arenas may have been paramount from a banker's point of view, careful cost management was apparently of secondary interest.

Table 6 depicts mean efficiency differentials. To further assess how many mergers were a success we turn our attention to the distribution of mergers according to the quadrant taxonomy described in section 4.2.

Table 7: Number of banks per quadrant x years after merger

		Group			Total
Years	I	II	III	IV	N
elapsed	Success	Change loser	Total loser	Level loser	
1	544	317	175	91	1,127
2	479	183	191	50	903
3	323	145	166	43	677
4	236	86	117	27	466
5	153	57	72	24	306
6	106	34	51	9	200
7	72	19	48	4	143
8	56	11	26	6	99
9	27	10	17	5	59

Note: Multiple acquirers included only once; each bank treated separately after merger. Savings and cooperative banks.

The number of banks in group I is throughout the years after merging at around 50 percent. Thus, we conclude that in terms of CE every second savings and cooperative bank merger resulted in a successful merger. To avoid that multiple acquirers, i.e. those that absorbed more than one bank in a given year, are assigned too much weight in the categorisation of mergers, we included these banks' post-merger performance only once in each year they conduct multiple acquisitions.[35]

Another indication provided by table 7 refers to the declining share of group II mergers and the increasing share of group III mergers over time. A possible explanation is that banks suffering from below non-merging banks' CE changes ultimately also fall below the mean level of non-merging banks' CE ratios. Then, these banks transit into the total loser group if they continuously experience below average CE changes. However, the observation of switching shares of group II and III, respectively, can only be regarded as an indication for the aforementioned

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[35]We did the same for the calculation of efficiency differentials in table 6.

interpretation. This is because in table 7 it is also possible that the share of a group stays fairly constant, such as for group IV, but the composition of individual institutes continuously changes from year to year. To draw stronger inference we would have to construct transition matrices and seek to estimate the probability of transition given a whole range of bank-specific and environmental variables.[36]

While we argue that efficiency is particularly suited to evaluate the success of mergers in the course of time, we acknowledge the inherent interest of practitioners and regulators in alternative KPI to assess the (lack of) virtues of bank mergers. We therefore turn to the development of KPI introduced in table 3 for each of our merger groups.

5.2   Characteristics of Mergers across Groups

In table 8 we show the KPI ratios introduced in section 2.3 in addition to mean CE over time and banking groups. Overall, KPI after a merger bear markedly different information between savings and cooperative banks. In addition, most differences between traditional KPI across groups are not significant in the long run. Thus, they are by and large uninformative when categorising mergers on the basis of CE six years after the merger. This indicates that after approximately six years other factors than a merger determine these indicators. We therefore concentrate in table 8 on the medium and short run.

Consider savings banks first. We find that profitability is highest for mergers exhibiting above benchmark CE changes but below benchmark CE levels, i.e. group IV mergers. At the same time both net interest margins and concentration are highest for this group, too. Consequently, high profitability may be due to market power. We consider such a merger not a success and conclude that market power concerns are appropriate for savings banks that exhibit above benchmark CE changes. Our taxonomy of success on the basis of CE seems to avoid identification of such mergers as desirable. With respect to potential motives of merging we find little support that either scope or scale economies are realised in savings bank mergers. The share of fee to interest income and unit costs are not the most favourable ones for our success group I. However, our productivity proxy indicate that successful mergers are those with high labour productivity. Consequently, savings bank mergers in Germany might indeed be a vehicle to reduce the work force under comparably rigid labour laws. This result is akin to findings of Lang and Welzel (1999) who report that only those mergers yield above average efficiency growth which are accompanied by closure of branches.

Consider cooperative banks next. Profitability is high for group I but also for group IV mergers. While the CI ratio is univocally the lowest for our identification of successful mergers, this result implies that CE and profitability measures contain different information. In contrast to savings banks, we find that neither margins nor concentration is particularly high for group IV mergers. In fact, both measures are hardly ever significantly different across merger groups. We conclude that market power concerns are of minor importance for cooperative

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[36]In fact, it is an interesting question in its own right which banks transit over time from one group to another for what reason. An example of an explicit account of the transition dynamics associated with bank consolidation can be found in Robertson (2001). Such an approach is beyond the scope of this paper and subject to future research.

Table 8: Mean performance and structure indicators across mergers

Years	KPI	Savings					Cooperatives				
One	Group	I	II	III	IV	$KW^{5)}$	I	II	III	IV	$KW^{5)}$
	CE	78.17	76.85	71.78	71.99	0.000	78.04	76.74	71.47	72.65	0.000
	ROE	12.18	9.92	11.15	12.43	0.633	10.09	9.11	5.44	10.89	0.000
	CI	70.05	70.09	70.95	76.30	0.066	73.45	74.83	80.91	74.95	0.000
	NIM	2.72	2.60	2.74	3.04	0.003	2.82	2.81	2.90	2.86	0.009
	$Prod^{1)}$	0.284	0.293	0.301	0.370	0.000	0.311	0.329	0.428	0.357	0.000
	$UC^{2)}$	5.57	5.50	5.80	5.84	0.008	5.78	5.98	6.19	6.02	0.000
	$INC^{3)}$	7.90	8.07	7.71	8.53	0.091	10.80	10.88	10.92	10.47	0.468
	$HHI^{4)}$	5183	5494	5064	6771	0.065	3735	3556	3915	4063	0.175
Three											
	CE	78.08	76.69	73.00	72.89	0.000	78.41	76.64	72.14	73.67	0.000
	ROE	18.29	10.07	10.73	18.65	0.006	10.15	7.89	8.71	10.05	0.006
	CI	66.06	69.80	71.55	68.86	0.042	72.89	75.00	78.20	76.90	0.000
	NIM	2.77	2.53	2.63	2.93	0.012	2.79	2.80	2.82	2.77	0.610
	$Prod^{1)}$	0.295	0.283	0.303	0.342	0.010	0.300	0.322	0.328	0.323	0.000
	$UC^{2)}$	5.31	5.41	5.41	5.18	0.562	5.61	5.76	5.87	5.80	0.000
	$INC^{3)}$	8.33	8.70	8.97	9.96	0.001	11.45	11.25	11.65	10.26	0.270
	$HHI^{4)}$	5850	5304	6350	7334	0.182	3835	3661	3755	3942	0.887
Six											
	CE	78.63	76.24	71.17	73.72	0.000	77.84	76.12	71.60	73.74	0.000
	ROE	13.01	12.24	9.16	16.73	0.161	8.24	7.66	6.91	4.81	0.180
	CI	68.01	69.79	67.89	65.90	0.932	73.98	77.65	81.77	83.98	0.005
	NIM	2.56	2.35	2.56	2.74	0.336	2.75	2.69	2.73	2.64	0.756
	$Prod^{1)}$	0.293	0.277	0.296	0.277	0.386	0.295	0.301	0.343	0.325	0.073
	$UC^{2)}$	5.02	5.18	5.11	5.07	0.728	5.61	5.70	6.09	6.13	0.010
	$INC^{3)}$	10.63	9.74	10.29	9.66	0.636	11.69	11.61	11.38	12.82	0.819
	$HHI^{4)}$	7139	5422	7386	7542	0.696	3961	3652	3577	3587	0.912

[1] Productivity measured as FTE per mn Euro of total assets; [2] Unit cost measured as Euro-cent
of total cost to Euro of total assets; [3] Income structure measured as fee to total income;
[4] HHI in points between 1 and 10,000; [5] p-value for Kruskall-Wallis test of equal populations.
Note: All mean KPI in percentages unless noted otherwise. Savings and cooperative banks.

bank mergers. With regard to potential merger reasons we find as for savings banks that productivity is most favourable for successful mergers. Thus, cooperatives may have used mergers as well to improve the productivity of their labour force. In addition, unit costs are the lowest for successful mergers. This mirrors the frequently raised objective of cooperative banks to increase the size of their operations to realise economies of scale. Note also that both ratios are the only significant ones in the long run. In contrast, income diversification is an unlikely candidate for a merger motive as differences across groups are insignificant in all periods.

We investigate next if the three characteristics raised at the beginning of section 3 did facilitate or obstruct mergers to become a success.

5.3 Transfer of Skill

The first deal-specific characteristic in section 3.1 inquires if especially those mergers are successful that involve partners with large CE differentials before a merger.

We create nine equally sized groups of CE differentials in table 9. We depict the mean difference in CE levels between the acquirer and the target one year prior to the merger, $CE_{t-1}^A - CE_{t-1}^T$, one, three and six years after the merger occurred.[37]

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[37] For multiple acquirers we calculated the differential between the acquirer's CE level relative to the average CE level of all targets weigthed by the respective target's total assets.

We then compare the relative frequencies of each merger group I through IV for each of these nine CE differential groups to the population representation.

Table 9: Cost efficiency differentials between acquirers and targets

Years	Group	1	2	3	4	5	6	7	8	9	Total
One	$CE^A_{t-1} - CE^T_{t-1}$	*-7.8%*	*-3.1%*	*-1.3%*	*-0.2%*	*0.1%*	*1.2%*	*2.6%*	*4.5%*	*11.7%*	*0.8%*
	I	53%	53%	47%	47%	44%	43%	43%	54%	50%	48%
	II	18%	31%	31%	34%	19%	31%	30%	26%	31%	28%
	III	21%	12%	16%	13%	19%	21%	17%	11%	10%	16%
	IV	7%	4%	6%	6%	18%	5%	10%	8%	10%	8%
	Total N	126	126	126	126	126	126	126	126	126	1,127
Three	$CE^A_{t-1} - CE^T_{t-1}$	*-6.9%*	*-2.5%*	*-1.0%*	*-0.1%*	*0.0%*	*0.8%*	*2.3%*	*4.0%*	*10.6%*	*0.8%*
	I	53%	47%	51%	48%	54%	60%	52%	51%	39%	48%
	II	22%	19%	21%	19%	13%	5%	29%	16%	24%	21%
	III	18%	25%	23%	28%	21%	28%	13%	25%	25%	25%
	IV	7%	9%	5%	5%	12%	7%	5%	8%	12%	6%
	Total N	76	75	75	75	76	75	75	75	75	677
Six	$CE^A_{t-1} - CE^T_{t-1}$	*-4.6%*	*-0.9%*	*0.0%*	*0.0%*	*0.0%*	*0.1%*	*1.3%*	*3.4%*	*10.1%*	*1.0%*
	I	52%	45%	64%	55%	70%	59%	55%	59%	41%	53%
	II	17%	23%	9%	27%	0%	14%	18%	9%	14%	17%
	III	30%	27%	27%	9%	22%	27%	27%	27%	41%	26%
	IV	0%	5%	0%	9%	9%	0%	0%	5%	5%	5%
	Total N	23	22	22	22	23	22	22	22	22	200

Note: $CE^A_{t-1} - CE^T_{t-1}$ depicts mean CE of acquirer less CE of target one year prior to merger; multiple acquirers included only once; each bank treated separately after merger. Savings and cooperative banks.

We draw three major conclusions. First, on average mergers involved pairs where the acquirer is slightly more efficient prior to the merger, namely by about one percentage point of CE. Given the tiny difference we concede that only little room prevailed as to "import" superior managerial skills from either party into the merged institute. Put differently, the desire to transfer skill or to replace less able incumbent managers appears to be of lesser importance for most mergers of cooperative and savings banks.

Second, large differentials of either kind, i.e. groups 1 and 9 in table 9, are in the short run more frequently successful compared to those mergers that involve banks with small CE differentials. Interestingly, those mergers where the target is the dominant partner are identified considerably more often a success compared to those where the acquirer dominates the target by a similarly large CE differential. This result suggests that it is not per se important as to which of the partners involved is dominant. We conclude that in the short run large differentials in general spur realisation of "quick wins" as both minimum and maximum CE differential groups 1 and 9 contain more often successful mergers.

Third, we find that the medium- and long-term effects differ markedly from those of the short-run. On the one hand, mergers which involve acquirers with CE levels on average ten percentage points higher than those of the target are less frequently identified as a success. On the other hand, those transactions where the target is around seven percentage points more cost efficient than the acquirer are also in the medium-run more often a success. However, for this group the benefits from transferring cost management skills wear off at the latest six years after the merger according to our results. Moreover, in the medium- and long-term those groups containing mergers with differentials close to zero, i.e. groups 4 to 6, contain successful mergers more frequently than any of the extreme differential merger groups.

In sum, we conclude that large pre-merger CE differentials yield more frequently successful mergers in the immediate aftermath of the transaction. But these short-term improvements in CE, which can be due to a transfer of skill, wear off already in the medium run. Three or more years after a transaction, mergers involving banks with pre-merger CE differentials around zero yield more often successful transactions.

5.4 Distressed Mergers

We next assess if distressed mergers are represented more than proportionately in one of our merger categories. To this end we examine the short-, medium- and long-term categorisation of (distressed) mergers in table 10. We compare group representations of mergers without regulatory attention versus those where either the target, the acquirer or both institutes are distressed.

Table 10: Distribution of distressed mergers across groups

Years	Group	Distressed ...				Total
One		None	Target	Acquirer	Both	N
	I	48%	50%	46%	0%	48%
	II	28%	32%	24%	50%	28%
	III	16%	5%	22%	25%	16%
	IV	8%	13%	7%	25%	8%
	Total N	1,044	38	41	4	1,127
Three						
	I	50%	58%	42%	67%	48%
	II	19%	17%	25%	33%	21%
	III	23%	21%	21%	0%	25%
	IV	8%	4%	13%	0%	6%
	Total N	626	24	24	3	677
Six						
	I	56%	50%	43%	100%	53%
	II	14%	50%	14%	0%	17%
	III	26%	0%	43%	0%	26%
	IV	4%	0%	0%	0%	5%
	Total N	189	2	7	2	200

Note: Each bank treated separately after merger; including multiple
acquirers once. Savings and cooperative banks.

Approximately seven percent of all transactions are distressed. We discuss three major conclusions with respect to the success of distressed mergers. First, the distribution of distressed mergers roughly mimics the one for non-distressed transactions. In line with Koetter et al. (2005), this indicates that a number of non-distressed mergers may be rather similar to those that received regulatory attention. With respect to the group of mergers where both acquirer and target received regulatory attention we note that robust inference seems inappropriate due to the very low sample size. We therefore disregard this group here.

Second, mergers where the target is distressed are more often a success than transactions where the acquirer is distressed. This result is robust over time. Overall, the results clearly indicate that rendering a distressed bank the acquirer in a problem merger is not beneficial from a CE perspective.

Third, we note that according to table 4, the majority of distressed mergers occurred after 1997. Thus, our comparison of distressed and non-distressed mergers six years after the transaction suffers from a lack of observations because the last year of available data is 2003. We thus caution to draw inferences based on these results alone. However, one interesting outcome is that out of the eleven mergers that are still in existence six years after the transaction, the majority of seven are transactions where the acquirer was initially distressed. Moreover, these mergers are identified relatively often in group III. We tentatively interpret this as a further indication that mergers with distressed acquirers are not recommended.

In sum we conclude that mergers can be a successful tool to alleviate distress in the medium run. However, short-run gains are unlikely to materialise and wear off in the long run. It is more favourable to render distressed banks the target rather than the acquirer from an efficiency point of view.

5.5   Regional Proximity

We turn next to the question if regional proximity results in relatively more successful mergers. In table 11 we compare the distribution of transactions across groups representing three different degrees of regional proximity. First, we depict mergers where partners are from the lowest level of regional demarcation available, namely municipalities. Second, we depict mergers where both the acquirer and the target are from the same county. In the third pair of columns we show those mergers where partners are from different regions as a reference group. As previously, we analyse the short, medium and long run. We focus in our discussion on two major conclusions.

First, merging savings banks that are located closest to each other are relatively infrequently identified as successful mergers in the short and medium run. The frequency of group I mergers ranges between 35 and 38 percent, respectively. This is considerably less often compared to banks located further apart from each other. Our results imply that regional proximity hampers merger success for this banking group from a CE point of view. Note, however, that we cannot observe whether these merger partners voluntarily decide to join or if they were forced to join forces with "available" banks within their region.

Second, this result does not hold for cooperative bank mergers. In the short run the representation of county and municipality mergers in group I is just slightly below that for non-regional mergers in table 11. In fact, in the medium and long run regionally close partners accomplish merger success more frequently compared to those outside the region. The closer the partners in a cooperative merger are, the higher are the chances to outperform non-merging banks in terms of CE level and change even up to six years after the merger. This result is in line with Lang and Welzel (1999), who note that successful cooperative bank mergers in Bavaria are those that, first, involve partners with some overlap in their branch networks and, second, reduce these redundancies by closing branches in order to enhance efficiency. In the same vein, Hackethal (2004) show that the number of cooperatives is despite ongoing consolidation still the highest in Germany, while the size of their operations continues to be small. Our results here indicate that cooperative bank mergers might thus have eliminated some of the excess coverage in regions where fewer banks can provide customers more efficiently with banking

Table 11: Successful mergers and regional proximity

Years	Group	Municipality		County		Other	
One		*Savings*	*Coop's*	*Savings*	*Coop's*	*Savings*	*Coop's*
	I	38%	48%	42%	49%	46%	51%
	II	38%	28%	24%	29%	22%	27%
	III	8%	15%	20%	16%	15%	16%
	IV	17%	8%	14%	7%	17%	7%
	Total N	24	240	71	554	44	194
Three							
	I	35%	48%	47%	51%	43%	42%
	II	15%	21%	17%	22%	9%	27%
	III	35%	28%	23%	23%	30%	23%
	IV	15%	4%	13%	5%	17%	9%
	Total N	20	149	53	330	25	100
Six							
	I	54%	56%	64%	48%	50%	50%
	II	0%	15%	14%	25%	6%	19%
	III	46%	28%	17%	23%	25%	31%
	IV	0%	0%	6%	4%	19%	0%
	Total N	13	39	36	77	18	18

Note: Each bank treated separately after merger; including multiple acquirers once.

services. While we note that we have no information on branching overlap and (lack of) branch closure, the results indicate to us that mergers of regionally close cooperative banks are slightly different from savings bank mergers. More than for the latter, proximity may rather reflect the elimination of too dense banking (and branching) networks.

In sum, we find that regional proximity has different effects on mergers among savings and cooperative banks, respectively. With the exception of county mergers in the long run, savings banks are less frequently represented in group I compared to cooperative banks. In contrast, regional proximity among cooperative banks implies higher chances of a successful merger.

6   Conclusion

In this paper, we suggest a taxonomy as how to evaluate the merger wave of German savings and cooperative banks. We employ cost efficiency (CE) estimates obtained with stochastic frontier analysis to benchmark banks on the basis of their ability to efficiently convert inputs into outputs.

We define successful mergers as those which, first, yield CE levels that are above mean CE of non-merging banks and, second, exhibit larger changes between the evaluation and merger years as compared to the respective cohort of non-merging banks in the same period.

Our results indicate that approximately every second merger is a success according to our taxonomy. On average, cooperative bank mergers are more often a success than savings bank mergers. Importantly, the margin of success as indicated by mean CE level differences between merging and non-merging banks is very small - on the order of one to two percentage points only.

Successful mergers exhibit higher profitability than transactions resulting in

below benchmark changes of CE, i.e. groups II and III. However, we find for both banking groups that mergers in group IV, i.e. those that exhibit the highest change in CE but below benchmark CE levels, also exhibit high profitability. For savings banks, we find that both concentration and net interest margins are highest for group IV, too. We interpret these findings as indication that savings bank transactions might fail to yield CE improvements due to the absence of market discipline. In contrast, we find for cooperative banks that mean concentration and net interest margins remain similar across groups. Consequently, market power concerns do not seem to be an issue for cooperative bank mergers.

Investigation of three particularities of the German bank merger wave lead us to the following core conclusions. First, the potential for transferring skills from acquirers and targets is low as mean pre-merger CE differentials are minuscule. Those few transactions with high CE differentials do not result in sustained CE gains. Instead, we find that successful mergers exhibit no mean CE differentials.

Second, bank mergers where the acquirer is distressed are less often a success. In contrast, mergers involving distressed targets lead in the short and medium run relatively more often to successful mergers. Therefore, mergers where the less efficient institute is the target are preferable.

Third, regional proximity of merger partners has on balance detrimental CE effects for savings banks but positive CE effects for cooperative banks. Mergers of cooperative banks from the same municipality are in the medium and long run more often successful. In contrast, savings bank mergers involving partners from the same municipality are rarely a success and more often an outright failure.

Finally, an additional route for further research is to assess bank merger success on the basis of relative profit efficiency (PE). Because only few banks manage to be efficient in both dimensions, we hypothesise that a simultaneous classification based on PE and CE yields even fewer successful bank mergers.

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