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Bank consolidation, interest rates, and risk: A post-merger analysis based on loan-level data from the corporate sector*

Steffen Juranek[a], Øivind A. Nilsen[a], Simen A. Ulsaker[b]

[a] *NHH Norwegian School of Economics, Helleveien 30, 5045 Bergen, Norway*
[b] *Telenor Research, Snarøyveien 30, N-1360 Fornebu, Norway*

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Abstract

In this paper we analyse the bank merger between DnB and Gjensidige Bank in 2003, ranked by market share as number one and number three in the Norwegian bank market. Focusing on loans to firms, the merger led to an immediately higher concentration in the banking market, but this concentration decreased in the following years. Looking only at new loans, the increase in concentration was not greater in affected markets (markets where both merging parties were present) compared to unaffected markets. The interest rate tended to be lower in the affected markets relative to unaffected markets, but this relationship was weak and not statistically significant. The merger also seemed to affect the riskiness of loans only marginally. These weak effects could be the result of efficiency gains in the form of lower costs being pass-through to customers, and the increased market power (and consequently higher interest rates) cancelled each other out. The remedial measures imposed by the Norwegian Competition Authority on the two merging parties are also likely to explain some of the modest effects of the merger. The weak effects are largely coincident with international literature showing the effects of mergers and acquisitions in the banking sector to be modest.

JEL classification: G21, L41, D53

Keywords: banking; local competition; risk taking; firm behaviour

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Email addresses: Steffen.Juranek@nhh.no (Steffen Juranek), Oivind.Nilsen@nhh.no (Øivind A. Nilsen), simen.ulsaker@telenor.com (Simen A. Ulsaker)

1. Introduction

Mergers and acquisitions are observed in most industries all over the world. The banking sector is no exception (see for instance, Calomiris and Karceski (2000), and Amel et al., 2004). From a regulatory point of view this consolidations raises concerns regarding a decrease of competition, and a consequential harm of costumers through higher prices and restricted access to loans. However, in addition to this antitrust perspective, there is a concern that less competition may decrease financial stability. In the aftermath of the 2008/2009 financial crisis, this relationship received particular attention, as highlighted by the European Commission's expert group (Liikanen et al., 2012), the Bank of England (Bank of England, 2015), and also an expert group reporting to the German Ministry of Education and Research (Gill et al., 2013).

The relationship between competition and bank stability is empirically not well understood, yet. Two opposing effects impose a challenge for empirical studies (see Vives 2016, for a synthesis of the literature). First, the theoretical literature hypothesizes that the erosion of profit margins due to an increase of competition creates incentives for banks to take greater risk. This competition-fragility hypotheses argues that reduced profit margins decrease a bank's charter value, implying that a bank has less to lose if its charter is revoked (see Allen and Gale, 2004; Carletti and Hartmann, 2003; Demsetz et al. 1996; and Keeley, 1990 for more details) Second, however, competition decreases the interest rates that borrowers are facing. Therefore, competition may not only improve the average quality of loan applicants but also decrease their risk-taking incentives (Caminal and Matutes, 2002; Boyd and De Nicolo, 2005)

A number of empirical within-country studies find evidence for the charter value hypothesis by analyzing the relationship of competition measures and bank risk measures. Keeley (1990) circumvents competition and uses Tobin's q to measure charter value and finds a positive relationship with capital to asset ratios in the US. Jimenez et al. (2013) relate competition measures (Lerner index and concentration measures) to the ratio of non-performing loans for Spanish banks, and find a u-shape of the relationship as predicted by Martinez-Miera and Repullo (2010). In contrast, Goetz (2018), who relies on

differences in banking deregulation in the US to measure the contestability of markets, finds that the increase in market contestability significantly improves bank stability. For Norway, Canta et al. (2020) using a cut of the same data as used in the present study, find that more competition leads to more risk taking, lower interest rates and higher loan volumes. They also find that smaller firms are more sensitive to changes in bank competition compared than larger and more mature firms. Also Juelsrud and Wold (2020) find that smaller firms are more sensitive to changes in banks' capital requirements.[1]

Evidence from cross-country studies also leads towards that direction. Uhde and Heimeshoff (2009), using bank level data from the EU-25 find that national banking market concentration has a negative impact on banks' financial soundness. Berger et al. (2009) show that banks' loan portfolio risk increases in market power. However, because banks hold also more equity under those circumstances, the overall risk decreases. Boyd, De Nicolo, and Loukoianova (2009) concentrate on systemic shocks and find that more concentration leads to a higher probability of a systemic shock. In contrast, Schaek et al. (2009) find that concentration is associated with a higher probability of a crisis. Furthermore, Beck et al. (2006) show that fewer regulatory restrictions, indicating a higher level of competition, are associated with a lower systemic risk. However, they also find that systemic crises are less likely in concentrated banking systems. This observation already points towards the discussion whether concentration is a good proxy for competition and market power, and whether the typical proxies for competition perform well in the banking market (see, e.g., Shaffer and Spierdijk, 2017).

What is common to most of the studies is that they relate competition to equilibrium (ex-post) bank or bank system risk measures, thereby trying to establish whether the risk-taking incentives of banks dominate the risk-taking incentives of the borrowers in the analyzed setting. However, the studies do not differentiate between the two channels. That would require an isolation of the bank behavior in terms of risk-taking from the borrower behavior.

[1]Herpfer et al. (2020), another study of Norwegian corporate borrowers, find that lower distance between borrowers and banks increases the likelihood of initiating a new banking relationship.

We implement this background into our post-merger analysis of the merger between DNB and Gjensidige in late 2003. Particularly, we analyze the effect of the merger on the interest rate and on banks' risk-taking. With the former, we perform a classical post-merger analysis on the price, and analyze a bank-specific angle with the latter by analyzing changes in the the loan composition.

Our analysis relies on the the full population of corporate loans in Norway. We use regional variation of the effect of the merger. We define affected regional markets as markets in which both banks are present at the time of the merger. We follow the regions over time and implement a difference-in-differences approach to identify potential effects of the decreasing competition in regional markets. Information of both banks and firms, together with information about each loan, are based on public registers which are audited by authorized auditors and tax authorities and are therefore of high quality.

We find that the merger had no strong effect on the competitive situation in the affected markets. Even though the concentration of the stock of loans obviously increased, there was no such effect on the concentration of new loans. Furthermore, in line with that observation, we cannot identify a causal effect of the merger on neither the interest rate of new loans, nor the riskiness of the loan-takers. Potential explanations for these observations are effective strings attached to the merger by the competition authority, an offset of an increase of market power and efficiency gains, or that the merger took place in the markets that were most prone to entry, i.e., the most contested ones.[2]

The rest of this paper is organized as follows. In Section 2, we provide institutional details about the Norwegian banking industry. Section 3 describes the various data sources and the final dataset. The empirical results are presented in Section 4. Finally, Section 5 concludes.

[2]See Calomiris (1999) for an interesting discussion about econometric pitfalls when analysing efficiency gains related to bank mergers.

2. Background of the merger

2.1. The Norwegian bank market

Compared to other European countries, the Norwegian banking sector is small in terms of total assets, with total assets amounting to only two times the GDP. This is a relative small multiplier compared to Sweden, France or the Netherlands where totals assets are higher than three times GDP. [3] One explanation is that Norwegian banks mainly focus on the domestic market. The main focus of Norwegian banks are private and corporate loans, as reflected by the fact that loans account for the majority of assets held by the banks (Norges Bank, 2019). In terms of regulation, the Basel accords apply also to the Norwegian banking industry.

Today the Norwegian banking sector consists of 26 commercial banks and 100 saving banks (Norges Bank, 2019). The main distinction between the two banking types is ownership structure, and not which services they offer.[4] The saving banks are mainly small, but have formed extensive alliances, with the aim of sharing services unrelated to the banking activity, such as common advertising campaigns. Foreign owned bank have had the opportunity to operate in Norway since 1985. The three largest foreign-owned banks operating in Norway (Nordea, Handelsbanken, and Danske Bank) have a combined market share in total lending of roughly 20% and close to 30% in the business segment.

The number of bank branches has declined drastically over the last decades, and since the beginning of 1990, the number has more than halved to slightly less than 900 branches in 2018 (Finans Norge; https://www.finansnorge.no/statistikk/bank/antall-ekspedisjonssteder/). The decrease in the number of branches are driven among other things by changes in consumer behaviour and new technological developments such as internet banking (see among others; Aamo. 2016, p. 80-81).

[3] For a more detailed description, as well as an analysis of the market evolution, see Norges Bank, (2017).

[4] Saving banks have historically focused their operations on personal banking in their respective local communities, whereas commercial banks have been more targeted towards the business segment. In 2002 the strict regulations of ownership and external capital raising of savings banks was removed, which has made the distinction between commercial and saving banks is not very clear.

2.2. The merging parties, and the remedies defined by the Competition Authorities

The first public notice about the merger between DnB and Gjensidige Nor came 18 March 2003 from the merging parties.[5]

Just before the merger, DnB was ranked as number one and Gjensidige Nor as number three in terms of market shares, 27 % and 10 % respectively. At that time DnB had 125 brances, and Gjensidige Nor 137 branches. The main worries of the Competition Authority were related to the importance of proximity and relationship banking. The decision document of the Norwegian Competition Authority shows quite clearly (all the translations are our own). It first refers to the importance of relationship banking:

"(...) the relationship with customers is based on the personal contact between the account manager in the bank and the customer. According to the notice, it therefore appears that most bank customers choose to take out mortgages in the local bank branch, although there may be slightly worse interest rates there than in a bank with no local affiliation (...)". (p. 5 in the decision document)

Then, the document expresses worries about a decrease of competition:

"(. . .) the concentration in the markets increases significantly, that the two merging parties get market power in a number of markets, and that competition will be significantly limited (...)", (p. 5 in the decision document)

The document highlights the increase of market power of the two merging banks:

". . . in the markets for lending to retail customers and to small and medium-sized enterprises, individual and collective pension schemes, payment services to individuals and companies, funding (lending to other banks), leasing and factoring. The Authority thinks that the two companies in most of these markets together would have a market share of over 50 percent...". (p. 5 in the decision document)

The Authority trades off these downsides with potential benefits and states in its conclusion:

"(...)The Norwegian Competition Authority's conclusion is that the merger between DnB and Gjensidige NOR leads to a significant restriction of competition in several markets. However, the Authority sees that the merger as well can provide some socio-economic benefits as a result of cost savings for the parties. These effects must be, according to the Competition Act, weighed against each other. After such a trade-off it is the Authority's view that the merger as a whole will result in a socio-economic loss." (p. 91 in the decision document)

[5]The infomation in this sub-section is taken from official decision document about the merger (The Norwegian Competition Authority (2007))

Based on this evaluation, the merger was only accepted by the Authorities with the inclusion of remedies to counteract the anti-competitive effects of the merger. Particularly, the merging partners were required to close 53 branches (should be seen in relation to the 125 and 137 branches of the merging parties, and the total number of branches in 2003; 1376 (Source: Bankplassregisteret)). Furthermore, it was required that:

"(...)DnB's and Gjensidige NOR's bank branches and business centers that are to be closed down must be allowed to be taken over by potential competitors. A competitor who establishes itself in the closed down bank branch will therefore have increased opportunities to compete for existing customers in the branch or center and hire staff with local knowledge. The restriction of competition is further alleviated by DnB NOR being obliged to refrain from offering particularly favorable terms to existing loan customers who have been associated with closed branches and centers. Furthermore, DnB NOR must in writing, directly inform existing customers about which bank will take over the bank premises(...)". (p. 91 in the decision document)

Based on the assumption that the efficiency gains would outweighed the negative effects the merger was approved by the Norwegian Competition Authority 7 November, 2003.

2.3. Characteristics of Norwegian Firms

There were approximately 430 000 firms in Norway in the beginning of 2004, the subsequent year of the merger. Table 1 shows the size distribution of firms in Norway (Source: Statistics Norway, Table 372, 2004)

Employees	**0**	**1-4**	**5-9**	**10-19**	**20-49**	**50-99**	**100+**	**total**
Number of companies	266573	86048	34323	22168	13737	4399	2662	429910

Table 1: Firm size distribution 2004.

We see that small and medium-sized firms dominate the size distribution of Norwegian businesses. Most businesses have no employees (i.e. self-employed or inactive firms), and very few firms with more than 100 employees. The geographical location of firms shows the highest concentration of firms in and around Oslo, which should not come as a surprise given that this is the capital and the biggest city in Norway. In this region we also find the greatest presence of large corporations. In the later table 4 we show some more details about the industry composition.

3. Data

3.1. Data sources

We are relying on two main data sources. First, we use the population of loans of Norwegian firms from Norwegian banks. The data is provided by from the Norwegian Tax Administration.[6] For each loan we know the size of the loan as of December 31 of each year as well as the interest payments during the year. An advantage of these data are that they are collected for public registers and have universal coverage. Furthermore, they are scrutinised by auditing firms and the Tax Administration before being made available for aggregate public statistics and research. Hence, the data are in general of a high quality. Furthermore, it identifies the bank and the name (and an identifier) of the loan taker.

Second, we use balance sheet information provided by the financial statement database maintained by the Centre for Applied Research (SNF) at the NHH - Norwegian School of Economics. The database includes the population of compulsory annual financial statements (Brønnøysundregistrene). Also these data are collected for public registering and have universal coverage. Furthermore, they are also of high quality since they are scrutinised by auditing firms and the Tax Administration before release. The database also includes addresses and industry classification codes. We use the balance sheet information to construct our risk indicators. In our analysis, we mainly focus on the ingredients of the Altman z-score (working capital/assets, retained earnings/assets, return on assets, leverage, asset turnover) plus EBITDA/liabilities and current assets/liabilities).[7] Finally, we use the NIBOR (Norwegian Inter Bank Offered Rate) published by Norges Bank (the Norwegian Central Bank) to calculate the risk-premium, or the net interest rate, of the loans. [8]

[6]These data are collected by the tax authority since interest payments are deductible in Norway.

[7]To the best of our knowledge, our analysis is one of the few to address the question of competition in the banking sector and the firms with such a rich dataset linking the whole population of banks and firms, and details about the loans.

[8]We have cleaned the data, removing extreme values of the various ratio-variables using a winsorizing approach.

3.2. Defining affected markets

We differentiate between affected markets in which both merging banks where present before the merger, and unaffected markets, in which none or only one of the two banks was present. Norway is a long and narrow country, with a very long coastline. Administratively it is divided into counties and municipalities. For local bank market definition, we rely on the 46 labor market areas defined by Statistics Norway (see Bhuller, 2009).[9] The division into economic regions is based on the commuting distance between the center municipality and the surrounding municipalities. This is done to reflect actual workforce-flow between the municipalities. That means that a group of municipalities might be grouped together even if they are located in different counties. One would think that these geographical labor-markets/commuting areas are relevant for other services and activities, for instance loan access, as these areas might reflect common culture and thinking. Such arguments are supported by findings in the literature which indicate that banks prefer to form relationships with geographically close customers (see for instance Guiso et al., 2004; Degryse and Ongena, 2005, and Huber, 2018). 17 of these markets are directly affected by the merger. Table 2 shows the 46 different local markets.

An underlying assumption in our analysis is that only local markets where the merging banks have branch offices are affected by the merger. Thus, it is important to have information about the location of the bank branches. Information about the addresses of the bank branches is based on information from Finans Norge (Finance Norway), the financial sector's industry organization, and collected in the so-called Bank Branch Location Register (Norw.; Bankplassregisteret). The information in this register is based on a questionnaire sent to all banks located in Norway. Responses are voluntarily. For our analysis, missing information in the Bank Branch Location Register is completed with data directly collected from the banks themselves (for instance from Nordea for some of the last sample years), or by manually using address information of the bank branches.

[9]In 2009, the year used to define local markets in tis study, Norway consisted of counties 19 and 430 municipalities.

Market	Affected	Market	Affected
11 South-Østfold	x	51 Sunnfjord	
12 Oslo	x	52 Sognefjord	
13 Vestfold	x	53 Nordfjord	
14 Kongsberg	x	54 Søndre Sunnmøre	
15 Hallingdal		55 Ålesund	
21 Valdres		56 Molde	
22 Gudbrandsdalen		57 Nordmøre	
23 Lillehammer	x	58 Kristiansund	
24 Gjøvik	x	61 Trondheim	x
25 Hamar	x	62 Midt-Trøndelag	x
26 Kongsvinger		63 Namsos	x
27 Elverum		64 Ytre Helgeland	
28 Tynset/Røros		65 Indre Helgeland	
31 Northwest-Telemark		71 Bodø	x
32 East-Telemark	x	72 Narvik	
33 South-Telemark	x	73 Vesterålen	
34 Arendal		74 Lofoten	
35 Kristiansand		75 Harstad	
36 Lister		76 Midt-Troms	
41 Stavanger		77 Tromsø	x
42 Haugesund		81 Alta	x
43 Sunnhordland		82 Hammerfest	
44 Bergen	x	83 Vadsø	x

Table 2: Affected markets

4. Results

In order to focus on the competition affect, we concentrate in this analysis on new loans. For new loans, we expect to see a direct effect of the merger. In contrast, the stock of loans involves a mechanical effect if there are search costs and/or switching costs. Search costs are related to finding a better offer given that a merger might lead to increased interests rates and worsened loan conditions in general. Switching costs include both fixed fees and costs to sign a new loan, and that banks may hesitate to change the interest rate for previously established loans timely after the merger. Hence, we concentrate on the loan information from the year of establishment. We observe 96619 newly established loans from 47 772 distinct companies between 2000 and 2007.

4.1. The effect of the merger on competition/concentration

We start out looking at the concentration, measured by the Herfindahl-Hirschman Index (HHI).[10] Figure 1 shows the development of the HHI of new loans in in the local markets, differentiated into affected and control markets.

Figure 1: Development of the HHI over time, based on new loans

The figure based on new loans indicates that there is an increase in both the affected markets and in the control markets before the merger. In 2002, the year prior to the merger, the concentration in the affected market is marginally smaller than in the control markets. In 2004, the concentration in the affected markets is now higher than in the control markets. This is not what one would expect if the interest rate would increase and supply of loans would decrease following from anticompetitive effects of the merger. Admittedly we observe when including both existing and new loans a strong increase of the HHI in the affected markets. However, this is more or less due to a mechanical effect when calculating the concentration from one player instead of two individual players.

In order to analyze the evolvement in concentration, we run a difference-in-difference model on the geographical market level with the mean HHI of new loans as the dependent variable. We use the time period from 2000-2007, where the merger periods start with 2004. Specifically, we estimate at the geographical market level the following specification

$$\text{HHI}_{jt} = \alpha + \nu_j + \gamma_t + \beta \cdot \text{after merger}_t \cdot \text{affected market}_j + \epsilon_{jt} \tag{1}$$

[10]The Herfindahl-Hirschman Index (HHI) is commonly used as a measure of competition. See for instance Boone (2008), Shaffer and Spierdijk (2017) and Vives (2016, p 88-89) for discussions about pros and cons of well-established competition measures.

where j denotes the related geographical market in year t. We are especially interested in the β -coefficient as this will pick up the effect of the merger since it reflect the difference in the affected markets relative to the control markets, a difference that was non-existing before the merger. Thus, the additional difference is supposed to stem from the actual merger.

	(1) HHI	(2) HHI <1bn	(3) HHI <100mn	(4) HHI <10mn
affected×after	0.015	0.005	0.009	0.007
	(0.019)	(0.018)	(0.017)	(0.014)
Constant	0.306***	0.303***	0.291***	0.286***
	(0.006)	(0.005)	(0.005)	(0.004)
Local market fixed effects	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes
Observations	368	368	368	368

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Effect of the merger on HHI, based on new loans; total and by loan sizes

Table 3 confirms the observation from the figure. We repeated the analysis excluding loans larger than 1bn, 100mn and 10mn NOK. The results are presented in columns 2-4. The conclusion remains the same.[11]

4.2. The effect of the merger on new loans

We focus from now on loan level information. Table 4 shows the distribution of loan observations across industries, and the number of distinct companies. We use the Standard Industrial Classification SN2002 used by Statistics Norway until 2007, splitting into 12 main industries. Services and Real Estate, and Wholesale and Retail account together for about 60 percent of the observations. This is not surprising given that the Norwegian business landscape is dominated by small firms.

Table 5 summarizes information on loan characteristics including the risk-measures of the loan-taker. The average interest rate in the sample period equals 7.0 percent, and

[11]When including old loans the HHI increases significantly in the affected markets, showing the mechanical effect of the merger.

	Loans	Share	Firms	Share
1 Primary industries	2671	0.028	1307	0.027
2 Oil and Gas	127	0.000	53	0.001
3 Manufacturing industries	11423	0.118	5313	0.111
4 Constructions and Energy	11693	0.121	5291	0.111
5 Wholesale and Retail	25351	0.262	13557	0.284
6 Shipping	1354	0.014	494	0.010
7 Transport and Tourism	5161	0.053	2081	0.044
8 Finance and Insurance	1211	0.013	430	0.009
9 Services, Real Estate	32260	0.334	16174	0.339
10 Health and Social Services	2144	0.022	1200	0.025
11 Culture and Media	2180	0.023	1230	0.026
12 IT and Telecommunication	1044	0.011	642	0.013

Table 4: Loans- and firms shares, by industry

subtracted by the NIBOR 2.6 percent. The average loan size equals around 7mn NOK. However, this distribution is heavily skewed as the median is much smaller than the mean. Furthermore, we observe on average an return on assets of 7.6 percent, and the companies finance 81.8 percent by debt.

	Obs.	Mean	SD
Interest rate	96619	0.070	0.039
Interest rate (net)	96619	0.026	0.027
Loan amount	96619	7099643	70290872
Return on assets	96619	0.076	0.153
Leverage	96619	0.818	0.278
EBITDA / Liabilities	96619	0.197	0.344
Current assets / liabilities	94977	1.524	1.854
Asset turnover	96619	1.640	1.754
Working capital / assets	96619	0.055	0.282
Retained earnings / assets	96619	0.049	0.306

Table 5: Summary statistics, firm-level information for firms with new loans

Investigating the development of the mean interest rate in the affected and non-affected markets, Figure 2 shows that the mean interest rate in affected markets mirrors the mean interest rate in the control market. The only exception is year 2002 where the mean interest rate is somewhat higher in the affected markets. It is hard to see that this difference should be related to the merger between DnB and Gjensidige NOR the subsequent year.

Turning to the evolvement of the risk measures, we observe some differences in the

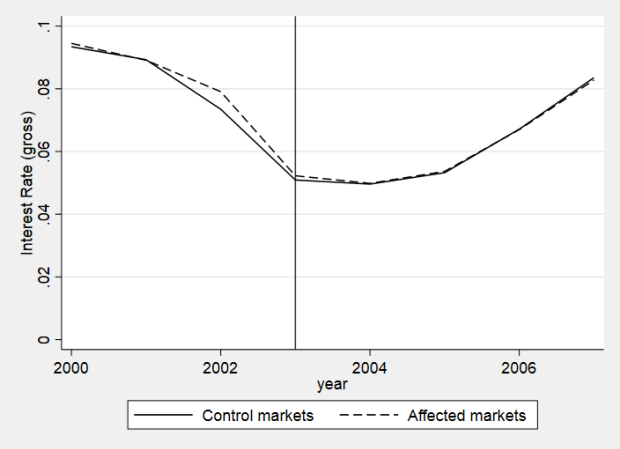

Figure 2: Interest rate development over time

development of the risk measures in the affected and control markets in Figure 3. As for the interest rates in Figure 2, we do not observe a consistent effect related to the merger on any of the seven risk measures. Thus, it is hard to state that the merger has significantly affected the risk behavior of the merging banks.

In order to analyze some of the observed but still marginal differences in interest rate and risk measures further, we utilize a difference-in-difference regression equation framework. This framework allows us to address the statistical significance of potential differences. More specifically, we estimate the following specifications

$$\mathrm{y}_{ijt} = \alpha + \nu_j + \gamma_t + \beta \cdot \text{after merger}_t \cdot \text{affected market}_j + \epsilon_{ijt}, \tag{2}$$

where i denotes individual loans, j the related geographical market in year t, and y_{ijt} either the related interest rate or risk measure.

We observe in Table 6 that there is no statistically effect on any of the risk measures reported in Columns (2)-(8) i.e. that the β or $Affected \times After$ are all statistically insignificant. The regression supports the impression from the figures that there seems to be no effect on the risk taking in markets affected by the merger, i.e., in markets that experience a decrease in competitive pressure.

Note however, we observe that the interest rate, Column (1) is lower in affected markets after the merger. Before discussing interpretations of this observation, we analyze this effect further statistically. In order to establish a causal effect of the merger, we

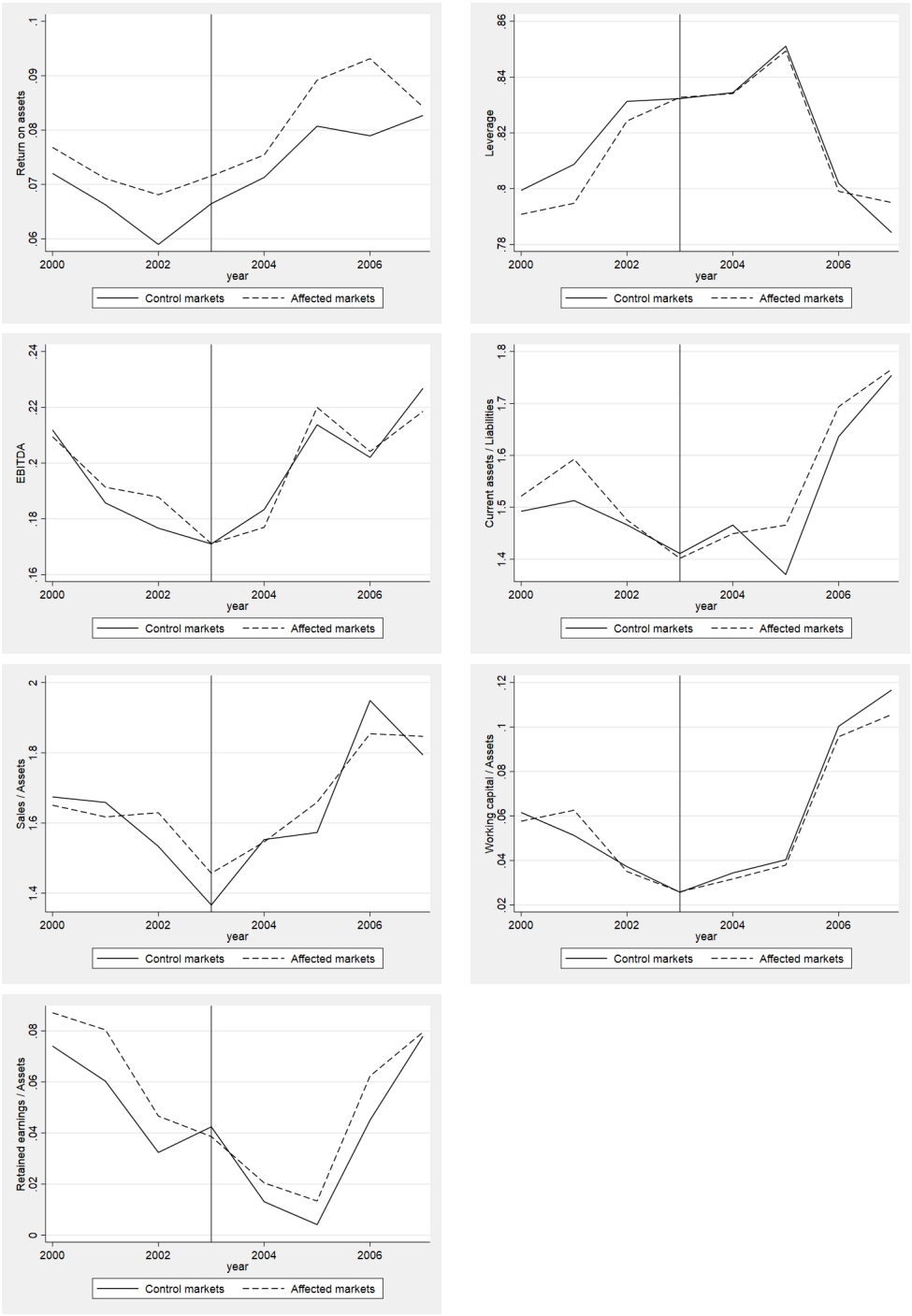

Figure 3: Risk measures over time

	(1) interest rate	(2) return on assets	(3) leverage	(4) EBITDA/ liabilities	(5) current ass./ liabilities	(6) sales/ assets	(7) working cap./ assets	(8) retained earn./ assets
Affected ×	-0.002**	0.001	0.010	-0.005	0.015	-0.018	-0.008	-0.004
After	(0.001)	(0.0032)	(0.007)	(0.006)	(0.025)	(0.038)	(0.006)	(0.006)
Constant	0.088***	0.045***	0.802***	0.135***	1.893***	0.235***	0.006	0.055***
	(0.001)	(0.006)	(0.018)	(0.011)	(0.072)	(0.053)	(0.011)	(0.014)
Observations	96619	96619	96619	96619	94977	96619	96619	96619
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm size FE are implemented by 10 dummy variables for different spans of firm sizes in terms of number of employees.

Table 6: Regression results; diff-in-diff model (see eq. (2))

require common trends in the pre-merger periods. That means, there should be no statistically significant differences between the affected markets and the control markets before the merger. We furthermore require a decline in the post-merger periods. Therefore, we analyze the leads and lags by interacting $Affected$ with a dummy variable for each individual years, except the last pre-merger year 2003, which serves as the baseline. Results are presented in Table 7.

	(1) interest rate	(2) return on assets	(3) leverage	(4) EBITDA/ liabilities	(5) current ass./ liabilities	(6) sales/ assets	(7) working cap./ assets	(8) retained earn./ assets
Affected market ×	0.000	0.000	-0.007	0.001	0.016	-0.025	-0.001	0.018***
y2000	(0.001)	(0.004)	(0.008)	(0.008)	(0.056)	(0.047)	(0.008)	(0.006)
Affected market ×	-0.001	0.001	-0.011	0.008	0.067	-0.063	0.011*	0.021*
y2001	(0.001)	(0.005)	(0.009)	(0.010)	(0.045)	(0.038)	(0.006)	(0.011)
Affected market ×	0.004**	0.004	-0.009	0.010	0.021	-0.005	-0.002	0.021**
y2002	(0.001)	(0.004)	(0.010)	(0.011)	(0.050)	(0.053)	(0.0112)	(0.009)
Affected market ×	-0.001*	0.000	0.000	-0.003	-0.017	-0.070*	-0.004	0.011
y2004	(0.001)	(0.004)	(0.009)	(0.010)	(0.0477)	(0.035)	(0.008)	(0.007)
Affected market ×	-0.001	0.003	0.000	0.006	0.101*	-0.011	-0.004	0.010
y2005	(0.001)	(0.005)	(0.010)	(0.009)	(0.051)	(0.054)	(0.009)	(0.009)
Affected market ×	-0.001	0.009*	0.002	0.002	0.047	-0.080*	-0.002	0.017*
y2006	(0.001)	(0.005)	(0.010)	(0.010)	(0.050)	(0.040)	(0.007)	(0.009)
Affected market ×	-0.002**	-0.003	0.013	-0.007	0.014	-0.013	-0.012*	0.003
y2007	(0.001)	(0.005)	(0.009)	(0.012)	(0.070)	(0.050)	(0.007)	(0.010)
Constant	0.088***	0.045***	0.809***	0.133***	1.873***	0.260***	0.005	0.038**
	(0.002)	(0.007)	(0.021)	(0.013)	(0.083)	(0.069)	(0.012)	(0.016)
Observations	96619	96619	96619	96619	94977	96619	96619	96619
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm size FE are implemented by 10 dummy variables for different spans of firm sizes in terms of number of emplozees.

Table 7: Leads and lag analysis; differences relative to 2003

It turns out that year 2002 is different from the other years, in the sense, that the interest rate is significantly higher in the affected markets than in the unaffected markets and in the other years. This result is confirmed by Table 11 in the Appendix where we leave out year 2002. Without the year 2002 there is no statistically significant difference between the affected markets and the unaffected markets. Given that the difference in Table 7 occurs *before* the merger, these regression results together with leads and lags figure, Figure 2, leads us to conclude that the merger did not have a causal effect on the interest rate in the affected markets.

We can already exclude one potential explanation for the zero effect of the merger on the interest rate - the loan composition or the risk profiles of the costumers. In principle, less risk-taking by the banks, decreasing the average risk premium, could offset an interest rate increasing competition effect. However, in our analysis, we do not find an effect of the merger on the loan risk composition as we observe no consistent effect of the merger on any of the risk variables.

Hence, we are left with four more potential explanations for the *null* findings related to the merger. First, there is heterogeneity in how far markets are affected by the merger because the merging parties' market shares differ. Second, an efficiency enhancing effect may offset the competition effect. Third, the merger were only of minor importance for the markets, or, fourth, the merger was insofar endogenous that the affected markets are those that are increasingly prone to competitive pressure from new entrants and foreign banks in particular. In the following, we investigate further whether our result can be explained by the first or the second argument.

4.2.1. Heterogenous treatment effects

One reason for not observing an effect of the merger could be that we treat all affected markets as homogenous. However, the market shares of the two merging banks differ across the geographical markets. Therefore, we calculate for each market by how much the HHI would have increased in the last pre-merger year (2002) with a merger of the parties (ΔHHI). We consider this measure to be superior over the sum of market shares

as we also observe markets where only one of the banks has a strong position.[12] Then, we use this measure to capture heterogeneous treatment intensity in our model.

However, we observe a very similar picture. The difference-in-differences analyses reported in Table 8 reveal again a lower interest rate in the markets that are more affected by the merger (see Column (1)). Furthermore, we observe that the companies getting a loan tend to be of higher risk; leverage is higher, working capital over assets and retained earnings over assets are lower (Columns (3), (7), and (8), respectively). However, after consulting the leads and lags again only in Table 9 the effect on leverage has the potential to be reasonably causally linked to the merger.

Note that a change of the loan composition or changes in risk behavior can still not explain the zero effect on the interest rate as that would require a decreasing leverage. This is because only a decreased interest rate due to a lower leverage can compensate for an increasing interest rate due to an increase of market power. In Column (3) of Table 8, however, we observe the opposite. In markets with a larger increase in concentration we actually observe *reduced* leverage. Therefore, we are confident to rule out the heterogeneity of the merger effect as an explanation for the zero effect on the interest rate.

	(1) interest rate	(2) return on assets	(3) leverage	(4) EBITDA/ liabilities	(5) current ass./ liabilities	(6) sales/ assets	(7) working cap./ assets	(8) retained earn./ assets
ΔHHI $\times$	-0.009**	0.002	0.098***	-0.038	-0.010	0.263	-0.072**	-0.061**
After	(0.003)	(0.004)	(0.028)	(0.045)	(0.122)	(0.205)	(0.027)	(0.0242)
Constant	0.088***	0.046***	0.801***	0.135***	1.899***	0.224***	0.006	0.056***
	(0.001)	(0.006)	(0.017)	(0.011)	(0.072)	(0.055)	(0.010)	(0.014)
Observations	96619	96619	96619	96619	94977	96619	96619	96619
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm size FE are implemented by 10 dummy variables for different spans of firm sizes in terms of number of emplozees.

Table 8: Regression results - HHI change

4.2.2. Efficiency effects and inside vs outside banks

The second potential explanation for the zero effect is that a decreasing local efficiency effect cancels out the competition effect. In order, to check for the existence of a local

[12]Our results are, however, robust to using the sum of market shares.

	(1) interest rate	(2) return on assets	(3) leverage	(4) EBITDA/ liabilities	(5) current ass./ liabilities	(6) sales/ assets	(7) working cap./ assets	(8) retained earn./ assets
ΔHHI ×	0.000	0.001	-0.001	-0.000	-0.012	0.026	-0.001	0.008
y2000	(0.001)	(0.003)	(0.008)	(0.008)	(0.046)	(0.038)	(0.006)	(0.007)
ΔHHI ×	-0.010**	0.043**	-0.063	0.059	0.239	0.049	0.064**	0.108*
y2001	(0.004)	(0.020)	(0.040)	(0.061)	(0.153)	(0.148)	(0.026)	(0.058)
ΔHHI ×	0.022***	0.053***	0.032	0.075	0.223	-0.002	0.023	0.057
y2002	(0.008)	(0.016)	(0.072)	(0.048)	(0.217)	(0.257)	(0.060)	(0.070)
ΔHHI ×	-0.003	-0.009	0.015	-0.050	-0.050	-0.198	-0.004	0.013
y2004	(0.004)	(0.026)	(0.033)	(0.048)	(0.271)	(0.151)	(0.030)	(0.032)
ΔHHI ×	-0.005	0.036	0.112***	0.004	0.2645	0.726***	-0.059*	-0.048
y2005	(0.004)	(0.028)	(0.042)	(0.071)	(0.28241)	(0.205)	(0.034)	(0.041)
ΔHHI ×	-0.010**	0.066**	0.084**	0.037	-0.238	0.039	-0.043*	0.007
y2006	(0.004)	(0.025)	(0.039)	(0.067)	(0.201)	(0.171)	(0.026)	(0.042)
ΔHHI ×	-0.008	0.004	0.130***	-0.024	-0.083	0.454	-0.100***	-0.012
y2007	(0.005)	(0.033)	(0.040)	(0.079)	(0.300)	(0.275)	(0.031)	(0.055)
Constant	0.088***	0.044***	0.803***	0.133***	1.902***	0.206***	0.006	0.048***
	(0.002)	(0.007)	(0.017)	(0.013)	(0.076)	(0.063)	(0.010)	(0.013)
Observations	96619	96619	96619	96619	94977	96619	96619	96619
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm size FE are implemented by 10 dummy variables for different spans of firm sizes in terms of number of emplozees.

Table 9: Leads and lags, HHI change, differences relative to 2003

efficiency effect, we differentiate between loans by the merging banks and by the competitors. If the merger lead to efficiency increases, the interest rate of the merging banks should decrease stronger (or increase less) than the interest rates of the competitors. Both type of banks are directly affected by the change of the competitive situation but only the merging banks can benefit from an efficiency effect. Therefore, we use a triple interaction term $inside\,bank \times Affected \times After$ in our model, where $inside\,bank$ is a dummy variable equalling one if a loan is granted by either Gjensidige NOR or DnB.

The results in Table 10 shows no difference between the merging banks and their competitors. Therefore, we find no evidence for the existence of local efficiency effects explanation.

4.2.3. Other potential explanations for the zero findings

As already mentioned, one potential explanation for the zero finding is that the merger actually were only of minor importance for the markets, i.e. that the anticompetitive effect was rather small. In the already shown Figure 1, the HHI went from 0.31 to 0.345 in the

	(1) interest rate	(2) return on assets	(3) leverage	(4) EBITDA/ liabilities	(5) current ass./ liabilities	(6) sales/ assets	(7) working cap./ assets	(8) retained earn./ assets
Affected ×	-0.002**	0.003	0.009	0.001	0.019	0.023	-0.002	0.001
After	(0.001)	(0.004)	(0.007)	(0.008)	(0.024)	(0.056)	(0.005)	(0.0071)
inside bank	-0.003	-0.002	-0.030**	-0.011	-0.043	-0.114***	-0.000	0.023*
	(0.002)	(0.004)	(0.015)	(0.010)	(0.067)	(0.0364)	(0.014)	(0.013)
inside bank ×	0.001	0.005	0.006	0.011	0.034	0.138***	0.010	0.002
Affected	(0.002)	(0.004)	(0.016)	(0.012)	(0.071)	(0.046)	(0.015)	(0.014)
inside bank ×	0.001	0.001	0.003	0.009	0.077	-0.011	-0.001	0.0029
After	(0.001)	(0.004)	(0.011)	(0.011)	(0.078)	(0.036)	(0.010)	(0.010)
inside bank ×	-0.002	-0.007	-0.007	-0.026**	-0.047	-0.152**	-0.018	-0.011
Affected × After	(0.001)	(0.005)	(0.013)	(0.012)	(0.079)	(0.071)	(0.011)	(0.012)
Constant	0.089***	0.044***	0.810***	0.135***	1.896***	0.227***	0.002	0.046***
	(0.001)	(0.006)	(0.017)	(0.011)	(0.070)	(0.053)	(0.011)	(0.014)
Observations	96619	96619	96619	96619	94977	96619	96619	96619
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Firm size FE are implemented by 10 dummy variables for different spans of firm sizes in terms of number of emplozees.

Table 10: Regression results - insider/outsider

affect market (3.5 percentage points increase), perhaps (or evidently) not enough to rock the boat. An alternative explanation is that the merger was insofar endogenous in the sense that it came as a response to increasingly to competitive pressure from new entrants and foreign banks. Even though aggregate statistics show only a few new entrants in the Norwegian bank market subsequent to the merger, the perceived threat could be enough to discipline the existing players. Furthermore, the Norwegian Competition Authority enforced closing of 53 branches in affected markets, to refrain the merged bank from offering particularly favourable terms to existing loan customers, and to inform the same customers if branches are transferred to another bank. It is hard to know exactly to what extent these remedies reduced potential anticompetive effects the merger as the contrafactual outcome is impossible to observe.

5. Concluding remarks

It is of great interest to analyze the effects of a merger between two of the most significant players in the financial market, as competition and risk behavior, and therefore stability is of great importance not only for the affected parties and stakeholders, but also for the real activity, stability and growth of the whole economy. In this paper we perform a

post-merger analysis of the 2003-merger in the Norwegian bank market of the number one and number three when it comes to market shares. Despite increased concentration, it is hard to find any evidence that this merger actually lead to an increase in the interest rate charged the firms. Also the share of the corporate market controlled by the merging parties seems to very stable. Thus, the merger did not lead to a great reallocation of customers from the merging parties to the non-merging parties. When analyzing the various risk-measured based on balance-sheet and accounting information of the firms, the effects are rather modest.

Even though the effects of the analyzed merger are rather modest, cautious and continuous looks at the financial markets both by the competition authorities and the financial regulators are highly necessary. The costs of dampened competition, both for the households and firms, and the society as a whole by misallocation of financial resources might be significant. On the other, a potential collapse in the financial sector will also be serious to many stakeholders. As there are both efficiency gains and potential negative marked power effects of mergers, each merger must be analyzed individually and with great care. Furthermore, the remedies against the potential market power increase must be functional and proportional. In most cases it is hard to know the contrafactual outcome if no anti-competitive measures would have been imposed, also for the merger analyzed in this study.

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Appendix

	(1) interest rate	(2) Return on assets	(3) Leverage	(4) EBITDA/ Liabilities	(5) current assets liabilities	(6) sales/ assets	(7) working capital/ assets	(8) retained earnings/ assets
Affected market ×	-0.001	0.002	0.009	-0.003	0.014	-0.013	-0.008	-0.002
After merger	(0.001)	(0.003)	(0.008)	(0.007)	(0.027)	(0.033)	(0.006)	(0.006)
Constant	0.089***	0.044***	0.802***	0.140***	1.886***	0.213***	0.009	0.056***
	(0.002)	(0.006)	(0.018)	(0.011)	(0.081)	(0.054)	(0.010)	(0.014)
Observations	85162	85162	85162	85162	83676	85162	85162	85162
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms size FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Regression results without 2002