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

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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, our difference-in-differences analysis shows no increase of concentration of new loans. The concentration in affected markets (markets where both merging parties were present) developed similarly to unaffected markets. Moreover, the interest rate tended to be lower in the affected markets relative to unaffected markets, but this relationship is weak and not statistically significant. The merger also affected 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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1. Introduction

Mergers and acquisitions are observed in most industries all over the world and the banking sector is no exception (see for instance, Calomiris and Karceski (2000), and Amel et al., 2004). From a regulatory point of view, market share concentration 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).

We present a case study of the 2003 merger between DnB and Gjensidige NOR in the Norwegian bank market. At the time of the merger, the merging banks were the largest bank and the third largest bank in Norway based on market shares. After a thorough investigation the Norwegian Competition Authority (NCA) allowed the merger conditional on remedies to counteract the possible anti-competitive effects of the merger. We outline considerations of the NCA and how it dealt with the merger proposal. We then present a event-study of the merger, and analyze its effect on the interest rate of business loans, and the associated riskiness of these loans. Our analysis relies on the population of corporate loans in Norway. Regional variation of the effect of the merger is used to examine whether the merger led to changes in the interest rates customers were charged and the risk composition of loans of the banks. We define affected regional markets as markets in which both banks are present at the time of the merger. The regions are followed over time, and we 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.

The effect of the merger is a priori unclear. The interest rate may increase because of a lower degree of competition. However, if the strings attached by the NCA are effective

the decrease of competition may be limited. Furthermore, there may also be efficiency gains. The effect of merger on the riskiness of the loans may also go both ways as 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)

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.[1]

Related literature. 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

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

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.[2]

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).

Finally, our results contrast findings from studies analyzing mergers across different industries. Ormosi et al. (2015) and Kwoka (2015) find on average rather strong price effects of mergers assessed by competition authorities in Europe and the US.

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

[2]Herpfer et al. (2021), another study of Norwegian corporate borrowers, finds that lower distance between borrowers and banks increases the likelihood of initiating a new banking relationship.

and the final dataset. The empirical results are presented in Section 4. Finally, Section 5 concludes.

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 such as common advertising campaigns. Foreign owned banks 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. [5] The decrease in the number of branches are driven among other things by changes in consumer behaviour and new technological developments such as internet

[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.

[5]See Finans Norge: `https://www.finansnorge.no/en/statistics2/banking-sector/number-of-bank-offices/`

banking (see, e.g., Aamo 2016, pp. 80-81).

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 March 18, 2003 from the merging parties.[6] 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.

At the time of the merger, the Norwegian competition legislation stated that the authorities should emphasize total surplus, i.e., the sum of consumer surplus and producer surplus.[7] The main worries of the NCA were related to the importance of proximity and relationship banking, shown quite clearly in the decision document (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 NCA 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

[6]The infomation in this sub-section is taken from official decision document about the merger (The Norwegian Competition Authority (2003))

[7]In 2016 the legislation was changed such that the authorities should from now on emphasize consumer surplus only.

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)

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 of the 262 branches.[8] 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)

Thus, the merger remedies were a combination of structural- and behavioral remedies.[9] Furthermore, the above mentioned quotes show that the NCA was concerned about negative competition effects of the merger. They traded-off efficiency gains and costs of lower competition, and imposed significant restrictions in order to balance the two effects. Finally, the merger was approved with the above mentioned remedies by the NCA November 7, 2003.

3. Data

3.1. Loan characteristics

We are relying on two main data sources. First, we use the population of loans of Norwegian firms[10] from Norwegian banks, provided by the Norwegian Tax Administration. In Norway, all deposits and loans are reported to the Norwegian Tax Administration, and there is basically no room for underreporting. Furthermore, the data are scrutinised by

[8]Note that the total number of branches in 2003 was 1376 (see Finans Norge: `https://www.finansnorge.no/en/statistics2/banking-sector/number-of-bank-offices/`)

[9]See Brekke et al. (2021) for a discussion about merger remedies in a Norwegian setting. Their findings indicate that the Competition Authority seems to look into a smaller share of the mergers, but that the number of mergers turned down has increased over the last few years.

[10]Please note that we use the terms firm, enterprise and company synonymously.

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. The data provides the loan amount for each loan as of December 31 of each year as well as the interest payments during the year. Furthermore, it identifies the bank and the name (and an identifier[11]) 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 risk indicators. In our analysis, we mainly focus on the ingredients of the Altman z-score, i.e., return on asset, leverage, EBITDA/liabilities, current assets/liabilities, sales/assets, working capital/assets, and retained earnings/assets. 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.[12]

In order to focus on the competition affect, we focus on new loans in our analysis. We do so for two reasons. First, 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. Second, we aim to analyze the role of risk-taking of the banks, and new loans are the main channel

[11]Every organization in Norway has a unique organization number by which it is recognized by public authorities.

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

for banks to change their loan composition.

Employees	**0**	**1-4**	**5-9**	**10-19**	**20-49**	**50-99**	**100+**	**total**
Number of companies	23140	27837	18743	13528	8332	2502	2537	96619

Table 1: Firm size distribution

In total, we observe 96 619 newly established loans from 47 772 distinct companies between 2000 and 2007. Table 1 shows the size distribution of the firm-year observations. We see that small companies dominate the size distribution of our data. That reflects the size distribution of Norwegian businesses in general (see, e.g., Statistics Norway, Table 372, 2004). Most businesses have no employees (i.e., self-employed), and very few firms with more than 100 employees. This is important to keep in mind as relationship banking is likely to be of higher importance for smaller companies.

	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 2: Loans- and firms shares, by industry

Table 2 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 the domination of small firms in our sample.

Table 3 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 the average net interested rate (subtracted by the NIBOR) 2.6 percent. The average loan size

	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
Sales / assets	96619	1.640	1.754
Working capital / assets	96619	0.055	0.282
Retained earnings / assets	96619	0.049	0.306

Table 3: Summary statistics, firm-level information for firms with new loans

equals around 7 million 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.

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).[13] 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

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

by the merger. Table 4 shows the 46 different local markets.

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 4: Affected 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*, the financial sector's industry organization, and collected in the so-called Bank Branch Location Register (*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.

The number of companies is not equally distributed among the two groups. Naturally, the number of companies correlates with the inhabitants. Furthermore, large corporations

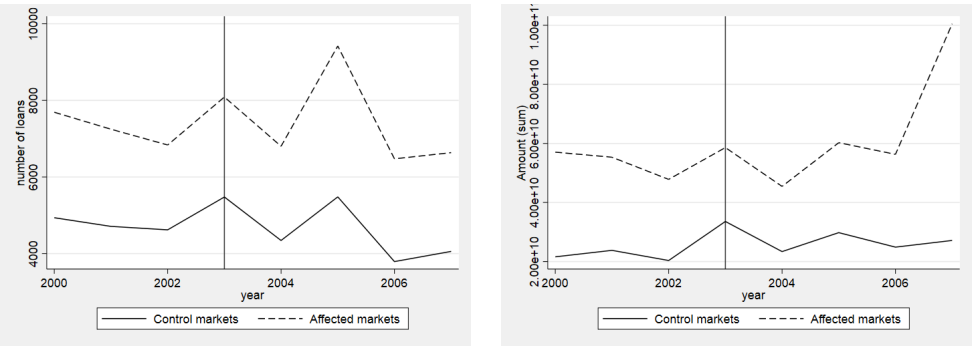

Figure 1: Development of the number of new loans (left) and total amount of new loans in bn NOK (right) over time

tend to be located in the bigger cities. In Norway, that is particularly true for Oslo, the capital and biggest city. As the treatment group contains most of the larger cities, it is bigger than the control group. Figure 1 shows the development of the number of loans and the loan amount for the two groups over time.

4. Results

4.1. The effect of the merger on competition/concentration

We start our analysis on the market level by looking at the concentration, measured by the Herfindahl-Hirschman Index (HHI).[14] Figure 2 shows the development of the HHI of new loans in in the local markets, differentiated into affected and control markets.

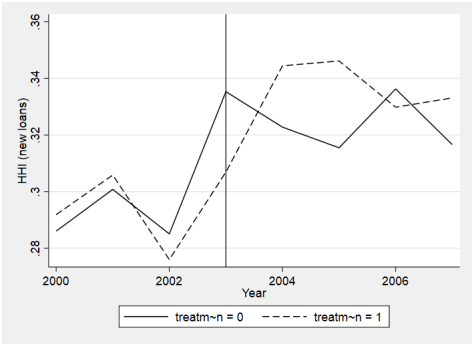

Figure 2: Development of the HHI over time, based on new loans

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

[14]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.

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.[15]

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 after-merger period starts with 2004. Specifically, we estimate at the geographical market level the following specification

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

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)	(2)	(3)	(4)
	HHI	HHI <1bn	HHI <100mn	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)
Market FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Observations	368	368	368	368

Standard errors in parentheses

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

Table 5: Effect of the merger on HHI, based on new loans; total and by loan sizes

Table 5 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)-

[15]Note that we observe the mechanical effect - calculating the concentration from one player instead of two individual players - when analyzing existing and new loans. Then the HHI in the affected markets strongly increases.

(4). The conclusion remains the same.[16] For completeness, we provide a graphical leads and lags analysis as advocated by Cunningham (2021) in Figure A.1 in the Appendix. There, we observe no evidence against the common trend assumption, nor a convincing effect of the merger on the HHI in the affected markets.

4.2. The effect of the merger on new loans

After the concentration analysis on the market level, we focus from now on loan level information. Investigating the development of the mean interest rate in the affected and non-affected markets, Figure 3 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.

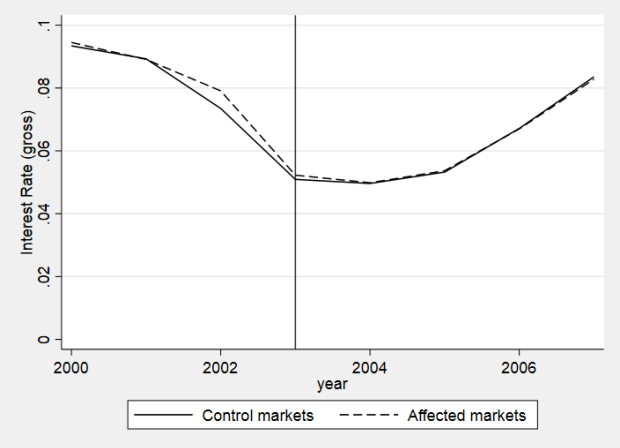

Figure 3: Interest rate development over time

Turning to the evolvement of the risk measures reported in Figure 4, we observe some differences in the development of the risk measures in the affected and control markets. As for the interest rates in Figure 3, we do not observe a consistent effect related to the merger on any of the seven risk measures in Figure 4. Thus, it is hard to state that the merger has significantly affected the risk behavior of the merging banks.

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

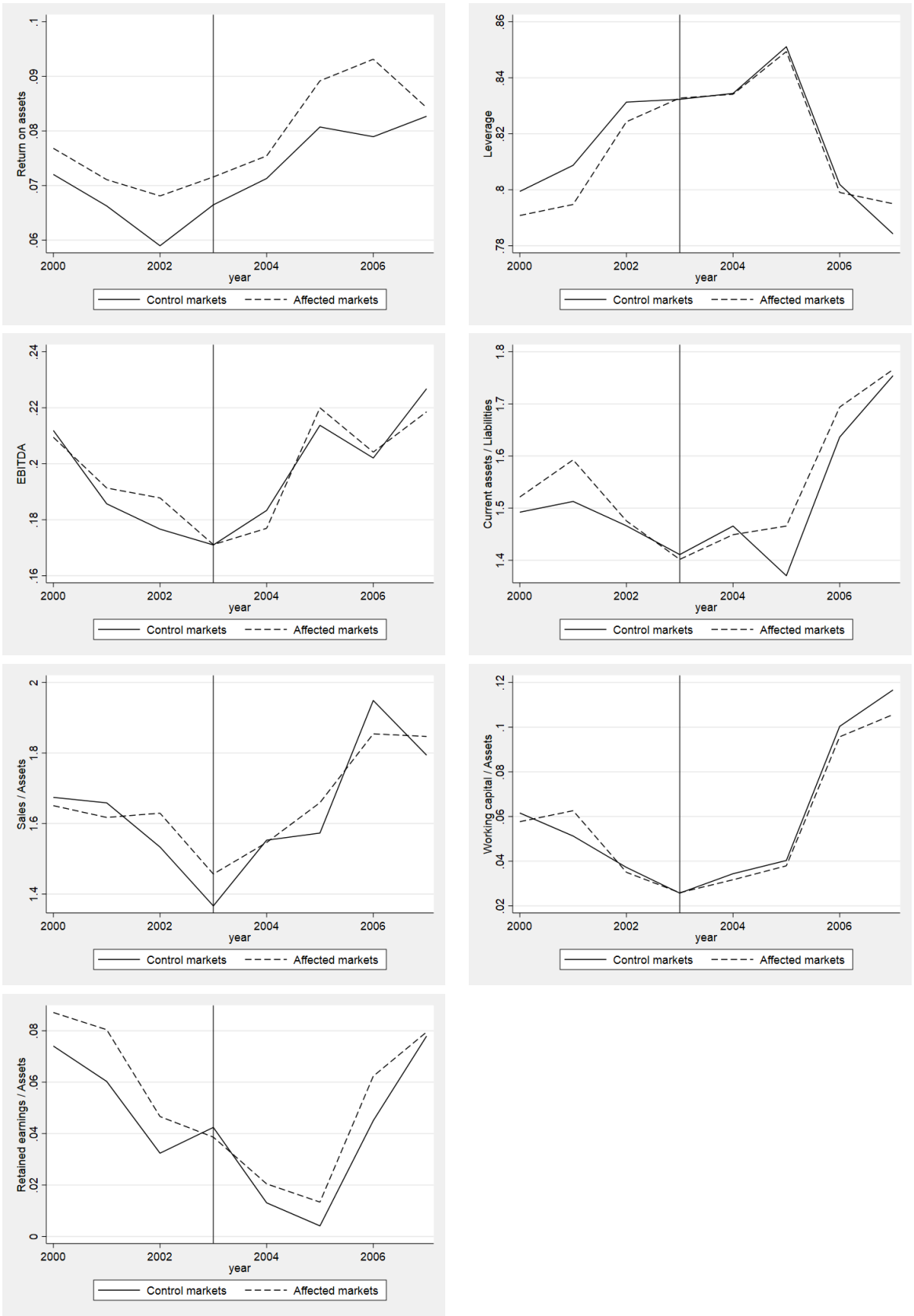

Figure 4: Risk measures over time

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

$$\mathrm{y}_{ijt} = \alpha + \nu_j + \gamma_t + \beta \cdot \text{Affected Market}_j \cdot \text{After Merger}_t + X_{ijt} + \epsilon_{ijt}, \tag{2}$$

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

	(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
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

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

We observe first that the interest rate, Column (1) Table 6, is lower in affected markets after the merger. Such a negative effect may indicate that the efficiency gains dominate the competition effects, i.e., giving support to the argument that the merger may led to some cost savings for the parties. Before coming back to this, we first comment on the various risk measures. In Table 6 we see there is no statistically effect on any of the risk measures reported in Columns (2)-(8), i.e., that the β of *Affected*×*After* are all statistically insignificant. The regressions support 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.

In order to establish a causal effect of the merger, we 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 for the affected markets. Therefore, we analyze the time dynamics with the leads and lags. We interact *Affected* with a dummy variable for each individual year, except the last pre-merger year 2003. The latter serves as the baseline. Specifically, we estimate the following specifications

$$\mathrm{y}_{ijt} = \alpha + \nu_j + \gamma_t + \sum_{t \neq 2003} \beta_t \cdot \text{Affected Market}_j \cdot I_t + X_{ijt} + \epsilon_{ijt}, \tag{3}$$

where i denotes individual loans, j the related geographical market in year t, X_{ijt} a vector of control variables, I_t an indicator variable equal to one in year t and zero otherwise, and y_{ijt} either the related interest rate or risk measure.

That procedure allows us to analyze the treatment effect over time relative to the last pre-treatment year. 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***
I_{2000}	(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*
I_{2001}	(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**
I_{2002}	(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
I_{2004}	(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
I_{2005}	(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*
I_{2006}	(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
I_{2007}	(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
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

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

With these leads and lag analysis results at hand in Table 7, we are better able to explain the negative effect of the merger on the interest rate seen in Column (1) of Table 6. To ease the interpretation of the results in Table 7, we visualize them in event study plots

as advocated by Cunningham (2021) with the merger taking place in year 2003 (Figure A.2 in the Appendix). We plot the 95% confidence intervals of the treatment leads and lags. Based on the results in Column (1), Table 7, it turns out that year 2002 is different. In this year the interest rate is significantly higher in the affected markets than in the unaffected markets and in the other years (*Affected market* $\times$ $I_{2002} = 0.004^{**}$). These results are confirmed by Table A.1 in the Appendix where we leave out year 2002 from the analyses. Without year 2002 there is no statistically significant differences between the affected markets and the unaffected markets when it comes to the risk behavior of the merging banks. Given that the negative difference in the interest rate in Table 7 occurs *before* the merger, we conclude that the merger did not have a causal effect on the interest rate in the affected markets.

Otherwise, in Table 7 we see only significant differences for the pre-merger years for retained earnings / assets. But more important, there are no consistent statistically significant effects after the merger, i.e., no significant change in risk behavior of the merging banks.

Thus, 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 how much the HHI would have increased in the last pre-merger year (2003) with a merger of the parties, i.e., 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.[17] Then, we use this measure to capture heterogeneous treatment intensity in our model. These additional difference-in-differences analyses where we instead include the change in HHI, are reported in Table 8. We observe very similar patterns as already seen in Table 6, i.e., the table shows again a significantly negative coefficient for the interest rate in the markets that are more affected by the merger (see Table 8, 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).

	(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 ×	-0.009**	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
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Regression results - HHI change

As the results in Table 8 indicate some effects of the merger, we again do leads and lags analyses. That means, we analyze how the treatment effects evolve relative to the last pre-treatment year 2003. After consulting the time dynamics with the leads and lags, reported in Table 9, only the effect on leverage has the potential to be reasonably causally

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

linked to the merger as leverage is the only variable for which we observe common pre-trends and a significant change in the three treatment years. Given there are no systematic and consistently statistically significant effects across the interest and risk measures after the merger, it is hard to state that the merger affected the behavior of the merging banks.

	(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 $\times$	0.000	0.001	-0.001	-0.000	-0.012	0.026	-0.001	0.008
I_{2000}	(0.001)	(0.003)	(0.008)	(0.008)	(0.046)	(0.038)	(0.006)	(0.007)
ΔHHI $\times$	-0.010**	0.043**	-0.063	0.059	0.239	0.049	0.064**	0.108*
I_{2001}	(0.004)	(0.020)	(0.040)	(0.061)	(0.153)	(0.148)	(0.026)	(0.058)
ΔHHI $\times$	0.022***	0.053***	0.032	0.075	0.223	-0.002	0.023	0.057
I_{2002}	(0.008)	(0.016)	(0.072)	(0.048)	(0.217)	(0.257)	(0.060)	(0.070)
ΔHHI $\times$	-0.003	-0.009	0.015	-0.050	-0.050	-0.198	-0.004	0.013
I_{2004}	(0.004)	(0.026)	(0.033)	(0.048)	(0.271)	(0.151)	(0.030)	(0.032)
ΔHHI $\times$	-0.005	0.036	0.112***	0.004	0.265	0.726***	-0.059*	-0.048
I_{2005}	(0.004)	(0.028)	(0.042)	(0.071)	(0.282)	(0.205)	(0.034)	(0.041)
ΔHHI $\times$	-0.010**	0.066**	0.084**	0.037	-0.238	0.039	-0.043*	0.007
I_{2006}	(0.004)	(0.025)	(0.039)	(0.067)	(0.201)	(0.171)	(0.026)	(0.042)
ΔHHI $\times$	-0.008	0.004	0.130***	-0.024	-0.083	0.454	-0.100***	-0.012
I_{2007}	(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
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
Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

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

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 lower interest rate due to a lower leverage can compensate for an increasing interest rate due to an increase of market power. In Column (3) in the already presented Table 8, however, we observe the opposite. In markets with a larger increase in concentration we actually observe *increasing* 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.

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 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 ($Affected \times After \times inside\,bank$) 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 show no significant difference between the merging banks and their competitors after the merger when it comes to the interest rate (i.e. Column (1)). Furthermore, consistent with the findings in Table 9, there are no systematic and consistently statistically significant effects across risk measures after the merger in the remaining parts of Table 10. Thus, it is hard to state that the merger affected the behavior of the merging banks, and/or induced any local efficiency effects.

	(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
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loansize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses

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

Table 10: Regression results - insider/outsider

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 was only of minor importance for the markets, i.e., that the anti-competitive effect was rather small. As seen in Column (1) in the already presented Table 5, the HHI increased by 1.5 percentage points in the affect market relative to the uneffected markets, perhaps (or evidently) not enough to rock the boat. An alternative explanation is that the merger was insofar endogenous that it came as a response to an increasing 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.

Finally, the NCA 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 structural and behavioural remedies reduced potential anticompetive effects the merger as the counterfactual outcome is impossible to observe. The null findings of the DnB and Gjensidige merger contrast the findings of Ormosi et al. (2015). These authors investigate a total of 27 ex post studies of mergers that were assessed by either the European Commission or by national competition authorities in Europe and find that 60% of the mergers approved with remedial measures resulted in higher prices, with the average price increase around 1-2%. Our findings deviate even more compared to the findings of Kwoka (2015). He conducts a meta-study of ex post analyses of 42 US mergers and find that on average, prices increased by more than 16 % following mergers approved with structural remedies and with more than 7 % following mergers approved with behavioral remedies.

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 measures based on balance-sheet and accounting information of the firms, the effects are rather modest.

We find no evidence of local efficiency gains following the merger, suggesting that the remedies implemented in local markets especially affected by the merger were sufficient to offset any anti-competitive effects, potentially with the help of efficiency savings occurring at the firm (rather than branch) level. In this way, our study suggest that carefully designed remedies targeted at local markets where the anti-competitive effects are likely to be most severe may indeed be effective.

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

Standard errors in parentheses

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

Table A.1: Regression results without 2002

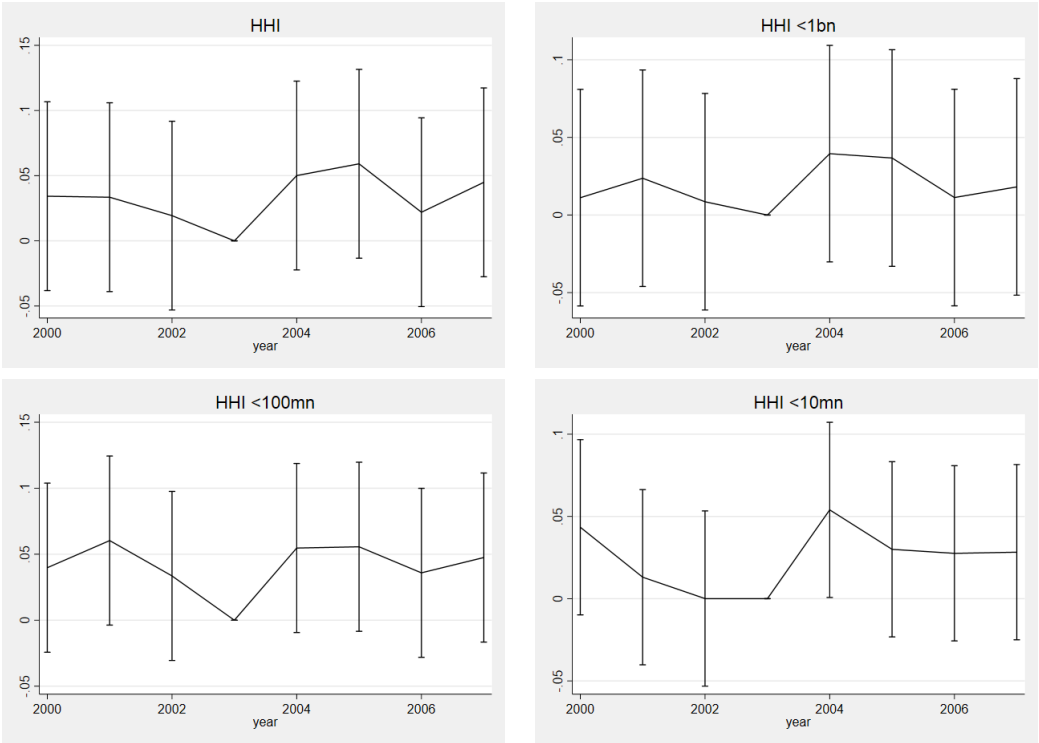

Figure A.1: Leads and lag analysis of the effect of the merger on the HHI

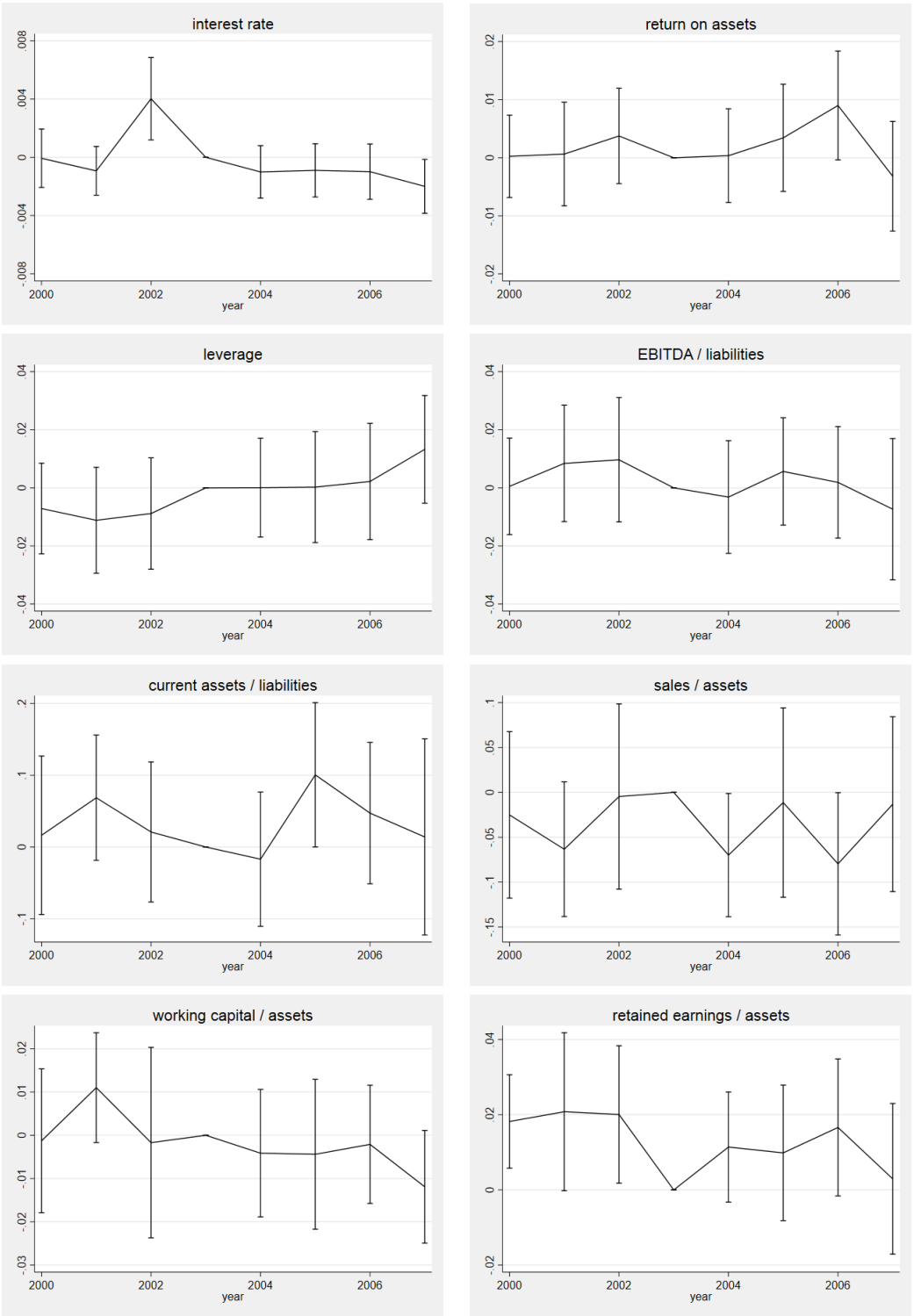

Figure A.2: Leads and lag analysis of the effect of the merger on the interest rate and risk measures

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