Economies of scale and scope in banking

Dijkstra, M.A.

Citation for published version (APA):
Dijkstra, M. A. (2017). Economies of scale and scope in banking: Effects of government intervention, corporate strategy and market power

Download date: 17 Jan 2018

ECONOMIES OF SCALE & SCOPE IN BANKING

Effects of Government Intervention, Corporate Strategy and Market Power

The financial crisis and ensuing policy responses have made the question of economies of scale and scope in the banking sector as topical as ever. This dissertation estimates economies of scale and scope in the banking sector and discusses the role of government intervention, corporate strategy and market power.

Overall, economies of scale are found to be positive while mixed evidence is found on the existence of economies of scope. Implicit governmental subsidies play a role but do not fully explain economies of scale and scope. Furthermore, a case study on ABN AMRO investigates the role of corporate strategy in the creation of economies of scale and scope and discusses the role of business level incentives.

And an investigation into the Dutch mortgage market shows that the presence of large banks in concentrated markets can adversely affect the impact of policy proposals that address competition.

Mark Dijkstra (1981) graduated in economics at the University of Groningen in 2006. After working for the Ministry of Economic Affairs and ESB, he started working on his PhD thesis at the University of Amsterdam and Amsterdam Center for Law & Economics (ACLE). His research interests include banking, corporate finance and competition in financial markets.

Economies of Scale & Scope in Banking

Mark A. Dijkstra

Mark A. Dijkstra
Universiteit van Amsterdam

Economies of Scale and Scope in Banking

Effects of Government Intervention, Corporate Strategy and Market Power

Coverdesign: Tim Schippers, website: www.behance.net/timschippers

Economies of Scale and Scope in Banking

Effects of Government Intervention, Corporate Strategy and Market Power

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

op gezag van de Rector Magnificus

prof. dr. ir. K.I.J. Maex

ten overstaan van een door het College voor Promoties ingestelde commissie,

in het openbaar te verdedigen in de Agnietenkapel

op dinsdag 25 april 2017, te 12.00 uur

door

Mark Age Dijkstra

geboren te Groningen

Promotiecommissie

Promotores: Prof. dr. A.W.A. Boot Universiteit van Amsterdam

Prof. dr. J. Koelewijn Nyenrode Business Universiteit

Overige leden: Dr. S.R. Arping Universiteit van Amsterdam

Prof. dr. T. Beck Cass Business School

Prof. dr. H. Degryse Katholieke Universiteit Leuven

Prof. dr. A. de Jong Erasmus Universiteit Rotterdam

Prof. dr. E.C. Perotti Universiteit van Amsterdam

Prof. dr. M.P. Schinkel Universiteit van Amsterdam

Faculteit Economie en Bedrijfskunde

Acknowledgements

It is often said that a PhD is about the journey rather than the destination. If this is true, then it's the people that travel along that make the journey interesting. As such, I have a bunch of people to thank, because this dissertation would not have been possible without them. First and foremost, I would like to thank my advisor Arnoud Boot. Arnoud's incredible knowledge, high standards and excellent feedback have helped me push my boundaries and increased the overall quality of this work and my future work. Despite his busy schedule, he was always available when I needed him and his feedback was always spot on. A great many thanks also go out to my second advisor Jaap Koelewijn, with whom I crossed paths often before he became my advisor in an official capacity. Jaap was always available and went above and beyond to give me excellent advice on both my work and life in general. Furthermore, Jaap always took considerable effort to make sure to meet up in person for our meetings in spite of his busy schedule which was greatly appreciated. Life at the ACLE would also not have been nearly as engaging without working together with Maarten Pieter Schinkel. Not only did I learn a lot thanks to Maarten Pieter's great insight and engagement, I also found that the time spent together was always of the highest quality in every aspect of the word, and this must be the highest form of praise to someone who reads Zen and the Art of Motorcycle Maintenance at least once a year. I also want to thank the other members of the committee, Stefan Arping, Thorsten Beck, Hans Degryse, Abe de Jong and Enrico Perotti. They are all experts in their field and highly regarded by both myself as well as my supervisors. Although they all taught me in different ways, I learned a lot from each of them through a combination of their feedback, classes in grad school, formal and informal meetings and reading their papers. And I want to thank the Gieskes Strijbis foundation for contributing to the funding of this project and in doing so allowing me to pursue my academic dream.

The overall experience at the University of Amsterdam has been fantastic, mainly because of all the colleagues there. Especially Timotej, with whom I started

working at the ACLE and who became my roommate for a significant amount of time. In the E-building I still cherish warm memories of talks and lunches with Eva, Josephine, Guilherme, Lukas, Martijn, Jeroen, Guiseppe, Carmine and Wim. Sharing the office with the other PhDs at the fourth floor was also very pleasant thanks to Dorinth, Fleur, Ieva, Pascal, Richard, Rob and Robin: I'm sure you guys will find a new floor manager to keep the peace. I also want to thank everyone at the Finance department in providing an excellent learning environment. There is a saying that goes: If you're the smartest person in the room, you're in the wrong room. Thanks to everyone in the Finance department I rarely felt like I was in the wrong room. Within the Finance department I want to thank Jeroen especially for enabling me to work as a lecturer for these last two years which I highly enjoyed. Lecturing was especially pleasant because of the colleagues I worked with directly thanks to Philippe, Tolga, Tomislav, Pepijn and Vladimir. And of course I need to thank Sidonie and Lorena, who always ensured that everything ran smoothly around the office. Lunch talks with Daan in 't Veld were also greatly appreciated, as were bi-annual drinks with Jakob de Haan. And I want to thank Peter van Bergeijk and Albert Jolink whose encouragement gave me the final push in the decision to undertake this project. I would also like to thank the interview candidates that asked to remain anonymous for their time and insight, which have been instrumental in further increasing the quality of this dissertation.

Beyond academia, I wanted to thank my family and friends who supported me on this journey. My mom and dad for always supporting me and encouraging me to chase that which I love. My sisters, Karin and Ellen, for keeping me grounded and for the knowledge that they will always be there for me regardless of what life throws at us. I am also very happy that I can share this moment with Beppe, my grandmother. As for my friends, I want to thank Willem and Michiel for agreeing to be my paranymphs and for making being a big nerd seem like the coolest thing in the world. Bastiaan, Joël and JKN for making discussing economics more fun than it should rationally be. Wietze, Martin and Frank for sticking with me for over a quarter of a century and helping me remember where I came from. Dirk, Thomas, Stephanie and Emiel for encouraging me to get back into academia and making the end of my twenties a complete blast. Fabian, Damien, and David for remaining

close friends even though we usually live half a world apart. Steffen, Eszter, Violetta, Kasper and Jim for getting me through grad school without making me feel too much like an old man.

And finally I would like to dedicate a paragraph to my family. During my PhD I experienced many highs and few lows, but the best experiences have definitely been marrying my wife Lai Ka and the birth of my first daughter Lisanne. Lai Ka has been endlessly supportive during this time and always inspires me to become a better man. And Lisanne is just the loveliest girl and never fails to light up any room she is in. I am completely powerless whenever she smiles at me. While writing these acknowledgements, our family has also been blessed with a second daughter who should be with us when this thesis will be defended. I look forward to fill our house with even more love. Lai Ka, Lisanne and Zusje: You are truly what makes life worth living.

Utrecht, March 6th 2017

Contents

Chapter 1

General Introduction and Outline

This dissertation consists of four chapters – apart from this introductory chapter – that together address issues of scale and scope in banking. The overarching research question is: Do economies of scale and scope exist in banking and are they real or the result of implicit governmental subsidies and market power? This question will be addressed from several angles. The question of existence of economies of scale and scope will first be analyzed by undertaking a large scale empirical investigation over multiple years in multiple European countries. The general – large database – insights will then be applied to a case study of ABN AMRO over the period 1997-2007. Specifically, its strategy and performance over this period will be analyzed and placed in the context of the discussion on economies of scale and scope in banking. Finally, an investigation will be made into the interaction between regulation and competition by analyzing the Dutch mortgage market.

1.1 Motivation

The financial crisis and ensuing policy responses have made the question of economies of scale and scope in the banking sector as topical as ever. Both the financial sector as a whole and individual banks have grown ever larger, even in the wake of the financial crisis. Academics and policymakers alike have questioned whether the increase in size of both the financial sector and individual institutions is efficient. The answer, as in most things in economics, is that it depends.

Economies of scale and scope are found to exist for individual financial institutions, but are limited and can turn negative. This dissertation seeks to add insights to the scale and scope debate.

The broader question is on the size of the financial sector. How the financial sector adds to welfare affects the effectiveness of policy proposals. Proposals of financial regulation have focused on increasing capital requirements, forbidding banks from undertaking certain activities and splitting up banks by activity lines or a size cap. The effectiveness of these proposals depends on the structure of the financial sector. For example, if economies of scale and scope in financial institutions are fully the result of implicit governmental subsidies (e.g. larger institutions are more likely to be supported in case of any difficulties), splitting up banks to ensure they are no longer too big to fail may make sense. However, if economies of scale and scope are partly real, splitting up banks may increase costs for banks which are then passed on to consumers. The net effect of costs and benefits will then determine how much welfare may be lost when these policy measures are put in place and other ways of addressing implicit governmental guarantees may make more sense from a welfare point of view.

The research question is assessed through different empirical approaches. A large scale dataset is used to estimate economies of scale and scope from a large number of banks across multiple years and multiple countries. This is followed by a case study analysis of ABN AMRO during the period 1997-2007. Finally, the competitive behavior in the Dutch mortgage market is analyzed. The diversity in approaches is chosen because the different approaches complement one another. A large scale empirical investigation can sketch rough patterns, but is less useful in determining exact causality, because it is often difficult to disentangle causality and correlation (George and Bennett, 2004). Furthermore, it focuses on measurable variables and is concerned mostly with the average bank, so that the results may not apply to all types of banks. Case studies might provide additional insights that cannot be gathered from large scale data investigations and these insights themselves might in return lead to new hypotheses to be tested (Jensen et al., 1989). Finally, the investigation of competitive behavior analyzes the interplay between actors, so that the reactions of one bank to the other are well measured, but it is less

useful in determining the characteristics of individual actors that cause economies of scale and scope. By combining several different approaches the research question can be answered more completely.

In economics, the norm is to use large scale datasets to estimate relationships, while less focus is placed on the use of case studies. As such, economics tends to favor the nomothetic (large number of observations) approach over the idiographic (single observation) approach. The nomothetic approach may have advantages in terms of having a scientific approach and being useful for prediction. However, it is less useful in determining causality and explaining individual behavior because the ideographic approach can go into much more detail on an entity. As such, different approaches may be favored to answer different questions, so that case studies may have an advantage in some situations. The advantages and disadvantages of the nomothetic and idiographic approaches are presented below.

1.2 Nomothetic versus idiographic approach

The nomothetic approach derives its name from the Greek word for law, nomos. The nomothetic approach is the approach of investigating a large number of observations in order to derive general laws for the behavior of large groups of individuals. The idiographic approach, stemming from idios (private or personal in Greek), is the approach of studying a single entity, such as an individual or corporation. Most studies in empirical economics are nomothetic in nature, in which a large dataset of companies or individuals is analyzed by a quantitative measure. This approach has its advantages, in that it is useful in determining the laws that determine behavior and has more outside validity. Furthermore, the nomothetic approach lends itself better to making predictions.

At the same time, the nomothetic approach does have its limitations. It may give a superficial understanding of behavior, but may not give the full motivation. If the underlying assumptions are incorrect, it may in fact draw the wrong conclusions. For example, the third chapter in this dissertation shows what happens

if the estimation of economies of scale in banking does not account for risk taking. It finds that economies of scale are completely explained by governmental subsidies when risk is excluded from the estimation, while economies of scale are real when risk is accounted for. By using the wrong model, one could easily come to a different conclusion, so that the validity of the nomothetic approach is dependent on the validity of the model that is used.

For making predictions, the nomothetic approach is useful for predicting behavior as a group, but not for the individual. For example, from the large scale data study in the third chapter of this dissertation, it turns out that economies of scale exist at all asset levels, but this may not be useful to all banks. When considering ABN AMRO in the fourth chapter, it turns out that economies of scale may not have materialized in the same way that economies of scale and scope are found in an estimation with many observations. From this case, it would be possible to get a better understanding of the exact causes of economies of scale and scope. A further limitation of the nomothetic approach is that it focuses on measurable variables. Variables that theoretically may play a large role in determining behavior, such as culture or transparency, may be very hard to measure directly or even proxy, invalidating the nomothetic approach partially. Causality and correlation may also be difficult to distinguish in nomothetic studies, because causality may be reversed or unobserved variables may affect both variables of interest.

On the opposite side of the nomothetic approach, the idiographic approach gives a more complete understanding of an individual case. It allows for an in depth examination of exactly what is going on with the individual and in which way causality lies. Furthermore, it may be more adept at estimating relationships that are difficult to quantify, because it needs to focus less on data and can focus more on qualitative relationships.

The idiographic approach has its own shortcomings. It has less external validity because it focuses on only one entity or a couple of entities, which may bear little resemblance to the population as a whole. Indeed, case studies tend to be prone to selection bias, because the most interesting observations are typically studied in depth. These observations are generally interesting precisely because

they deviate from the norm. As such, these case studies may represent outliers that tell little about the behavior of the average observation. It depends on how the case study is used, however. If the goal is not to make predictions based off the case study, but instead it is used to analyze the impact of a certain aspect, it may be useful to make a case study of precisely the individual that is most endowed in that aspect.

Both the nomothetic and idiographic approach can make meaningful contributions to research and are complementary. The ideographic approach is more suited to description, while the nomothetic approach is more suitable for prediction because it estimates relationships from observable data over a large number of observations. These estimated relationships can then be used on new data to create predictions (George and Bennett, 2004). The two approaches are complementary: ideographic research can be used to further fill in the details that nomothetic research necessarily omits. Alternatively, ideographic research can be a source of inspiration and ideas for nomothetic research. Table 1 presents an outline of the arguments for the nomothetic and idiographic approach.

The use of the idiographic versus nomothetic approach has been the subject of debate in especially the psychological literature. Clinical assessment of patients plays a central role in determining psychological behavior, but may lack the outside validity to make predictions. As a response, the practice of formulating personality traits and quantifying them has been introduced to the field. The usefulness is up for debate. Although external validity is higher, Thomae (1999) notes that the viability of the nomothetic approach is limited by the degree to which behavior is determined by (observed or unobserved) personality traits and to which it is determined by the uniqueness of the individual. If individual behavior can be assessed as if dictated by personality traits which if observable may be measureable, the nomothetic approach may be more valuable, while the idiographic approach becomes more useful as individuals are thought of as being more unique.

Table 1: The nomothetic and idiographic approach.

	Nomothetic approach	Idiographic approach
Definitions	Investigates a large number of observations in order to deduce laws of behaviour that apply to the observational unit	Investigates a single individual observation or small group of observations in detail in order to achieve a unique understanding of them
Assumptions	The observation is a product of laws (nomos) governing the observation	The observation is unique
Methodology	Quantitative	Qualitative
Advantages	In line with deterministic nature of science because it estimates general laws of behaviour, useful for prediction	More complete understanding of the individual observation, may lead to results that spark new ideas for research
Disadvantages	White noise, can be difficult to obtain data to investigate theory	Difficult to generalize, external validity may be low. Less scientific, more subjective

Furthermore, Haynes, Mumma and Pinson (2009) note that the nomothetic approach of using personality traits introduces error when applied to the level of the individual and as such may not be useful for individual treatment. As an example, the authors note that depression may be investigated using a questionnaire with 10 items, such as self-reported fatigue and pessimism. If one individual reports high fatigue and another reports high pessimism, a test that focusses on these measures may find high standard errors in determining the cause of depression and thus reject that depression is affected by any individual measure, while it may be affected by either fatigue or pessimism.

George and Bennett (2004) note that the use of case studies has gone down substantially in political science during the 1960s and 1970s, while the use of data based methods has gone up. In analyzing articles from the American Political Science review, Bennett, Barth and Rutherford (2003) found that the proportion of

articles using statistics rose from 40 to 70 percent between 1965 and 1975, while the proportion using case studies declined from 70 to 10 percent.

1.3 Clinical studies in finance

In an editorial article in the Journal of Financial Economics, Jensen et al. (1989) argue for an increase in the use of case studies in the field of finance, terming them clinical studies. They argue that clinical studies may help to obtain a better understanding of theorems in finance and their (lack of) empirical validity. They note that clinical work can guide research by providing a different angle in approaching existing questions in finance as well as promoting new areas in which research can be done. Furthermore, clinical work can set the agenda for future theoretical and empirical work by focusing on unique phenomena that challenge the standard of thinking about a subject in finance. Jensen et al. (1989) note that different researchers could become specialized in different research methods, eventually leading to an overall more complete worldview. Despite this effort, it seems that the number of clinical studies in finance has declined over time. Tufano (2001) notes that 4 percent of the articles in the Journal of Finance, Journal of Financial Economics and Review of Finance in 1999 are clinical studies, while Gippel (2013) shows that this had gone down to 2.4 percent in 2010.

Clinical studies in finance are mostly used to investigate phenomena that are not easily captured in data, such as transparency or CEO character traits. For example, Henderson and Pearson (2011) investigate 86 instances of a newly introduced financial product to examine the role of transparency in the creation of this product. They find that this financial innovation may have been made intentionally complex to hide negative expected NPV. The clinical nature of their study enables the authors to focus more in depth on the unobservable aspects of the financial innovation (transparency, complexity) that would be difficult to capture quantitatively for a large scale study. DeAngelo and DeAngelo (2000) focus on the effect of a single CEO on the Times Mirror Company, and the clinical study allows

them to focus on unobservable variables such as the financial discipline of the CEO and monitoring by shareholders.

Clinical studies are also performed in the case of interesting subjects that have few data points. For example, De Jong et al. (2007) focus on Ahold before its accounting malpractices came to light in 2003 and focus on the role of investor relationships in setting beliefs by investors. By conducting a clinical study, the authors can take a qualitative approach to accounting malpractice and add more explanation on why specifically Ahold started to malpractice and how it could stay undetected for such a long time. Dailami and Hauswald (2007) in their clinical study of Ras Gas are able to disentangle how investors respond to different types of risk. By focusing on a single project, the authors are able to identify investors in great detail and are also able to asses in detail how these investors respond to different types of risk and why.

Besides providing a more in-depth look and allowing a focus on difficult to measure variables, clinical studies may enliven seminars and classroom discussions (Jensen et al., 1989; Tufano, 2001). This may be especially true in the case of highly prolific subjects, such as Ahold (De Jong et al., 2007) or ABN AMRO that is discussed in this dissertation. Clinical studies may also provide a starting point for discussion and the inspiration for future research (Jensen et al., 1989).

Although the field of finance has limited experience with clinical studies, the opposite is true for the field of business history. This field has historically consisted mainly of case studies and only recently has the field started to focus more on data driven studies (De Jong, Higgins and Van Driel, 2015). Comparing leading journals on business history in 1970-1971 and 2012, De Jong, Higgins and Van Driel (2015) find that most articles focus on a single entity in both periods,[1] although the frequency had dropped from 85 percent in 1970-1971 to 80 percent in 2012. There are changes however, as the authors note that business history articles in 2012 use measurable variables more frequently, with 60 percent of articles providing descriptive statistics of some sort in 2012 compared to 33 percent in

---

[1] The term single entity is not restricted to a single firm and may also refer to a single industry, country, individual or family. Around twenty percent of all single entity studies focus on a single firm (De Jong, Higgins and Van Driel, 2015).

1970-1971. In a similar fashion as Jensen et al. (1989), De Jong, Higgins and Van Driel (2015) argue that quantitatively driven studies may complement the traditional case studies that still form the majority of articles, rather than replace them or make them obsolete. Decker, Kipping and Wadhwani (2015) oppose the focus of De Jong, Higgins and Van Driel (2015) on hypothesis testing that is common in the economic literature and argue instead that the field of business history should become even more methodologically diverse, suggesting a wider spectrum of methodologies such as the inclusion of evolutionary economics. De Jong, Higgins and Van Driel (2015) note that case studies are valuable especially in determining causality and also note that case studies themselves may lend themselves to data analysis. One example is provided by Mulder and Westerhuis (2015) who use a combination of data driven research and case studies to investigate bank internationalization. A statistical analysis provides the authors with an analysis of quantifiable country characteristics to find which of these characteristics matter for bank internationalization. These findings are then complemented with case studies of three banks that allow the authors to also analyze how the regulatory environment affects internationalization and as such focus on a qualitative approach. Given the different experiences in the field of finance and business history in terms of nomothetic versus idiographic research and given that these research methods complement one another, the two fields may be able to learn from one another to come to a deeper understanding of different economic phenomena.

As Jensen et al. (1989) note, different methods apply to different problems that require different solutions. By combining the idiographic and nomothetic approach, this dissertation intends to add a layer of depth to the understanding of economies of scale and scope in financial intermediaries. Below, the dissertation outline is discussed in more detail.

1.4 Outline chapters and results

Chapter 2 is a literature survey on the scale and scope of the financial sector on a sector level as well as on the level of individual financial intermediaries. It discusses how the financial sector adds to welfare and how this value added is measured. The literature tends to find the financial sector adds to economic growth up until a certain size, while risk is not adequately accounted for in the national accounts. Furthermore, the chapter discusses how efficiency of financial institutions can be measured and discusses the literature on economies of scale and scope in banking. Generally, the literature tends to find economies of scale and diseconomies of scope. In studies before the turn of the century, economies of scale tend to decline after a certain asset size has been reached, but studies after 2000 generally find economies of scale at all asset levels. As for the sources of economies of scale and diseconomies of scope, diseconomies of scope are generally thought of as diversification discounts so that the increases in possible synergies do not compensate for the increase in agency costs. Economies of scale can be efficient or inefficient. Efficient economies of scale can come about because fixed costs are spread out over more output, while inefficient economies of scale can come about because of market power or implicit governmental support when big banks are not allowed to default because the repercussions to society would be too big. Recent policy proposals that place limits on scale and scope in banking are briefly discussed in this chapter as well.

The question if economies of scale and scope are real or the product of implicit governmental subsidies is a large part of chapter 3. This chapter consists of a large scale analysis of economies of scale and scope in banking within the Eurozone between 2002 and 2011. It investigates the presence of economies of scale and scope and attempts to disentangle the effects of implicit governmental subsidies. Implicit governmental subsidies are proxied through so called ratings uplifts which were taken from Moody's. Ratings uplifts are measured as the difference between a bank's rating as a standalone entity and the bank's rating when the possibility of external (governmental) support is taken into account. As such, ratings uplifts provide a measure of the expected value of external support.

The dataset consists of approximately 18000 observations on the bank level and it is found that economies of scale exist at all asset levels, even when accounting for ratings uplifts. When ratings uplifts are accounted for, banks with a ratings uplift have lower economies of scale than banks without, but both types of banks still experience economies of scale. The same model is used to estimate economies of scope between five different outputs of banks, and economies of scope are found to be positive in all years of the investigated period. The results for economies of scope are however very sensitive to the model specification.

Chapter 4 is a case study on ABN AMRO in the period 1997-2007. Specifically, this chapter is interested in explaining why ABN AMRO underperformed while conditions were in place for a good performance and what can be learned about economies of scale and scope from a business perspective. Given the findings in chapter 3, economies of scale and scope might have been expected, while economies of scale and scope were mostly absent for the bank in reality. The case study finds that few synergies were established between the different countries in which the bank operated and finds that the wholesale division underperformed relative to other parts of the bank. Even though the wholesale division underperformed, it grew faster than other divisions. An explanation for this growth is found in the managing for value system put in place, which might have favored transaction banking activities over relationship banking activities. Meanwhile, even though the bank increased its focus over time by selling off branches in countries where ABN AMRO had little presence, it remained one of the most spread out banks in the world. The bank seemed unable to create sufficient synergies between its home markets and between divisions to compensate for the costs of running a spread out organization.

Chapter 5 was co-authored with Maarten Pieter Schinkel and studies the mortgage market in the Netherlands. Specifically, this chapter addresses the competitive situation in the Netherlands after the European Commission implemented price leadership bans on three of the largest mortgage suppliers in the Netherlands. Because these banks had received state aid, they were subjugated to state aid conditions, amongst which was a ban on setting the lowest price on selected products. In the concentrated Dutch market, this may have led to

anticompetitive behavior. The chapter first discusses different explanations that have been brought forward to explain high mortgage rates in the Netherlands, and then uses a dataset of insured mortgages to investigate how banks responded to one another before and after the imposition of the price leadership bans. Using a dataset of approximately a million observations in rough data, it is found that the price setting bank which we identify as Rabobank became more important in interest setting behavior.

1.5 Main conclusions and policy recommendations

The overarching theme of this dissertation is the existence and sources of economies of scale and scope in financial intermediaries. It finds that economies of scale tend to be positive while mixed evidence is found on the existence of economies of scope. In the case of ABN AMRO synergies between country divisions and business units were limited, while the discovery of economies of scope in the large scale dataset is dependent on model selection. Although economies of scale are partially explained by implicit governmental guarantees when institutions grow very large, they are not fully explained by these implicit governmental guarantees. The institutions that enjoy these implicit guarantees do seem less efficient: financial intermediaries with positive ratings uplifts tend to have lower economies of scale than institutions that do not have a positive ratings uplift.

From the large scale dataset it is also found that economies of scale tend to be somewhat higher in more concentrated markets, implying that economies of scale may partially depend on market power, although the result is statistically weak and dependent on model selection. When competitive behavior is studied explicitly, the effects of financial intermediary size can be seen in more detail. The final chapter of this dissertation shows that price leadership bans may have had anticompetitive effects in the Dutch mortgage market. These anticompetitive effects were possible in the Dutch mortgage market precisely because Dutch financial intermediaries are relatively large, leading to a concentrated market. In a

less concentrated market, the price leadership bans would likely have had less of an effect.

For policy, the findings in this dissertation imply that size caps on financial institutions will likely both improve welfare if they are able to partially eliminate implicit governmental guarantees and market power, but may also harm welfare by increasing costs of financial services when they diminish economies of scale. Because this dissertation finds mixed evidence on the existence of economies of scope, splitting up banks by activity type such as in the case of ring-fencing may be preferable to size caps on financial institutions. Some caution is needed however, precisely because the evidence is mixed. From a welfare point of view, it would therefore be advisable to pursue other policies that diminish implicit governmental guarantees and market power without directly affecting the scale and scope of financial institutions such as, for example, capital requirements, bail-ins and enhancing competition by lowering barriers to entry.

The case study of ABN AMRO also shows that size is not the only thing that matters in financial intermediaries. First of all, the creation of economies of scale and scope depends on how a financial intermediary is organized, there is no universal law that dictates that an increase in scale or scope will always decrease costs or increase profits. And secondly, it is important to strike a balance between the creation of economies of scale and scope, because policies that create economies of scale within certain divisions may disincentivize the creation of synergies between divisions. Systems that were put into place to control costs at ABN AMRO may have had adverse effects on the creation of synergies, as the managing for value system gave few incentives to create synergies between business units and countries. That same managing for value system may have favored the wholesale activities over other activities even though wholesale activities were less profitable than those other activities.

The case study of ABN AMRO also shows that banks may have focused too heavily on the risk weights of their assets. ABN AMRO's wholesale activities grew over the period 2000-2005 in terms of assets, while they shrank in terms of risk-weighted assets. The growth in terms of assets of relatively unprofitable wholesale banking activities may actually have been obscured by the focus on risk-weighted

assets. These activities became smaller in terms of risk-weighted assets so that return on risk-weighted assets would remain relatively high compared to return on assets. Given findings in the literature that risk weights may not accurately reflect actual risk, a lower emphasis on risk-weighted assets may be favored so that financial intermediaries have less incentive to focus on risk weights.

When imposing policy, it is important not only to consider the existence of economies of scale and scope, but also to consider market conditions and incentives before imposing policy. Policies such as price leadership bans may work fine in diffuse markets such as the German mortgage market, but may have strong anticompetitive effects in more concentrated markets such as the Dutch mortgage market. Similarly, managing for value systems may work well in certain focused or specialized banks, but may create too many adverse incentives in banks that are highly diffuse and therefore rely relatively heavily on the creation of synergies between business units and countries.

Chapter 2

Literature Survey: Measuring Output and Efficiency in the Financial Sector

This chapter discusses the measurement of financial sector output as a whole as well as output by individual intermediaries. The financial sector is generally thought of to add to economic growth, although it may become too big and pose risks to the real economy. The value added by the financial sector as measured in the System of National Accounts may be exaggerated however, as it is insufficiently corrected for risk. On the level of individual financial institutions, the majority of the literature shows economies of scale and diseconomies of scope. Economies of scale and scope may be inefficient when they are the result of market power or implicit governmental subsidies when a large institution becomes too big to fail. In that case a financial intermediary may experience economies of scale and scope privately, while society as a whole experiences welfare losses. Current policy proposals aimed at limiting scale and scope in banking are discussed at the end of this chapter.

2.1 Introduction

The financial sector fosters economic growth through several channels: Financial intermediaries provide payment services to facilitate transactions, allocate capital where it is most productively employed, create information about investment opportunities, monitor investments and diversify risk. As such, the financial sector facilitates the real economy (Beck, 2009). This chapter will formalize how the financial sector adds to economic growth and how to measure the contribution of

the financial sector to the economy as a whole. This will be compared to how the contribution of the financial sector is currently measured, and will attempt a link to the literature on banking efficiency.

In part 2 of this chapter the link between financial development and economic growth is discussed as well as the theoretical channels through which the financial sector adds to the economy as a whole. In part 3, the question of how this value added can be measured is addressed and whether or not the current method of measuring is adequate is discussed in part 4. Part 5 addresses the output of individual financial institutions, while part 6 discusses economies of scale and scope within financial institutions. Part 7 discusses several current policy proposals that deal with scale and scope in banking, such as the Volcker rule in the US and ring-fencing in the UK.

2.2 Financial development and economic growth

The idea that the financial sector can add to economic growth was first suggested by Bagehot (1873) and was first empirically investigated by Goldsmith (1969), who found a positive correlation between the level of financial development and the amount of economic activity. Rajan and Zingales (1998) show a causal link between financial development and economic growth. They show that industries that are more dependent on external finance tend to grow faster in countries that are financially more developed. Hence, financial development may cause higher economic growth. In a meta-analysis of 67 studies covering 1334 estimates on the relationship between financial development and economic growth, Valickova, Havranek and Horvath (2015) find that the literature as a whole finds a moderate, but significantly positive relationship. This relationship becomes weaker during the 1990s and is stronger for developed countries than developing countries.

Recent developments have cast some doubt on the positive relationship between financial development and economic growth. Beyond a certain point financial development may have a negative impact on economic growth: a very large financial sector might impose too much risk on the economy as a whole

(Arcand, Berkes and Panizza, 2015). A bigger financial sector might also have a crowding out effect on the real economy, for instance by attracting human capital or financial capital that could be more productively employed in the real economy (Orhangazi, 2008). The size of the financial sector can be interpreted as reflecting the costs of the financial sector, while the revenues of the financial sector are implied by how well the rest of the economy is doing. However even in the sense of only representing costs to the real economy, a growing financial sector can still have a positive effect on the economy as a whole, as long as the economy as a whole grows faster than the financial sector does. Also, with cross-border effects a growing financial sector might attract business from abroad. This could mean that even when the value added by the financial sector is viewed as a pure transfer of wealth, this might still mean an increase of wealth if the wealth is transferred from abroad.

However, if it can be assumed that the financial sector does not represent a pure income transfer, but can actually add to economic growth, there is still the question of how much it adds to economic growth exactly. In order to estimate the output of the financial sector, first the question needs to be answered what financial intermediaries actually produce, how this output creates value and how this value can be measured.

2.3 Theory on bank output

Hughes and Mester (2010) give an overview of the types of services that are provided by financial intermediaries: banks solve potential problems of moral hazard and adverse selection by screening and monitoring borrowers, banks assess and manage risk, write contracts and resolve non-performance issues. Bhattacharya and Thakor (1993) divide these banking services into two broad categories, brokerage and qualitative asset transformation. Brokerage is about facilitating transactions, and includes transaction services, financial advice, screening and certification, origination and issuance. Qualitative asset transformation is about the modification of assets, such as maturity and credit risk transformation, and includes modifications to term to maturity, divisibility, liquidity and credit risk.

The division in these broad categories stems from a division in the literature on financial intermediaries, which gives two major reasons why banks exist, one strand of literature focusing on the assets side of the bank balance sheet, and one on the liabilities (Bhattacharya, Boot and Thakor, 2004). On the asset side, banks are viewed as delegated monitors that can add value by monitoring investments (Leland and Pyle, 1977) and as such adds value through the brokerage channel. On the liabilities side, banks are viewed as intermediaries that channel deposit funds into loans (Diamond and Dybvig, 1983). Here, banks can provide liquidity to depositors, who would be locked into illiquid capital investments without the presence of a financial intermediary. As such, value is added through the qualitative asset transformation channel.

2.3.1 Brokerage activities

Brokerage activities are services that bring together providers and users of capital without changing the nature of the claim transacted (Bhattacharya and Thakor, 1993). For purposes of understanding, brokerage can be further subdivided into brokerage with monitoring, and brokerage without monitoring.

Brokerage without monitoring includes brokerage as a single shot affair, there is only one interaction between financial intermediary and customer. This includes transactions services to depositors, buying and selling securities, financial advice, credit rating and issuance of securities, such as in the case of an initial public offering. These services are generally explicitly priced by a fee such as financial advice, credit rating and issuance of securities and show up in the intermediaries' books under fees. These transactions can add to wealth by reducing transaction costs and overcoming information asymmetries. Depending on the assumptions on profits made on these transactions, these fees should reflect the amount of welfare that they create.

Brokerage with monitoring is characterized as an ongoing affair, in which the bank creates a relationship with the party to which it offers a loan and goes on for a longer period of time. These activities are usually not explicitly priced, but are instead priced by charging an interest rate to the borrower that is higher than

the costs this loan poses to the bank. This indirect pricing ensures difficulty in estimating output by the financial sector. This type of brokerage is described by the asset side of the financial intermediary literature, starting with Leland and Pyle (1977). In this strand of the literature, the financial intermediary is viewed as supplying delegated monitoring services and by monitoring makes loans possible that would not exist if the intermediary is not present. Holmström and Tirole (1997) show that a financial intermediary with a monitoring advantage can reduce the amount of collateral that a company needs to provide. By introducing an intermediary, more projects become feasible, so that the existence of financial intermediaries adds wealth when the intermediary has a monitoring role.

The part of bank output that is dependent on overcoming information asymmetries can be split up into products that deal with hard and soft information. Hard information can be obtained without establishing a relationship, while soft information requires a relationship. Hard information products include services such as credit cards, and depositor services, while soft information products include mortgages and small business loans. Most hard information can be obtained by looking at the numbers and can be transmitted to another party, while soft information requires partners to look one another in the eyes and is harder to transmit to another party. Hard information products tend in general to be much more easily scalable, so that bigger banks may have a comparative advantage in these products. Similarly, small banks may have a comparative advantage in soft information products, since they might be able to more easily establish a relationship with customers (Berger et al., 2005). Therefore, the organizational form of the bank will have an influence on the type of informational problems it wishes to solve, and as such will also be important for its product mix.

2.3.2 Qualitative asset transformation

Qualitative asset transformation includes all the modifications to assets made by financial intermediaries, such as modifications to the term to maturity and divisibility (Bhattacharya and Thakor, 1993). Maturity transformation happens naturally in banking, by taking short-term deposits and transforming them into

loans that have a longer maturity. Diamond and Dybvig's (1983) seminal paper on financial intermediation describes how depositors are better off in a world with a financial intermediary than without, even without the monitoring service that is provided by the financial intermediary. The Diamond and Dybvig (1983) model features three periods and two investor types, a patient and an impatient type. In the first period investors make an investment decision, while they find out whether they are patient or impatient in the second period. If they are impatient, they will only receive utility from consuming in the second period, while the patient type will prefer to consume in the third and final period. Without a financial intermediary, the investors can invest in a short-term asset that pays off in the second period, or a long term asset that pays more in the final period. Risk averse investors will generally choose to hold the short term asset, which ensures that patient investors forego the higher payoff they would have enjoyed if they chose the long term asset.

By introducing a financial intermediary to the model, an opportunity for additional wealth creation arises. The financial intermediary can pool the resources of the investors and invest part in the long term illiquid asset equal to the expected share of patient types, and invest the rest in the short term asset. When the types are revealed, the impatient types can take their money out while the patient types can wait until period 2 and enjoy the payoff of the long term asset. In this way, the service of deposit creation by a financial intermediary can be thought of an insurance against impatience. The financial intermediary also frees up the funds provided by patient types to entrepreneurs, so that welfare is increased through liquidity creation. In absence of the financial intermediary, the patient types would not have an opportunity to invest in the long term asset, so that long-term financing of investments would be unavailable. Diamond (1984) argues that in a Diamond and Dybvig (1983) world, welfare is maximized if there is only a single financial intermediary, hinting at economies of scale. Economies of scale can either come about because of informational synergies in monitoring, or because the intermediary can better diversify credit risk as it finances more projects.

2.4 Financial sector output measured in the national accounts

In non-financial sectors, value added can usually be calculated by simply taking the output of a company and subtracting the costs of the inputs that were used in order to produce that output. By aggregating over all firms in the sector, total value added of the sector can be found. If for instance output of the motorcycle industry is considered, one would take the value of the motorcycles that are produced, and subtract the value of the wheels, tires, gas tanks and other inputs. Financial services are sometimes explicitly priced, for example the fee that is received when a bank coordinates a merger or acquisition. However, most of the services by financial intermediaries are indirectly priced, such as the management of deposits and the provision of loans. These services are priced through setting a higher interest rate for loans than the rate that is paid on deposits. The difference in these interest rates can be interpreted as the output by a financial intermediary. The standard method for calculating financial intermediation output for the System of National Accounts is called Financial Intermediation Services Indirectly Measured (FISIM). The System of National Accounts introduced FISIM in 1993, and still uses FISIM in its latest (2008) revision. After 2008, FISIM became compulsory in allocating the output of financial intermediaries, before this was optional. [2] Before 1993, all financial services were allocated to intermediate consumption, thus leaving financial output outside of the System of National Accounts.

To determine the output by a financial institution in FISIM, the interest on loans is compared to a risk free reference interest rate. This difference is multiplied with the loan amount, so that the product is the output by the financial institution. For instance, if a loan for 10000 euros is set at an interest of 10%, while the reference rate is 4%, the output value would be $10000 \times (10\% - 4\%) = 600$ euros. For deposits, the opposite is true, where the interest paid is subtracted from the reference rate to find the output by the financial institution.

---

[2] In the 1993 version of the System of National Accounts, countries could therefore choose for themselves if they wanted to treat financial intermediation as an intermediate good, or also allocate (part of) intermediation to final output through FISIM (System of National Accounts, 1993, paragraph 6.129).

Figure 1 shows growth in measured value added of the financial sector compared to the economy as a whole for OECD-countries between 1990 and 2009. Median growth of value added of the financial sector was 3.7 percent, while median growth of total value added was 2.4 percent, and in each country financial sector growth has outperformed growth of the economy as a whole.

Figure 1: Growth of value added by the financial sector and the economy as a whole, 1990-2009, y-o-y growth.
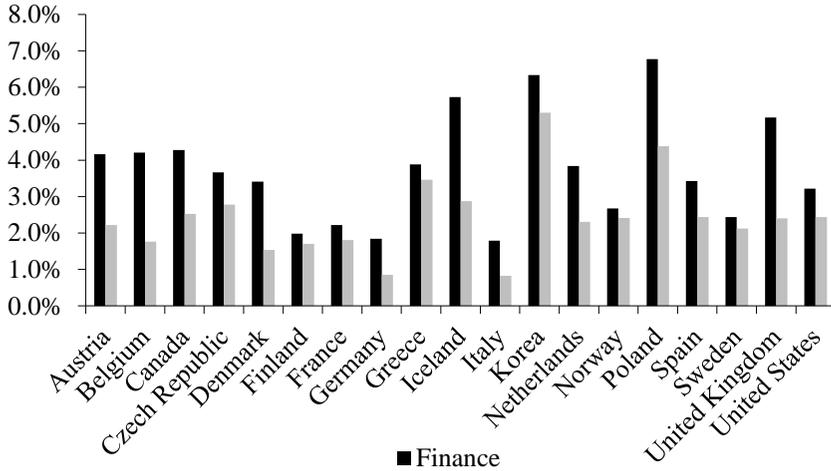
Philippon (2008) states that the rise in financial sector output can be mostly explained through the additional demand for capital by young firms that cannot loan as easily on financial markets. However, other scholars, such as Haldane, Brennan and Madouros (2010), have questioned whether financial sector output has indeed grown very fast, or if there is something wrong with the way in which the System of National Accounts measures financial sector output. FISIM does not take into account the riskiness of loans even though a loan to a riskier counterpart requires a higher interest rate than a less risky loan. In FISIM, this increase in the interest rate is counted as output, since each loan rate is compared to the same risk-free reference rate. Therefore, the increase in output by the financial sector between 1990 and 2009 as seen in figure 1 might simply be a product of a financial sector

that has taken on more risky loans.[3] Note that the criticism on riskless reference rates applies mostly to loans, and not as much to deposits, because most countries offer deposit insurance schemes.[4]

Several authors have made attempts to correct FISIM for risk. Basu, Inklaar and Wang (2011) match loans to securities that face a similar amount of risk in order to construct different reference rates for a wide assortment of loan types. In this way, they find that FISIM overestimates output by the financial sector in the United States in the period 1997-2007 by 21 percent. Similarly, Colangelo and Inklaar (2012) estimate that for the euro area between 2003 and 2008, financial sector output has been overstated by 24 to 40 percent. Inklaar and Wang (2013) use a transactions based rather than a value based activity measure.[5] They find notably different growth paths than the traditional measures of bank output find: the added value of traditional bank services may have been understated, while investment activities might have been overstated.

Fixler and Ziechang (2010) note that the true value of output may lie between FISIM estimates and estimates that are based off reference rates that use the market evaluation of risk, because banks may have better monitoring capabilities than the market. Furthermore it is not clear if risk should be completely removed from the measurement of financial sector output, because risk management can be seen as one of the main services that banks provide. Also,

---

[3] Haldane, Brennan and Madouros (2010) state that the financial sector in the United Kingdom grew in the fourth quarter of 2008, because banks increased their interest on loans as a direct response to the increased liquidity risk they were facing.

[4] Deposits in most countries are insured by a deposit insurance system financed by the government or banking system as a whole. An individual borrower therefore can consider most or all of his deposits as being riskless, so that a riskless reference rate might be relevant for deposits. For example, the Federal Deposit Insurance Corporation in the United States insures deposits up to $ 250000. In the Netherlands deposits are insured up to €100000. Deposit insurance means that credit risk is transferred to the government or system of banks, so that it will generally increase total risk in the system. However, the existence of a deposit insurance system might also alleviate the risk of a bank run, so that it is ambiguous whether or not a system of deposit insurance leads to more or less financial stability. Demirgüç-Kunt and Detragiache (2002) for instance show that the presence of a deposit insurance system increases the risk of a financial crisis.

[5] Inklaar and Wang (2013) do correct these transactions for quality, so that transactions that require more input will be weighted more heavily than transactions that require relatively little input.

Fixler and Ziechang (2010) note that FISIM uses the book value for loans while the market value may provide with a more accurate estimate for financial sector output. However, because loans by financial intermediaries are generally not marketable, it may be difficult to obtain a correct estimate. [6] Furthermore, a transaction based measure such as the one proposed by Inklaar and Wang (2013) assumes constant returns to scale for loans, which may not be realistic. Qualitative asset transformation also frees up liquidity. Additional liquidity has a positive value, but the exact value of liquidity is unclear, as well as how much additional liquidity is created exactly.

Although there is no direct evidence that would back up the Haldane, Brennan and Maduros (2010) claim that financial output has increased because of an increase in risk in the financial sector, circumstantial evidence can be found. Output growth is usually attributed to three sources, namely labor growth, capital growth, and an additional growth called total factor productivity, or TFP for short (Solow, 1957). This TFP-growth is usually attributed to technological change, but can be anything that isn't captured in labor and capital growth. In the financial sector that means that an increase in revenue due to an increase in risk will be included in TFP-growth, as well as an increase across the board of labor improvements or market power that translates into higher prices without increasing costs. Higher TFP-growth automatically implies an increase in the price of either labor or capital. Thus, it comes as no surprise that Philippon and Reshef (2012) find an excessive rise in wages in the financial sector when those wages are compared to similarly skill-intensive jobs outside of the financial sector. These high wages may attract talent from other sectors, which may affect growth in the real economy negatively, thus presenting a negative externality. Looking at the data, it can be seen that in the years before the financial crisis, TFP-growth has been significantly higher than it has been in the economy as a whole in the EU15 (figure 2), which lends support to the claim that the measured increase in the size of the financial sector was mostly an increase in risk.

---

[6] The marketability of loans may have increased in recent years due to financial innovations, especially securitization.

*Figure 2: TFP-growth in the financial sector and the economy as a whole 2000-2007 (y-o-y growth).**
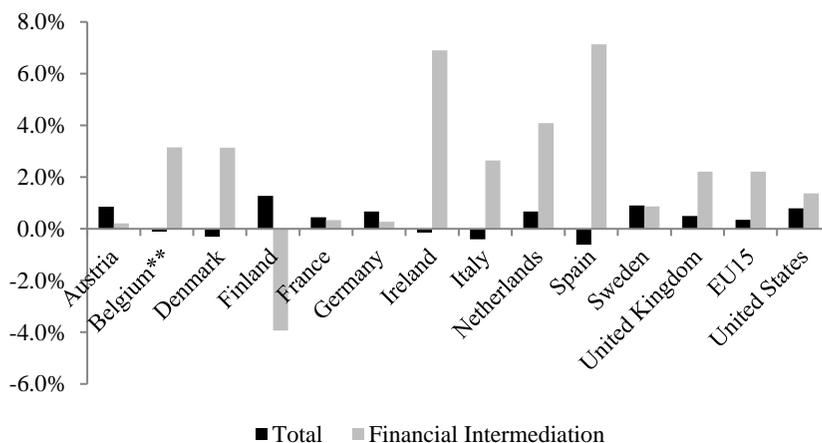
* Data for Greece, Luxembourg and Portugal was unavailable
** 2000-2006.
Source: EU KLEMS database

TFP-growth in the financial sector has been especially pronounced for Ireland and Spain, countries that were hit hard during the financial crisis, lending additional support to the claim that financial sector output growth mostly reflects increases in risk. Furthermore, Boot and Dijkstra (2011) find that TFP-growth in all Dutch service sectors was negative over the period 2000-2007 with the exception of the financial services industry. Beck, Degryse and Kneer (2014) estimate the effects on GDP growth and GDP volatility of both credit to GDP and value added by the financial sector to GDP. They find that higher credit to GDP is associated with less volatility, while a higher value added by the financial sector is associated with more volatility.

In conclusion, output by financial intermediaries is currently measured by FISIM, which takes outstanding loans and multiplies them by an interest spread over a risk free reference rate. One of the problems in this measurement has to do with the treatment of risk: more risk implies higher interest rates, which in turn would increase output of the financial sector. While financial intermediaries do

provide risk management services, an increase in the amount of risk taken by financial intermediaries should in principle not add to financial sector output. In order to correct for risk, proposals have been made to correct for risk on the loan level. In correcting for risk, financial sector output is found to be overstated by about 20 – 40 percent.

2.5 Efficiency of financial institutions

Bank efficiency is generally concerned by how much input is required to create a given amount of output. In terms of financial sector output, increases in bank efficiency can be interpreted as TFP-growth. Efficiency might have either a positive or a negative effect on the size of the financial sector depending on initial efficiency, because there is both a volume and price effect of efficiency (Philippon, 2008). When the financial sector is small and inefficient, increases in efficiency might lead to increased demand because more transactions can be fulfilled, thus leading to an increase in financial sector output. However, when the financial sector is already large and efficient, additional efficiency might reduce output because the fee on each transaction is reduced without increasing demand, so that lower financial sector output is measured.

2.5.1 Measurement of efficiency

As efficiency measures, some authors use directly observable balance sheet ratio's, such as return on assets, net interest margins, overhead cost ratio's and non-performing loan ratio's (Demirgüç-Kunt, Laeven and Levine, 2004; Claessens, Demirgüç-Kunt and Huizinga, 2001; Beck, 2007; Lin and Zhang, 2009). The advantage of these measures is that they are straightforward so that results are relatively easy to interpret. Also, these measures are generally available, both on a micro as well as a macro level, which makes them attractive for use. However, these direct measures do not reflect the production process of financial intermediaries and as such may not reflect efficiency accurately. For example, high

overhead costs may reflect skilled personnel which may be able to attract better business.

In order to incorporate the production process in efficiency measurement, an indirect approach is used in the literature in which a production function is estimated. This type of production function estimates how much input is needed to create a certain amount of outputs. Common approaches for efficiency estimation are Stochastic Frontier Analysis[7] and Data Envelopment Analysis.[8] Independent of the technique, most estimations amount to a variant on the following equation (Hughes and Mester, 2010):

$$ y_i = F\left(z_i, \tau_i, \phi_i, \theta_i \middle| \beta \right) + \varepsilon_i $$

Where y_i is a measure of bank i's performance, such as cost, profit or a combination of both. z_i is a vector of variables that measure key components of bank i's input and output, such as output quantities and input prices. τ_i is a vector of variables that proxy for bank i's technology and risk, for instance the ratio of non-performing loans. ϕ_i is a vector of characteristics of the organizational form and governance of bank i. θ_i is a vector of environment-specific characteristics of the regulatory environment, property rights and contracting rules bank i faces. Finally, the inefficiency term is captured by the error term: $\varepsilon_i \equiv \mu_i + v_i$ is made up of two stochastic terms: A normally distributed white noise error v_i and an efficiency term μ_i that is non-negatively distributed, e.g. lognormal distribution.

Stochastic Frontier Analysis (SFA) focuses on one objective, such as costs or profits, while Data Envelopment Analysis (DEA) can have multiple objectives,

---

[7] Sometimes variations on the Stochastic Frontier are used, such as the Distribution Free Approach (DFA), which uses bootstrapping techniques to estimate the distribution of the error term, or the Fourier Flexible Form, which adds trigonomic terms to the frontier estimation. The Thick Frontier Approach (TFA) looks at efficiency differences between the highest and lowest profit or cost quartile, and as such does not give information on the efficiencies of individual firms.

[8] A variant that is sometimes used, is the Free Disposable Hull (FDH), which is a DEA technique that does not assume linear substitution between banks on an isoquant. Where the DEA-frontier is a continuous function, the FDH frontier is a step function.

such as interest income, income from fees and other operating income. The Stochastic Frontier has a stochastic frontier, while the frontier in Data Envelopment is assumed to be deterministic. [9] Because of its deterministic nature, DEA is sensitive to outliers. Depending on the approach, different measures for the variables are taken. There is some disagreement on which approach works best, as both have their own advantages and disadvantages. The nonparametric methods, such as DEA, do not place any assumptions on the distribution of the efficiency measure, while the parametric methods do. However, the nonparametric methods don't allow for stochastics in the determination of efficiency, so that all errors are seen as differences in efficiency. Berger and Humphrey (1997) survey 122 articles on bank efficiency and found that 69 used non-parametric methods, while 60 used parametric methods. [10]

The majority of studies that I found that come after Berger and Humphrey (1997) use a parametric method, and among these the Stochastic Frontier Approach that measures cost efficiency is most popular (table 1).

---

[9] In terms of the error term this means that for the DEA $v_i = 0$ and $\varepsilon_i = \mu_i$, so that all errors are modeled as inefficiencies.
[10] Some studies used more than one approach.

Table 1: Methods to estimate efficiency after 2000.

Method	Measure of Efficiency	Study
Stochastic Frontier Analysis (or Distribution Free Approach, Fourier Flexible Form)	Cost efficiency, Profit Efficiency, Stock market efficiency, Market to Book efficiency	Adams, Bauer and Sickles (2004); Allen and Liu (2007); Baele, De Jonghe and Vander Vennet (2007); Berger, Hasan and Zhou (2010); Berger and Mester (1997); Bolt and Humphrey (2010); Bos et al. (2009); Bos and Kolari (2005); Bos and Kool (2006); Bos and Schmiedel (2007); Bonin, Hasan and Wachtel (2005); Bossone and Lee (2004); Brissimis, Delis and Tsionas (2010); Carvallo and Kasman (2005); De Jonghe and Vander Vennet (2008); Fang, Hasan and Marton (2011); Huang and Wang (2004); Humphrey and Vale (2004); Iimi (2004); Koetter, Kolari and Spierdijk (2012); Košak and Zorić (2011); Koutsomanoli-Filippaki and Mamatzakis (2010); Lensink, Meesters and Naaborg (2008); Lozano-Vivas and Pasiouras (2010); Maudos and Fernández de Guevara (2007); Pasiouras, Tanna and Zopounidis (2009); Tadesse (2006); Weill (2009); Yildirim and Philippatos (2011)
Nonparametric: Data Envelopment Analysis (or Free Disposable Hull)	Multiple outputs: Different loan volumes, income from different sources	Barth et al. (2010); Casu and Girardone (2010); Chen, Skully and Brown (2005); Cummins et al. (2010); Delis, Molyneux and Pasiouras (2011); Delis and Papanikolaou (2009); Lozano-Vivas, Pastor and Hasan (2001); Wheelock and Wilson (2012)
Balance sheet indicators	Return on Assets, Return on Equity, Net Interest Margin, NPL ratio, COI ratio	Asaftei (2008); Beck (2007); Claessens, Demirgüç-Kunt and Huizinga (2001); Claessens and Van Horen (2012); Demirgüç-Kunt, Laeven and Levine (2004); Lin and Zhang (2009)
Tobin's q	Market value assets/ book value assets	Elsas, Hackethal and Holzhäuser (2010); Laeven and Levine (2007)

In terms of the way in which banks produce, there are two different setups for the efficiency process, the production approach and the intermediation approach (Berger and Humphrey, 1997; Mester, 2008). In the production approach, financial institutions are seen as producers of financial services for account holders. In the intermediation approach, financial institutions are thought to intermediate funds between savers and investors. As inputs for the production approach, only physical inputs such as labor and physical capital are considered as well as ICT capital and human capital. For the intermediation approach, funds and interest costs should also be included as inputs. The production approach thus treats deposits as outputs in the production process, while the intermediation approach treats them as inputs.

Both approaches have their own advantages and disadvantages, depending on the goal of the estimation (Berger and Humphrey, 1997). The production approach might be better suited for comparing efficiency between bank branches, since funding and investment decisions are usually taken at a higher level than the branch level. Similarly, because of this reason, the intermediation approach is better suited when comparing banks as a whole, since it does include funding and investment decisions. Therefore, the intermediation approach would also give a more accurate description of profit and cost efficiencies, since not only production costs, but also interest costs are taken into account. Hughes, Mester and Moon (2001) investigate whether financial institutions behave as if deposits are inputs or outputs in the production process, and find that deposits are used as if they are inputs. Thus the intermediation approach might be more suitable in describing behavior of individual financial institutions.

Hasan, Koetter and Wedow (2009) focus on the interaction between bank efficiency and total financial production. They state that bank efficiency might be used as a proxy for the quality of financial production, and as such might play a role. Using a dataset on regional growth in 11 European countries, they find a significantly positive effect of bank (profit) efficiency on economic growth. Koetter and Wedow (2010) use a German dataset over the period 1995-2005, they find a significantly positive effect of bank (cost) efficiency on economic growth, while the size of the financial sector has no effect. Berger, Hasan and Klapper

(2004) use data across 49 countries over the period 1993–2000 to show that efficiency ranks and market shares of small, private banks contribute positively to economic growth. In contrast, Carbó Valverde, Humphrey and Rodríguez Fernández (2005) study 5 Spanish regions between 1986 and 1998 to find that bank competition did not significantly impact regional economic growth, so that financial sector quality might not influence economic growth.

2.5.2 Treatment of risk

In the bank efficiency literature, proxies for risk are often included, although it is unclear whether or not this is done in a satisfactory manner. Mester (1996) includes a quality measure of output in a stochastic frontier approach to account for risk. The quality measure she used was the average volume of nonperforming loans.[11] This measure has been used by numerous authors afterwards (for example, Berger, Hasan and Zhou, 2010; Fang, Hasan, and Maton, 2011). One problem with nonperforming loans as a measure for risk is that it is an ex-post measure, and might not give an accurate portrayal of ex-ante risk taking.

Another measure that is used, is loan loss reserves (Lensink, Meesters and Naborg, 2008) which may better capture ex-ante risk taking. However, riskier managers might actually prefer to hold lower reserves, so that higher loss reserves might in fact signal less risky behavior. Also, too-big-to-fail aspects of banking are not accounted for in this measure. Hughes, Mester and Moon (2001) take leverage as a measure of risk. Leverage may signal risk taking by firms, as a smaller amount of equity increases the possibility of financial distress. Leverage is widely used as a proxy for risk in the literature (for example, Berger, Hasan and Zhou, 2010; Fang, Hasan, and Maton, 2011). Leverage is a good proxy for financial risk, but does not necessarily reveal anything about operational risk. Also, leverage does not take too-big-to-fail subsidies into account. Finally, some authors such as DeYoung (1997) use risk weighted assets. These might be reported under the Basel guidelines. This

---

[11] These include loans that are not accruing interest, and loans that are accruing interest but are at least 30 days overdue. Mester (1996) uses a period of 30 days, which might differ between measures: some use loans that are 90 days overdue.

usefulness of this measure is dependent on how well the risk weights are set.[12] A measure that has not been widely used yet are spreads on credit default swaps.[13] These give the price of insuring against default by a financial institution and therefore directly measure risk at the bank level, ex ante, as investors are forward looking. An advantage of this measure is furthermore that investors should take implicit too-big-to-fail subsidies into account and as such price the riskiness of the bank accordingly. A disadvantage is that CDS spreads are generally only available for the largest of banks, limiting a possible sample.

2.5.3 Conclusion

When measuring output at the bank level, most studies are interested in the efficiency of production, which is most often measured with stochastic frontier analysis. This method measures the minimal amount of costs required to create a given amount of outputs, or the maximum profit that can be created with a given amount of inputs. On the institutions level, there is evidence that deposits are considered to be inputs in the production process, rather than an output that adds value. Corrections for risk have so far focused on nonperforming loans, loan loss reserves and leverage, which might not adequately correct for risk because they either are ex-post measures, don't take operational risk into account or don't account for too-big-to-fail effects.

---

[12] There has been some critique of the Basel 2 risk weights. Acharya (2011) argues that systemic risks have not been recognized in estimating risk weights and that risk weights are heavily dependent on credit ratings, while credit rating agencies might not adequately rate credit when times are good.

[13] Credit default swaps offer insurance against defaults on loans. The seller of the credit default swap will compensate the buyer when a credit event or default occurs. This will usually mean that the buyer gets the face value of the loan, while the seller gets the defaulted loan.

2.6 Economies of scale and scope

Like the financial system as a whole, individual financial institutions have incentives to grow as large as possible. Goldstein and Véron (2011) show that the biggest financial institutions have grown sevenfold between 1990 and 2009 and Uhde and Heimeshoff (2009) show that the concentration of the biggest banks in European banking markets has increased between 1997 and 2005, suggesting banks have grown larger on average over this period. This increase in size may be efficient because of economies of scale and scope or inefficient because it consists of empire building incentives of managers, increases in market power and implicit too-big-to-fail guarantees.

It is useful to disentangle scale, scope and geographical focus. Scale is the size of the activities of the bank, scope is the number of different types of activities the bank undertakes and geographical focus how many geographical areas the bank is active in. Economies of scale, scope and geography are characterized by cost decreases or revenue increases, while diseconomies of scale, scope and geography are characterized by cost increases or revenue decreases.

2.6.1 Theory on scale and scope

Table 2 presents the different sources of economies of scale, scope and geography. Most sources of scale may also affect economies of scope and geography.

The fixed component of ICT investment, investment in the corporate brand and innovation related costs ensure that expanding the total scale, scope and geography of a bank will spread those fixed costs over a larger size, number of activities and number of countries, leading to lower average costs. In a similar vein, a better ICT infrastructure might enable a bank to more easily offer a wider range of products to customers in multiple countries, leading to revenue economies of scale, scope and geography. Information processing is another possible source of economies of scale relating to ICT. Insofar information required for providing

loans is hard rather than soft,[14] ICT can enable economies of scale by processing information at a low cost.

Table 2: Theoretical sources for economies of scale, scope and geography.

Source	Cost or revenue	Scale, scope or geography
ICT	Cost, revenue	Scale, scope, geography
Brand/ Reputation	Cost, revenue	Scale, scope, geography
Innovation	Cost, revenue	Scale, scope, geography
Diversification	Cost	Scale, scope, geography
Too big to fail	Cost	Scale
Too complex to fail	Cost	Scope
Too interconnected to fail	Cost	Geography
Market power	Revenue	Scale
Internal capital markets	Cost	Scale, scope, geography

Diversification of risk is more controversial as a source of economies of scale, scope and geography. Traditional finance theory states that diversification will not bring any advantages to the firm, because investors can diversify their own portfolios so that they will not pay a premium for diversified firms (Ross, 1976). However, diversification may add value through decreasing the possibility of financial distress. Because of the nature of financial distress in the banking sector, which is characterized by bank runs and fire sales, financial distress costs may be especially high. By mitigating these costs of financial distress, diversification may create economies of scope in the financial sector. Also, some services offered by financial intermediaries contain a guarantee component. In order to sell these guarantee types of services at all, a certain credit rating may be required. Internal capital markets may also provide economies of scale and scope, depending on the economic situation. During crisis times divisions of a larger company may be able to attract funding internally while markets are hesitant to provide funding. As such,

---

[14] Petersen (2004) provides a discussion on hard versus soft information. Hard information is generally collected in the form of numbers, while soft information is collected as text. Furthermore, the collection of hard information can be separated from its use, while collection and use generally can't be separated for soft information.

a large bank might be more able to allocate capital to profitable segments when capital markets dry up, while smaller institutions are unable to obtain capital for their investments on the market (Huang, Tang and Zhou, 2012).

Besides real economies of scale, scope and geography, an artificial advantage can come about for large financial institutions when they become too big to fail, too complex to fail or too interconnected to fail. When the bankruptcy of a very large financial institution has a negative impact on the financial system as a whole, the government might have no choice but to save the financial institution, thereby creating an ex ante bankruptcy insurance for that institution, leading to possible lower costs of funding. Furthermore, when a larger scale or scope is achieved through mergers and acquisitions, this may lead to increased market concentration and an increase in market power, which may lead to monopolistic rents. However, even though increases in market power and implicit too-big-to-fail-subsidies might benefit individual institutions, they have negative external effects and harm society as a whole. As such, they may lead to economies of scale, scope and geography that are positive privately, but negative for society as a whole.

Increasing scale, scope and geography may come at a cost as well, leading to diseconomies of scale, scope and geography. Agency problems may increase from increasing the size of a bank as well as spreading a bank over a wider range of activities and countries. Furthermore, internal capital markets may lead to diseconomies when profitable segments of a bank subsidize unprofitable segments. Whether or not internal capital markets profit the bank ultimately depends on which effect dominates (Boot, 2011).

The type of banking activity matters: Walter (2003) states that economies of scale are easier to realize for transaction banking activities than for relationship banking activities. Marinč (2013) adds to this point in stating that relationship banking activities mostly deal in soft information, which is harder to scale up than transaction banking activities which use hard information which is more easily accumulated through the use of ICT and as such more easily scalable. As with economies of scale, the type of banking activity matters for the creation of economies of scope. On the one hand, relationship and transaction banking

activities might create synergies through ICT cost sharing, R&D and brand synergies, internal capital markets and through diversification. However, there might also be a dark side to combining relationship and transaction banking activities in which inefficient cross-subsidizing might take place. Boot and Schmeits (1998) note that trading activities might free-ride on more traditional banking activities if the bank allocates the same costs of capital for all activities in a bank. In that case, the riskier activities that should require a higher rate of return appear more attractive than they actually are, because the costs of capital are not adjusted to reflect this higher risk.[15] Furthermore, trading activities are generally more easily scalable than relationship banking activities, creating an incentive to use all the capital that is available for trading without taking an increase in risk of the activities into account.[16]

2.6.2 Empirics on scale and scope

Empirical studies on scale in banking from the 1980s and 1990s generally find that the relationship between economies of scale and asset size displays an inverted U shaped pattern. In those studies economies of scale are exhausted at a level of around $100 million to $500 million in total assets (Berger and Humphrey, 1997; McAllister and McManus, 1993). Studies near the end of the 20th century tend to find that the estimate for the asset size at which economies of scale are exhausted has gone up to around $10 billion to $25 billion, but generally still tend to find an inverted U shaped relationship between scale and asset size (Berger and Mester, 1997; Hughes, Mester and Moon, 2001). The most recent studies using data past 2000 tend to find economies of scale at higher levels, even for the largest of banks (Feng and Serlitis, 2010; Hughes and Mester, 2015; Wheelock and Wilson, 2012; Gandhi and Lustig, 2015).

---

[15] Krüger, Landier and Thesmar (2015) find that companies that use a single discount rate for all activities tend to allocate more capital to divisions that are associated with more risky activities.

[16] A more formal analysis of the interaction between traditional banking activities and trading activities can be found in Boot and Ratnovski (2016).

Table 3 presents an overview of selected studies after 2000. [17] The fact that economies of scale are found at higher and higher levels in the literature may be due to econometric improvements (Mester, 2008), or changes in the financial environment: Technological improvements through ICT may have taken hold past 2000 (Marinč, 2013) and the first decade of the 21st century was characterized by financial deregulation such as the Gramm-Leach-Bliley Act.

While the literature generally seems to support the existence of economies of scale in banking, the exact sources of these economies of scale are less well-understood. Many researchers point to ICT as a possible source of economies of scale in banking, such as Boot (2003) and Walter (2003). However, empirical work in this area has been limited as of yet. Based on an overview of the literature, Berger (2003) states that advances in information technology appear to have increased productivity and scale economics. Direct evidence is limited, however. Erber and Madlener (2009) for instance find no significant relationship between ICT capital and bank productivity on a country level. Similarly, Beccalli (2007) uses a European data set over the period 1995-2000 to find a negative relationship between bank efficiency and country-level bank investment in hardware and software, but a positive relationship between bank efficiency and country-level bank spending on ICT consulting services. Martín-Oliver and Salas-Fumás (2008) find that the stock of ICT capital explains about one third of the growth in output of Spanish banks in the period 1983-2003. However, investment in ICT did not increase profits. Ho and Mallick (2010) find that ICT investment can lead to cost savings for banks, but can also lead to increased competition, and they find a negative relationship between ICT investment and bank profitability. Koetter and Noth (2013) find that merely increasing ICT investment does not lead to higher profitability, but that efficiency in employing ICT matters for banks.

---

[17] Gambacorta and Van Rixtel (2013) provide a similar overview of studies on economies of scale, scope and geography in banking.

Table 3: Empirical evidence economies of scale, scope and geography.

	Evidence	N	Literature
Scale	Economies of scale	27	Berger and Mester (1997); Adams, Bauer and Sickles (2004); Huang and Wang (2004); Humphrey and Vale (2004); Iimi (2004); Tadesse (2006); Allen and Liu (2007); Asaftei (2008); Lensink, Meesters and Naaborg (2008); Barth et al. (2010); Feng and Serlitis (2010); Hughes and Mester (2015); Wheelock and Wilson (2012); Berger, Hasan and Zhou (2010); Bos and Kolari (2005); Bossone and Lee (2004); Carvallo and Kasman (2005); Chen, Skully and Brown (2005); Claessens and Van Horen (2012); De Haan and Poghosyan (2012); Delis and Papanikolaou (2009); Fang, Hasan and Marton (2011); Brewer and Jagtiani (2013); Gandhi and Lustig (2015); Beccalli, Anolli and Borello (2015)
	Diseconomies of scale	8	Baele, De Jonghe and Vander Vennet (2007); Bonin, Hasan and Wachtel (2005); Bos and Kool (2006); De Jonghe and Vander Vennet (2008); Elsas, Hackethal and Holzhäuser (2010); Davies and Tracey (2014); Lin and Zhang (2009); Sanyal and Shankar (2011)
Scope	Economies of scope	10	Hughes, Mester and Moon (2001); Drucker and Puri (2005); Asaftei (2008); Baele, De Jonghe and Vander Vennet (2007); Carbó Valverde and Rodríguez Fernández (2005); Carvallo and Kasman (2005); De Jonghe and Vander Vennet (2008); Elsas, Hackethal and Holzhäuser (2010); Iimi (2004); Lozano-Vivas and Pasiouras (2010)
	Diseconomies of scope	14	DeLong (2001); DeYoung and Roland (2001); Adams, Bauer and Sickles (2004); De Nicoló et al. (2004); Stiroh (2004a; 2004b); Stiroh and Rumble (2006); Laeven and Levine (2007); Schmid and Walter (2009; 2014); Berger, Hasan and Zhou (2010); Bos and Kolari (2005); Chaplinsky and Erwin (2009); Cummins et al. (2010); Huang and Wang (2004)
Geo-graphy	Economies of geography	4	Asaftei (2008); Deng, Elyasiani and Mao (2007); Deng and Elyasiani (2008); Gulamhussen, Pinheiro and Pozzolo (2010)
	Diseconomies of geography	3	Klein and Saidenberg (2010); Goetz, Laeven and Levine (2013; 2016)

Since the most recent financial crisis, a bigger focus in the literature has been placed on the effect of too-big-to-fail. The effect of too-big-to-fail has been traditionally proxied by using dummies that are equal to one when a bank crosses a certain asset or market capitalization threshold. For example, Brewer and Jagtiani (2013) find that investors are willing to pay a premium when the result of a merger or acquisition would create a bank with assets over $100 billion. Rime (2005) similarly finds that banks above a variety of thresholds tend to have higher credit ratings and Baker and McArthur (2009) show that banks that have more than $100 billion in assets have lower costs of capital. Becalli, Anolli and Borello (2015) show that economies of scale are larger for banks that are designated as systemically relevant by the European Commission.

Recent work by Ueda and Weder di Maurer (2012), Davies and Tracy (2014), Noss and Sowerbutts (2012) and Bijlsma and Mocking (2013) focuses on a proxy for too-big-to-fail that is outlined by Haldane (2010). These authors take differences in Moody's ratings for banks as standalone entities and the ratings for those same banks when possible government support is taken into account. By taking the difference between these ratings, a proxy for the size of the implicit funding subsidy can be found. If a bank's financial strength as a standalone entity is deemed low but its unsecured debt is rated highly, risk to investors is deemed low, so that there is a large implicit governmental guarantee. Using the ratings uplift measure to estimate the size of the implicit subsidy yields an estimate of a cost advantage of 60 to 80 basis points for banks that are systemically important (Ueda and Weder di Maurer, 2012), which represents a value of approximately 0.1 – 1 percent of GDP (Bijlsma and Mocking, 2013). Davies and Tracey (2014) use ratings uplifts in scale estimation and find that the ratings uplift explains all economies of scale for large banks. This result is not without controversy, as Hughes and Mester (2015) note that Davies and Tracey (2014) do not account for endogenous risk-taking in their study, which may affect estimations economies of scale negatively. When endogenous risk taking is taken into account, as is done in chapter 3 of this dissertation, economies of scale are partially, but not fully, explained by implicit governmental subsidies.

2.6.3 Conclusion

Most studies on bank efficiency find positive economies of scale. Studies before Berger and Humphrey (1997) mostly find economies of scale up to a certain amount of assets, while later studies typically find economies of scale at higher asset levels as well. This may be due to improvements in estimation techniques, or may be the result of financial deregulation or technological improvements on ICT. Or these economies of scale might simply be the result of additional market power or implicit too-big-to-fail subsidies. While there is evidence of economies of scale in banking at almost all levels, the evidence on economies of scope is mixed at best, with a majority of studies finding a negative effect. As for the sources of economies of scale, ICT theoretically plays an important role although more empirical research is needed on the topic. Implicit governmental subsidies for banks that are too big to fail also play a role, although they do not explain all economies of scale in banking.

2.7 Policy proposals

Since the most recent financial crisis, many countries have proposed and implemented policies that aim to reduce the possibility that a bank needs to be bailed out by the government. Some proposals span multiple countries, such as the Basel 3 accord, while others are limited to a single country. Some proposals aim to limit the scale or scope of banks while others explicitly tax banks. Although policy proposals vary wildly, some common factors can be found, and the proposals can roughly be distributed in proposals that i. increase bank equity, ii. place limits on the business model of banks and iii. tax banks directly. Of interest for the effects on scale and scope are the proposals that place limits on the business model of bank. In the US, the Volcker rule (Section 619 of the Dodd-Frank Wall Street Reform and Consumer Protection Act) forbids retail banks from engaging in certain activities and investing in certain types of investment funds, while the Vickers commission in the United Kingdom has advised to legally separate retail banking activities from other activities (ring-fencing). Similar proposals have been made

for the EU by the Liikanen Committee (Liikanen et al., 2012) which advised the European Commission on financial sector regulation. These three proposals are discussed in more detail below.

The Volcker rule is part of The Dodd-Frank Wall Street Reform and Consumer Protection Act, a large scale overhaul of the US financial sector (Greenbaum, Thakor and Boot, 2016). The Volcker rule forbids banking entities from engaging in i. investment in hedge funds, private equity funds and pooled investment funds, and ii. proprietary trading, defined as short-term trading with the intent to profit from the difference between the purchase and sale price (Thakor, 2012). Within these categories there are exceptions, such as activities that are related to market making and hedging. Whether or not an activity qualifies as an exception is generally hard to distinguish, leading to lengthy regulation.[18] The theory behind the Volcker rule is that by limiting the activities of deposit-taking institutions, risk that is created outside of deposit-taking institutions does not spill over. As such, financial distress that has its origin in trading activities may not affect deposit-taking institutions so that government intervention may be less necessary.

It has been debated whether or not the Volcker rule would actually be effective in limiting systemic risk. Elliott and Rauch (2014) note that the Volcker rule may limit exposure to financial market fragility for banks but does not eliminate credit risk, a mayor component of the latest financial crisis. Furthermore, not all forms of contagion may be addressed with the Volcker rule. For example, Lehman Brothers was an investment bank, but when it fell still intensified the financial crisis. Furthermore, banks without trading activities are not fully riskless either, like for example Northern Rock that was nationalized during the financial crisis, even though it hardly had any activities that the Volcker rule forbids (Greenbaum, Thakor and Boot, 2016).

As for the efficiency effects of the Volcker rule, the effects of limiting scope would probably be limited given the lack of evidence of economies of scope found

---

[18] The Dodd-Frank Act is 848 pages long, of which 11 pages are dedicated to the Volcker Rule. However, the actual Volcker Rule when it was implemented was 71 pages in length, with an 850 page preamble.

in the literature. Thakor (2012) argues that market making by banks may suffer because of the Volcker rule, but this is disputed by Admati and Pfleiderer (2012) who note that market making by banks may not be socially desirable.[19] There is an argument to be made that the increase in regulation creates artificial economies of scale, as the costs of complying with regulation may have a fixed component and as such burden large banks less than small banks.

In the UK, the Vickers Commission (Independent Commission on Banking, 2011) advised ring-fencing of banking activities. Ring-fencing is the legal separation of retail banking from wholesale and investment banking activities. This means that retail and investment banking subdivisions are allowed under the same bank name, but each activity has a separate managerial board and has its own separate capital structure (and as such is subject to its own separate capital requirements). Furthermore, the subdivisions are only allowed to trade with one another at arm's length. In case of a financial crisis, the government would only need to rescue the retail part of the banking operations.

Whether or not limiting the scope of activities through ring-fencing will affect risk of the financial system is up for debate. Systemic risk can also be created outside of the retail banking sector,[20] and contagion risk may still be possible through a reputation channel (Admati and Hellwig, 2011; Goodhart, 2012). Furthermore, Martinova (2015) notes that ring-fencing may give incentives to place relatively risky assets in the deposit taking part of the bank, while keeping relatively safe assets on the balance sheet of the investment part of the bank.

In terms of efficiency, ring-fencing still allows some economies of scale through sharing information and sharing the brand name. Furthermore, the bank can still provide multiple products to the same client. The economies of scope that are created by internal capital markets that are mostly positive during crisis times could disappear, as only the investment bank may function as a capital backstop for the retail bank and not the other way around. If the investment banking division

---

[19] Note that Admati and Pfleiderer (2012) do not provide an argument why the Volcker rule may not hamper banks in a socially undesirable way.

[20] As noted, Lehman Brothers was close to a pure investment bank.

is hit harder during the crisis, this means there is no possibility of funnelling capital from the retail to the investment bank.

The Liikanen report (Liikanen et al., 2012) which advised the European Commission on financial regulation combines features of the Volcker rule and the Vickers committee. It proposes that trading activities are moved to a separate entity if they reach a certain size. As such, it mirrors the proposals by the Vickers commission, although it aims to separate trading activities from the retail and investment banking activities, rather than separating retail activities from the investment and trading activities. In this way, it is more similar to the Volcker rule, which forbids certain trading activities. The aim is similar in that the proposal attempts to ensure that risky trading activities do not benefit from implicit governmental subsidies. And because the proposal is similar to the Volcker rule and proposals of the Vickers committee, it is subject to the same criticisms of increased regulatory burden and possible ineffectiveness in dealing with contagion.

In academia, proposals for limiting scope of financial institutions have gone even further by suggesting different forms of narrow banking, in which deposits can only be used to invest in risk-free assets, while banks that invest in other assets have to be fully financed with equity (Kotlikoff, 2010; Pennacchi, 2012; Cochrane, 2014). Narrow banking is a more extreme variant of the proposals currently enacted within the US, UK and EU and as such would have similar, but stronger effects. Direct limits on the scale of banks have also been proposed in academic circles (Buiter, 2009; Fisher, 2013), but have not led to actual policy proposals on size restrictions of banks. However, direct bank taxation has been proposed, which may be seen as a size restriction insofar the tax is only levied on the biggest of banks. Furthermore, regulation that aims to strengthen competition between banks may also affect bank size. Limits on the size of banks may impact economies of scale. DeYoung (2010) states that the question for policymakers should not be whether banks are too big, but how a bank can be resolved if it fails, regardless of size and interconnectedness. Mester (2010) adds to this by noting that authorities need to find a way to make financial firms fail without precipitating a crisis. Imposing a strict size limit on banks would hamper economies of scale, while a credible resolution mechanism may also limit risk taking without negatively affecting

economies of scale. Furthermore, although size and too-big-to-fail generally go hand in hand, it is also possible for smaller banks to become too-big-to-fail, limiting the effectiveness of size caps on financial intermediaries.[21]

Besides changes in the business model of banks, increasing bank equity (capital requirements) has been at the forefront of the academic discussion on financial regulation. Capital requirements make up one of the pillars of the Basel 3 accord, which proposes both a minimal leverage ratio of three percent as well as a minimal ratio of capital to risk-weighted assets (the size of this ratio depends on the economic situation and is maximally thirteen percent). Proposals in academia have gone much further than the Basel 3 capital requirements: Admati et al. (2013) plead for a minimal unweighted leverage ratio of twenty percent of bank assets, while Kotlikoff (2010) aims to turn banks into fully equity finances entities. These authors argue that increasing equity may not affect banks much besides lowering incentives for risk taking, noting the classic Modigliani and Miller (1958) insight that funding costs are independent of the capital structure. For banking, this may not be the case. Deposit insurance and implicit governmental guarantees may limit the risk compensation demanded by debtholders even at very high values of leverage, making debt financing relatively cheap. As such, increasing equity requirements may increase funding costs for banks.[22] Empirical studies do tend to find that increases in equity for banks are associated with cost increases with cost increases around 13 to 15 basis points for a one percent increase in tier 1 capital to risk-weighted assets (BCBS, 2010; Slovik and Cournède, 2011; Santos and Eliot, 2012). At the same time however, Delis, Molyneux and Pasiouras (2011) find that regulations related to Basel 2, such as capital requirements and supervisory power do not influence bank efficiency. As such, it is unclear how banks are affected by additional capital requirements. There may be a secondary effect of capital

---

[21] In chapter 3, ratings uplifts are introduced as a measure of too-big-to-fail and are shown to also exist for smaller banks. As a concrete example, one may consider SNS REAAL in the Netherlands, which was nationalized in 2013 with an asset size of approximately €125 billion at the time.

[22] Note however that the costs of risk-taking do not disappear but are borne instead by government, so that social costs may decrease with increased equity requirements even if private costs to individual banks increase.

requirements. In most proposals, banks that qualify as Systemically Important Financial Institutions (SIFI) are required to hold more equity. Although it is unclear exactly how a bank qualifies as a SIFI it seems to be related to size. As such, increased equity requirements for systemically important banks may disincentivize banks from growing past a certain size, which may limit economies of scale. Variants of capital requirements have also been proposed, such as bail-in capital, in which a certain percentage of debt is converted to equity before the government intervenes, and Contingent Convertible Bonds, which is debt that converts to equity at a supervisor's discretion or when the value of equity drops below a certain threshold. Although these measures differ in execution, they all aim to increase the equity component of banks' capital structure.

2.8 Conclusion

Output in the financial sector has grown faster over the last two decades than production in the economy as a whole. However, it is unclear whether or not this has to do with an additional contribution of the financial sector to the economy as a whole, or if this has to do with the way in which the output of the financial sector is currently measured. Increases in risk taking amongst banks result in more financial sector output measured, as do increases in lending amongst the financial sector itself. In order to correct for this, interest reference rates could be corrected for risk, transaction based measures could be used, or assets values could be corrected for risk. Mismeasurement of the financial sector might have implications for governance of the financial sector and might influence governmental interference in the financial sector.

On the individual level, financial institutions seem to face positive economies of scale. The exact sources of these economies of scale are unclear, however. Economies of scale might come about due to technological improvements, deregulation, better empirical measurement, or due to market power or implicit too-big-to-fail subsidies. The source of these scale economies heavily influences the preferred policy response. The evidence of economies of scope is

ambiguous, since most of the literature finds insignificant or negative economies of scope. As such, current policy responses to the financial crisis that limit the scope of banks are unlikely to have a very large effect on output by the financial sector.

Chapter 3

Economies of Scale or Too Big To Fail? Evidence from the European Banking Sector 2002-2011

This chapter estimates economies of scale and scope for banks within the Eurozone between 2002 and 2011 and attempts to uncover the sources of those economies of scale and scope. Economies of scale are found to be positive and significant for all years and at all asset levels. To estimate if economies of scale are the results of implicit too-big-to-fail subsidies a proxy for too-big-to-fail is included that is based on ratings uplifts calculated from Moody's credit ratings. With the inclusion of ratings uplifts, economies of scale become smaller but remain positive, so that economies of scale in banking are only partially explained by implicit governmental subsidies. Stronger scale economies are found for banks that focus on transaction banking compared to those that focus on relationship banking. Economies of scope are found to be positive for all years and to slightly increase during crisis years. However, the results for economies of scope are sensitive to the model specification and not significant in all model specifications. The results indicate that policy measures that attempt to limit scale and scope in the banking sector increase costs so that financial stability may be more efficiently guaranteed through other measures.

3.1 Introduction

Since the start of the recent financial crisis several large financial institutions have received state aid and concerns have been raised regarding the status these financial institutions as being too-big-to-fail. Since then, different countries have proposed a variety of measures that limit the scale and scope of banks through forbidding

certain activities,[23] explicitly separating financial activities,[24] or levying additional taxes on banks.[25] These measures have in common that they make it more costly for a bank to undertake additional activities and thus have a detrimental effect on the size and scope of banks.[26] Although these measures may enhance financial stability, they may just as easily not matter for financial stability,[27] while decreasing bank size might have adverse effects on the efficiency of the financial system. Possible economies of scale and scope[28] imply that larger banks might have lower average costs than smaller banks, which could lead to lower costs for consumers of financial services of large banks.

As noted in chapter 2, empirical studies on economies of scale in banking have generally found larger economies of scale over time. Studies that use data from the 1980s and before generally find that economies of scale are already exhausted at very small bank sizes, of about $100 million in assets (Berger and Humphrey, 1997). Recent studies tend to find economies of scale at the highest asset levels, suggesting that even the largest of banks could decrease their costs or increase their profits by increasing their scale (Feng and Serlitis, 2010; Hughes and Mester, 2015; Wheelock and Wilson, 2012). Meanwhile, the evidence of economies of scope in banks is sparser. A diversification discount is generally found, so that diversified financial intermediaries are worth less than specialized intermediaries (Laeven and Levine, 2007; Schmid and Walter, 2009; 2014; Berger, Hasan and Zhou, 2010; Cummins et al., 2010). Studies of scale and scope in banking have typically focussed on data from the United States, although similar evidence is found from studies that focus on worldwide data.

---

[23] The Volcker rule in the United States is an example of this kind of regulation.

[24] For example, the Vickers committee in the United Kingdom advocates ringfencing, which is the legal separation of retail and investment banking

[25] In the Netherlands, policy has been initiated in order to levy a banking tax.

[26] President of the Federal Reserve Bank of Dallas Richard W. Fisher (2013) proposed to directly limit the absolute size of banks.

[27] See for instance Admati and Hellwig (2011) on the Vickers report, or Admati and Pfleiderer (2012) on the Volcker rule.

[28] Economies of scale imply the cost elasticity to scale is smaller than one, or the profit elasticity to scale is larger than one. Economies of scope imply lower costs or higher profits as additional activities are undertaken.

In this chapter economies of scale and scope are estimated for twelve Eurozone countries for the period 2002 until 2011. Besides estimating the existence of economies of scale and scope, this chapter will make an attempt to disentangle the various sources of economies of scale and scope by examining the influence of a number of variables that proxy for too-big-to-fail, market power and the macro-economic environment. This chapter adds to the literature on economies of scale and scope in banking by examining the sources of those economies of scale and scope within a European context. The Eurozone is considered both because it has a history of relatively large and diversified banks, and because several policy proposals within Europe aim at limiting scope in banks. This chapter is related to research by Hughes and Mester (2015), who estimate economies of scale in the US in 2003, 2007 and 2010, and Davies and Tracey (2014) who estimate economies of scale for the largest banks in the world while taking the effect of too-big-to-fail into account through ratings uplifts. As in those papers, economies of scale are found to exist, as well as the existence of a too-big-to-fail effect. However, economies of scale remain positive even after ratings uplifts are included as a proxy for too-big-to-fail. Economies of scope are found to be positive over the entire sample period.

The rest of the chapter is laid out as follows: The second section briefly discusses related literature on economies of scale and scope in banking. The third section describes the research method for the estimation of economies of scale and scope. The fourth section describes the data that is used and from which sources the data was collected. The fifth section presents the results. The sixth section discusses the results and describes where the results may be placed within the literature. Finally, section seven concludes.

3.2 Literature

Real economies of scale and scope might be difficult to empirically disentangle from artificial economies of scale and scope. Proxies might be taken in order to account for these different possible sources of economies of scale and scope. Table

1 presents the issues in estimating economies of scale and scope in banking as well as the possible proxies that can be taken in order to control for these issues.

First of all, Hughes and Mester (2015) state that not including risk in the estimation of economies of scale might lead to incorrect estimates. Larger banks may have access to a higher risk-return frontier because of better diversification. In that case, a larger bank might be inclined to hold a different asset portfolio, for instance by holding less liquid assets than a smaller bank. Depending on the model specification, this may lead to a lower estimate of economies of scale. Traditional translog cost models tend to treat increases in risk as increases in costs without taking differences in risk-return frontiers into account. This implies that when a bigger bank takes on more risk because his risk-return frontier is better than that of a smaller bank, the bigger bank will be perceived as more costly and as such diseconomies of scale may be found. In order to account for risk, a different model specification from the traditional translog cost function may be needed.

Marinč (2013) argues that the increase of scale economies might be mostly influenced by improvements in ICT technology, which improve information processing within a bank. Some activities might be better scalable than others, with hard information products benefitting more in terms of scalability than soft information products. Boot (2003) mentions that information technology presents the greatest possible source of scale economies by better use of databases over a wider range of services and customers. It is not entirely clear how the use of ICT in financial intermediaries should be proxied, since high ICT expenditure might mean either a large commitment to ICT, or an inefficient ICT department. The ICT infrastructure that a bank operates in may provide a good proxy for the quality of ICT that is available to bank, as a better infrastructure possibly allows for lower costs of employing ICT. Proxies for the ICT infrastructure are the number of broadband connections per capita, or the percentage of internet users.

Table 1: Issues in estimating economies of scale and scope in banking.

Key issue	Hypothesis	Proxy
Risk frontier	Bigger banks might have access to a higher risk-return frontier	Equity capital, loan loss reserves, model specification
ICT	Information technology enhances economies of scale	Broadband connections per capita
Brand/ Reputation	Brand and reputation scale as a fixed cost	
Innovation	Innovation benefits can be spread out over a larger scale	R&D expenditure
Too big to fail	TBTF subsidies cause economies of scale	Dummy for assets>$100 bln, rating uplifts
Market power	Monopoly power causes economies of scale	CR3/4/5, HHI
Relationship banking	Relationship banking is not scalable	Interest income
Transaction banking	Transaction banking is scaleable	Trading income, commission income
Systemic scale economies	Scale economies are bigger in bigger financial markets	GDP, Size of the financial sector
Physical distance	Higher physical distance means less scalability	Population density
Scale economies to managers	Scale economies might benefit managers	Wages as an output
Scope diversification	Diversification leads to economies of scope	Specialization index
Scope coordination problems	Engaging in multiple activities might harm firm value	Specialization index
Scope as a strategic option	Expansions in new markets might be used as options	
Firm growth	Firms grow faster when financed by universal banks	TFP

The effect of too-big-to-fail has been traditionally proxied by using dummies that are equal to one when a bank crosses a certain asset or market capitalisation threshold. For instance, Brewer and Jagtiani (2013) assume that

banks with either $100 billion in assets or $20 billion in equity are too big to fail. Recent work by Ueda and Weder di Maurer (2012), Davies and Tracy (2014) and Bijlsma and Mocking (2013) focuses on a different proxy that is outlined by Haldane (2010). These authors take differences in Moody's ratings for banks as standalone entities and the ratings for those same banks when possible government support is taken into account. By taking the difference between these ratings, a proxy for the size of the implicit funding subsidy can be found.

Market power in banking is generally proxied by taking the Herfindahl-Hirschman index (HHI), which takes the sum of quadratic asset shares of banks within a country or region, or concentration ratios (CR3/4/5), which measure the share of total assets within a country held by the biggest four, five or six banks.

The share of trading income or commission income in total income might prove a good proxy for the amount of transaction banking activities in a bank and should generally be associated with larger economies of scale. Meanwhile, relationship activities generally take the form of interest contracts that pay off over a longer term and as such the share of interest income in total income might be a good proxy for the amount of relationship banking activities, and should generally be negatively correlated with economies of scale.

Degryse and Ongena (2005) show that physical distance is an important determinant with respect to a consumer's choice for a bank. Costs of monitoring could be determined by physical distance. Since setting up a branch means incurring a fixed cost, population density around that branch might imply economies of scale. Berger et al. (2005) however note that generally big banks are better at managing relationships at a distance, thus justifying larger scales in countries that have large physical distances from bank to client. Average distance to a client within a country might be proxied by population density.

Neuhann and Saidi (2012) mention the possibility of economies of scope in financing companies. By issuing both debt and equity, a bank might be able to lessen the impact of moral hazard from multiple sources. A debt contract induces truth-telling, while equity underwriting might alleviate debt overhang problems. They find that universal banks tend to invest in riskier firms that have higher TFP

growth than firms that were invested in by specialized banks. TFP growth within a country might be a result of broader banking.

Although the empirical literature has generally been favourable towards the existence of economies of scale in banking (Hughes and Mester, 2015; Wheelock and Wilson, 2012; Ghandi and Lustig, 2015), diseconomies of scope are generally found (Laeven and Levine, 2007; Schmid and Walter, 2009; 2014). Why economies of scale materialize but economies of scope do not, is less clear. Diversification benefits might be insufficient to make up for additional costs, agency costs could be higher when activities are stretched over multiple markets, or there may be specialization benefits that are foregone when multiple activities are engaged in. Also, improvements in the ICT environment may make scaling up more profitable, rather than saving costs over multiple activities.[29]

The next section will describe the method that is used in this chapter to estimate economies of scale and scope within the European banking sector.

3.3 Method

3.3.1 Economies of scale

Economies of scale are estimated in this chapter by using three methods: i. a baseline cost economies of scale estimation; ii. a cost economies of scale estimation that takes the costs of equity into account, and iii. an adaptation of a managerial preference model, based on Hughes and Mester (2015). As a baseline, economies of scale are estimated using a basic translog cost function.

$$ln(C) = \beta_0 + \sum_i \beta_i \ln g_i + {}^1\!/\!_2 \sum_i \sum_j \beta_{ij} \ln g_i \ln g_j$$

$$g = (x, y, z)$$

---

[29] Also, Boot (2003) argues that mergers directed at economies of scope might come about strategically to combat business uncertainty. When there are first-mover advantages for entering new markets, firms may estimate positive economies of scope ex ante, that might lead to overinvestment, and as such turn out negative ex post.

Where: C is total costs, x is a vector of input quantities $(x_1, x_2, x_3, x_4, x_5)$, y is a vector of output quantities $(y_1, y_2, y_3, y_4, y_5)$, and z is a vector of control variables. For the baseline estimation of economies of scale, only loan loss reserves are included in z in order to control for asset quality and risk as in Hughes and Mester (2015). Equity capital is not considered as an input. To control for macro factors that possibly affect economies of scale, proxies are included in z to take into account the size of the financial sector, the amount of competition, ICT infrastructure, population density and capitalization of the stock market. On the bank level, the composition of income over interest and commission income is considered. These variables proxy for relationship and transaction banking activities. Commission income is more associated with transaction banking, while interest income might be more associated with relationship banking. All control variables are fully interacted with one another and with the input and output variables. From the baseline cost function, economies of scale are estimated by:

$$Scale_{baseline} = \frac{1}{\Sigma_i \frac{\partial ln C_{CF}}{\partial ln y_i}}$$

This is the inverse of the elasticity of costs to output so that this measure is bigger than 1 in the case of increasing returns to scale and smaller than 1 in case of decreasing returns to scale. This measure serves as a baseline for comparing the other measures of scale that will be discussed below.

If equity is included in the estimation of scale economies, the cost function to estimate stays similar:

$$ln(C) = \beta_0 + \sum_i \beta_i ln\, h_i + \frac{1}{2} \sum_i \sum_j \beta_{ij} ln\, h_i ln\, h_j$$

$$h = (x, y, z)$$

In this specification, equity (k) is included in z. If economies of scale are estimated in the same manner as the baseline cost estimation, a constant price of

equity is assumed. However, the price of equity becomes lower as the amount of equity increases through the Modigliani and Miller (1958) theorem. Similarly, when large institutions are perceived as less risky because of diversification benefits, their equity might have a lower price. Ignoring the price of equity will underestimate economies of scale for larger banks: large institutions with smaller amounts of equity will have higher interest costs, because they are financed more with debt, so that costs are overestimated. By correcting for the price of equity, economies of scale are estimated by:

$$Scale_{equity} = \frac{1 - \frac{\partial lnC_{CF}}{\partial lnk}}{\Sigma_i \frac{\partial lnC_{CF}}{\partial lny_i}}$$

Besides these scale estimations that are based on translog cost functions, a third estimation of economies of scale is made, based on a methodology proposed by Hughes and Mester (2015).[30] This model uses the notion that managers are not only concerned with minimizing costs or maximizing profits, but also take risk into account. As such, managers are assumed to maximize their utility over two moments, both the first moment (profits) as well as the second moment (risk). Maximizing over multiple objectives implies that a model consisting of one equation won't suffice to capture the behaviour of bank managers. Risk is an essential element of banking, and may especially be important to the estimation of economies of scale, because the costs of risk may go down as size increases. For example, if a larger bank has access to a better risk-return frontier, that bank may choose to take on additional risk. In a traditional translog cost function, this would mean that costs are increased, since risk is costly. As such, a traditional translog model might underestimate economies of scale.[31]

---

[30] The authors have used this method before in Hughes et al. (1996; 2000), and Hughes, Mester and Moon (2001).
[31] In a similar analysis, Davies and Tracey (2014) exclude this estimation and find that economies of scale are fully driven by implicit too-big-to-fail subsidies. It will be shown that similar results are found for the traditional translog cost estimations, but that economies of scale do not disappear in the model that accounts for endogenous risk-taking.

In order to enable a model that maximizes over two moments, Hughes and Mester (2015) use a managerial preference model, modelled by an adaptation of the Almost Ideal Demand System. The Almost Ideal Demand System was first introduced for consumer goods by Deaton and Muellbauer (1980).[32] Instead of preferences over different consumer goods, Hughes and Mester (2015) use the basis of the Almost Ideal Demand System in order to model the preferences of managers over production plans. By observing output quantities and input prices and using them to estimate the share of revenue that is allocated to different cost components and profits, managerial preferences with respect to risk and return can be uncovered. From these estimations, cost elasticities to outputs can be found, so that inverted cost elasticities can then be used to see whether a bank is operating under increasing or decreasing economies of scale. More formally, the managerial preference model first formulates a standard utility maximizing problem that is faced by the manager:

$$\max_{\pi,x} U(\pi, \boldsymbol{x}; \boldsymbol{y}, n, \boldsymbol{p}, r, k)$$

$$s.t. p_\pi \pi = \boldsymbol{p} \cdot \boldsymbol{y} + m - \boldsymbol{w} \cdot \boldsymbol{x}$$

Where the variables are: π is profit, $\boldsymbol{x}$ is a vector of input quantities $(x_1, x_2, x_3, x_4, x_5)$, $\boldsymbol{y}$ is a vector of output quantities $(y_1, y_2, y_3, y_4, y_5)$, n is the amount of nonperforming loans, $\boldsymbol{p}$ is a vector of output prices $(p_1, p_2, p_3, p_4, p_5)$, r is the risk-free interest rate, k is the amount of equity capital, $\boldsymbol{w}$ is a vector of input prices $(w_1, w_2, w_3, w_4, w_5)$, $\boldsymbol{z}$ is a vector of other inputs (k, n, p, p_π), p is the average interest rate on assets, and p_π is the combined corporate tax rate

---

[32] The purpose of the Almost Ideal Demand System is to empirically estimate preferences of consumers over goods, using the data on observed consumption and prices. This data is used to estimate a system that contains one equation for each good that is included in the estimation. For each good, the share of income is estimated from prices, quantities and control variables. From these estimations, the elasticity of demand for each good can be calculated from the results. Instead of taking a system of demand equations, Hughes and Mester (2015) take each of five cost components and profit as shares of total revenue. As such, the manager is free to choose how to allocate revenue over the different cost components and profit, so that the model reflects the manager's preferences.

This optimization problem means that the manager maximizes his utility. The model allows for profit maximization as a possibility, but also allows a manager to choose lower profits and less risk, or higher profits and more risk. From the utility maximization problem, the indirect utility function can be taken. Taking first order conditions from the indirect utility function results in a system of equations that can be estimated:

$$\frac{p_\pi \pi}{p \cdot y + m} = \frac{\partial lnP}{\partial lnp_\pi} + \mu[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP] \qquad \text{(Profit)}$$

$$\frac{w_i x_i}{p \cdot y + m} = \frac{\partial lnP}{\partial lnw_i} + v_i[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP] \; \nabla \, i \qquad \text{(Input)}$$

$$\frac{\partial V(\cdot)}{\partial k} = \frac{\partial V(\cdot)}{\partial lnk}\frac{\partial lnk}{\partial k} = 0 \qquad \text{(Equity)}$$

Together, the sum of profit and expenses on inputs are equal to total revenue, so that the left hand side of the (Profit) and (Input) equations together sum to one. The system of equations describes the managerial decision on how to distribute revenue over cost categories and profit. Together, these equations can be estimated by nonlinear regression. The system of equations to be estimated empirically is:

$$\frac{p_\pi \pi}{p \cdot y + m} = F_4 + \sum_j H_{4j} lny_j + \sum_s L_{4s} lnw_s + \sum_i G_{i4} lnz_i + \mu[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP]$$
$$\text{(Profit)}$$

$$\frac{w_i x_i}{\boldsymbol{p} \cdot \boldsymbol{y} + m} = C_i + \sum_j E_{ij} lny_j + \sum_s D_{is} lnw_s + \sum_i L_{si} lnz_s + v_i[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP]$$
$$\text{(Inputs)}$$

$$F_1 + \sum_j H_{1j} lny_j + \sum_s L_{1s} lnw_s + \sum_j G_{1j} lnz_j + \kappa[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP] = 0$$
$$\text{(Equity)}$$

Where lnP is a function of all inputs, outputs, control variables and their interaction terms. Appendix 3A provides exact details of the estimated equations outlined above. This estimation is referred to as the managerial preference function

in the rest of the chapter. Economies of scale are then again estimated as the sum of inverted elasticities with respect to the outputs.

$$Scale\ economies_{MP} = \frac{C_{MP}}{\sum_i y_i \left[\frac{\partial C_{MP}}{\partial y_i} + \frac{\partial C_{MP}}{\partial k} \frac{\partial k}{\partial y_i} \right]}$$

$$= \frac{\boldsymbol{p} \cdot \boldsymbol{y} + m - p_\pi \pi}{\sum_i y_i \left[p_i - \frac{\partial p_\pi \pi}{\partial y_i} - \frac{\partial p_\pi \pi}{\partial k} \frac{\partial k}{\partial y_i} \right]}$$

The managerial preferences equations are subtly different from a translog cost functions that are described above. The traditional translog cost function assumes a constant risk-return frontier and does not take endogenous risk-taking into account. However, the risk-return frontier might differ between banks of different sizes. Larger financial institutions might enjoy more diversification advantages which enables a higher risk-return frontier. As such, it can be expected that a bigger financial institution chooses more risk and more return at a higher risk-return frontier, since risk is less costly for a large bank compared to a smaller bank. This poses a problem for a traditional translog cost function, since taking additional risk is always measured as an increase in costs. As such, if the translog cost function is used, increases in scale are associated with cost increases and diseconomies of scale will be found if bigger banks tend to take additional risk. Since the managerial preference function allows for different risk-return frontiers for different banks, it can correct for endogenous risk-taking that might be dependent on scale.[33]

3.3.2 Economies of scope

Besides economies of scale, economies of scope are estimated as well. Economies of scope measure if it is less costly for firms to produce a multitude of outputs

---

[33] Inverse cost elasticities to scale are estimated rather than profit elasticities. This makes it easier to compare the results to traditional translog cost functions, and may be more relevant to policy since cost economies of scale might signify possible improvements to consumers, while profit economies might mostly signal possible improvements to shareholders.

rather than focusing on a single output. Economies of scope can be estimated by comparing costs of the multiproduct firm with costs of the firm were it specialized in several smaller firms each specialized in a single output:

$$Scope\ economies = \sum_{i=1}^{5} \frac{costs(y_i,0,0,0,0) - costs(y_1,y_2,y_3,y_4,y_5)}{costs(y_1,y_2,y_3,y_4,y_5)}$$

Where $costs(y)$ is the relevant cost function for each of the three specifications. If this measure is greater than zero, costs would be larger if the firm was split up in multiple specialized firms, so that economies of scope exist, while a measure below zero implies diseconomies of scope. Mester (2008) argues that this measure of economies of scope is not correct. It evaluates economies of scope at a zero output level, so that it can't be used to evaluate translog cost functions because logarithms of zero do not exist. Besides this, it forces costs to be evaluated at zero output levels even when all firms produce positive levels of each output, so that results are extrapolated outside of the sample. Mester (2008) therefore proposes a measure for economies of scope per bank to be calculated by:[34]

$$Scope\ economies = \sum_{i=1}^{5} \frac{costs(y_i - (N-1)y_i^{min}, y_{-i}^{min}) - costs(y_1,y_2,y_3,y_4,y_5)}{costs(y_1,y_2,y_3,y_4,y_5)}$$

So that the costs to produce the output by the firm are compared to what it would cost to operate five firms that specialize in one output and produce the minimal amount of the other outputs.[35] If a bank is better off splitting up into multiple specialized banks, the measure will be negative, as costs for the specialized banks will be lower than costs for the bank offering all services. This measure of scope economies that will be evaluated here, for all of the three

---

[34] This measure was first proposed by Mester (1991).
[35] Note that some observations for banks that operate near the minimum output will fall out, as their specialized output will become a negative number, of which the logarithm doesn't exist. This is the case for around five percent of the observations.

specifications of the cost function: the two translog functions and the managers most preferred cost function.[36]

All measures of economies of scale and scope are estimated using data from banks in the euro area between 2002 and 2011, for which the data is described in the next section.

3.4 Data

Data on the level of individual banks is obtained from Bureau van Dijk's Bankscope. Data is collected for countries in the euro area between 2002 and 2011.[37] The year 2002 was chosen as a starting point as it was the first year in which the euro was introduced as a physical currency, and 2011 is the last year for which data was available when this chapter was written. The group of countries was chosen as these countries have been in the Eurozone over the entire period and as such use a common currency and are under similar rule of law. A minimum threshold level of assets is not considered in this chapter, as policy proposals that aim to split up banks or forbid certain activities affect banks at all asset levels. In total, Bankscope features 42493 observations for these countries over this period. Of these, 374 did not use the euro as their base currency, and as such were taken out, leaving 42119 observations. For estimation, logarithms of input and output quantities need to be taken, so that banks with non-positive values for inputs and outputs needed to be taken out. This left 20144 bank level observations. Finally, Bankscope features double observations, in which bank subsidiaries were measured both at the holding level and at the subsidiary level. These double observations were taken out, leaving 18639 observations. Finally, the data was checked for nonsensical observations which were likely the result of mismeasurement, which resulted in the removal of one observation where loan loss

---

[36] Economies of scope might also be evaluated by looking at the second derivatives of the cost function. In that case, a positive value means that adding to one input increases the marginal costs of other products, which implies diseconomies of scope. Similarly, a negative value implies economies of scope.

[37] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain.

reserves were larger than total liabilities. Other outliers were also checked but were left in, because it could not be determined with certainty that the outliers were the result of mismeasurement or mistakes in data entry.[38] The estimation thus includes most observations and as such the range of values within the sample can be large as can be seen in Table 2.

Bankscope features yearly data that is taken from the annual reports of banks. This implies that data is available on quantities and not on prices. Previous authors using the Bankscope database have used the input quantity over assets as a proxy for the input price.[39] Using input quantities over assets as a proxy for prices might lead to biases. For instance, if economies of scale are positive, one might expect the expenses on personnel over assets to fall as assets increase. As such the proxy for the input price of labour, or wages, will fall as assets increase. It may be intuitively more plausible that wages are not dependent on the scale of a bank, but rather economies of scale are caused by using proportionally less personnel as production increases.[40] Although it is unclear if this bias increases or decreases the scale estimates, Hughes and Mester (2015) note that Davies and Tracy (2014) tend to find lower economies of scale when input quantities over assets are used rather than input prices, suggesting that economies of scale are underestimated.

---

[38] For example, the French Allianz Banque endured heavy losses in 2008 while at the same time selling off its subsidiary Dresdner bank which made up a large part of its assets, leading to a negative outlier in terms of profits over assets.

[39] This is often done in the literature that studies banking outside of the US. Examples include Lensink, Meesters and Naaborg (2008); Berger, Klapper and Turk-Ariss (2009); Barth et al. (2013); and Feng and Serletis (2010).

[40] Since the first version of this paper was written, Bankscope has had a data update that makes it possible to estimate input prices more directly through dividing expenses on an input over the quantity of that input that is used, most notably through including the number of employees in addition to personnel expenses. Section 6 covers robustness tests using price date obtained from Bankscope.

Table 2: Data for EMU banks 2002-2011 (n=18,638).

Variable	Mean	Median	StdDev	Min	Max
Total Assets in € mln	14341	879	83382	15	220242
Total Revenue in € mln	693	50	3683	1	98712
Financial Performance					
Equity Capital/Assets	0.070	0.061	0.036	0.000	0.575
Loan Loss Reserves/Assets	0.005	0.004	0.005	0.000	0.263
Profit/Revenue	0.184	0.182	0.096	−3.156	0.785
Profit/Assets	0.011	0.010	0.011	−0.376	1.014
Asset Allocation					
Liquid Assets: y_1/Assets	0.168	0.136	0.127	0.002	0.977
Securities: y_2/Assets	0.202	0.188	0.124	0.000	0.935
Loans: y_3/Assets	0.604	0.623	0.160	0.000	0.989
Other Earning Assets: y_4/Assets	0.346	0.329	0.159	0.003	0.989
Off Balance Sheet Items:	0.119	0.061	0.525	0.000	33.969
Input Utilization					
PersonnelExpenses x_1/Assets	0.013	0.013	0.006	0.000	0.177
Physical Capital: x_2/Assets	0.014	0.013	0.010	0.000	0.547
Demand Deposits: x_3/Assets	0.252	0.231	0.143	0.000	0.907
Savings Deposits: x_4/Assets	0.355	0.413	0.210	0.000	0.943
Other Borrowed Funds: x_5/Assets	0.114	0.058	0.138	0.000	0.930
Prices					
Tax Rate	0.285	0.264	0.034	0.125	0.344
1/(1-Tax Rate)	1.401	1.358	0.068	1.143	1.525

To estimate the cost functions, five outputs are selected: y_1 liquid assets; y_2 the total amount of securities; y_3 loans; y_4 other earning assets; and y_5 off balance sheet items. The six inputs are: x_1 expenses on personnel; x_2 fixed assets; x_3 demand deposits; x_4 savings deposits; x_5 other funding; and k equity capital. Revenue is the sum of all interest and non-interest income, costs is total interest and non-interest expense, and profits are defined as revenue minus costs. Ex ante asset quality is proxied by p the average interest rate on assets and n the amount of loan loss

reserves, where riskier assets are assumed to earn a higher interest or require higher loss reserves. Table 2 presents the data. On average, banks in the sample have an asset size of €14 billion, with the smallest bank in the sample holding €15 million in assets ranging to the largest bank in the sample (Deutsche Bank in 2008) which holds €2.2 trillion in assets.

Macro level data is taken from Bankscope,[41] World Bank, International Telecommunications Union (ITU), and Mayer and Zignago (2011). The country level data is presented in table 3 below. The dataset is dominated by German banks.[42] This is because the dataset features a lot of small cooperative banks, such as the Sparkassen and Landesbanken, for which Bankscope does not provide consolidated data. Detailed information on the data sources is given in Appendix 3B.

Table 3: Macro data for EMU banks 2002-2011 (averages).

	Number of banks in sample	Depo- sits + Credit (€ bln)	Depo- sits + Credit (% GDP)	Market cap (€ bln)	HHI	Broad- band per 100 inhabi- tants	Popu- lation per square km
Austria	1248	533	207	78	939	16.8	98
Belgium	211	632	199	205	2337	22.6	319
Finland	51	212	127	158	5538	22.7	16
France	1210	3033	170	1413	1067	21.2	116
Germany	10800	5019	217	1034	495	19.5	230
Greece	81	343	165	102	2270	8.7	85
Ireland	42	446	273	74	3330	12.1	62
Italy	3850	2283	155	550	613	13.9	195
Luxem- bourg	229	236	716	56	1043	20.3	173
Nether- lands	127	1567	290	477	2990	27.9	366
Portugal	172	406	253	63	1538	12.8	104
Spain	617	2629	270	812	1226	14.9	87

[41] The Herfindahl Hirschman Index (HHI) is calculated from the Bankscope data by taking the sum of squared asset shares of banks within a country.
[42] It may be interesting to estimate economies of scale and scope within countries by using subsamples of only the banks in these countries. However, because of the large number of interaction variables and because the estimations are performed for each year separately, too few degrees of freedom would remain in these subsamples to perform a meaningful estimation for any country outside of Germany.

The data on too-big-to-fail is collected from Moody's. As in Davies and Tracey (2014), Noss and Sowerbutts (2012) and Bijlsma and Mocking (2013) ratings uplifts are used to proxy for the too-big-to-fail effect. Moody's generally has a number of different ratings for a bank, among which the Bank Financial Strength Rating (BFSR). This rating reflects the judgment of Moody's on a bank's intrinsic soundness, without taking external credit risks and outside credit support into account. As such, BFSR can be seen as the rating of the bank without implicit governmental guarantes. A proxy can be found for the size of the implicit subsidy by taking the difference between the BFSR and the rating on unsecured debt, in which usually the latter will be higher. This ratings difference may be interpreted as the probability that the bank will be bailed out in case of distress. If a bank's financial strength is deemed low but its unsecured debt is rated highly, risk to investors is deemed low, so that there is a large implicit governmental guarantee. The rating difference is then used as an input price in the cost estimation.

Data was collected manually by using Moody's website. Banks were considered with assets over €25 billion. This cut-off point was chosen because ratings uplifts were almost omnipresent in later years at very high asset levels. Especially above the €100 billion threshold, there were only a couple of banks per year that did not have a positive difference between the Bank Financial Strength Rating and the unsecured debt rating. Data availability prevented a lower cut-off point as ratings become less common at lower asset sizes. As the presence of a BFSR becomes rare around €25 billion in assets, this was chosen as a cut-off point. Both €100 billion or €50 billion in assets were considered as a cut-off point, but there were still quite a few bank with positive ratings uplifts below €50 billion in assets: in 2011, out of 31 banks that had a BFSR with assets below €50 billion, 21 had a positive ratings uplift.

Ratings were given numerical values, starting at 1 for the rating C (lowest), up until 21 for the Aaa rating. The ratings uplift was calculated by taking the difference between the rating on (senior) unsecured debt and the BFSR. If data on unsecured debt was unavailable, the rating on long term deposits was taken instead.

Only positive implicit subsidies were considered, so that a negative difference was given the value zero.[43]

Table 4 gives and overview of the ratings uplift data. Most striking is the change in ratings uplifts around the crisis. [44] Not only are there more banks that are deemed too big to fail (that have a positive ratings uplift), but the average size of the ratings uplift also increases slightly.

Table 4: Ratings uplift data (difference between Moody's unsecured debt rating and BFSR).

	Number of banks with a ratings uplift	Average ratings uplift	Average assets of TBTF banks (€ bln)
2002	23	3.3	121
2003	33	3.2	141
2004	30	2.7	136
2005	30	2.4	141
2006	34	2.9	155
2007	82	2.5	208
2008	107	3.1	222
2009	102	4.0	197
2010	97	3.8	194
2011	76	3.1	235

Table 5 shows uplifts by asset size, and shows that uplifts are less common at lower asset sizes.

Table 5: Ratings uplifts by asset class (number of bank-year observations).

Assets	Zero uplift	Positive uplift
25 - 50 billion	339	173
50 - 100 billion	178	141
100 - 250 billion	99	183
Over 250 billion	85	117

---

[43] A negative difference occurred 17 times.
[44] Contributing to this difference is the fact that less data was available for earlier years. However, this is still mainly driven by the actual data. For reference: about 20% of the banks for which a BFSR rating could be found had zero uplift in 2011, compared to about 65% in 2002.

3.5 Results

This section presents the estimates for economies of scale and scope for three model specifications with inclusion of different control variables.

3.5.1 Economies of scale

Economies of scale are estimated separately for each year. This was done because the cost frontier might differ from year to year. Also, since a new sample of banks is considered for each year survivor bias is limited as firms that go bankrupt are not excluded out of the sample. Table 6 shows scale estimates per year. These estimates are graphically represented in figure 1. For the complete sample, the translog cost functions show diminishing economies of scale over time. In these functions economies of scale start off positive, but turn into diseconomies of scale around the time when the financial crisis starts. This result is not shared by the managerial preferences function, which estimates significant economies of scale over the entire period that go up over time. Because the difference in these models has to do with the way in which risk is treated, this might mean that risk management has become more important since the crisis or that large banks are seen as less risky during the financial crisis.

Figure 1: Economies of scale per year.

Table 6: Economies of scale (inverse elasticities of costs to scale) for 12 EMU countries in the period 2002-2011, all banks.

All banks	Baseline	Equity included	Managerial preferences	N
2002	**1.022**	**1.011**	**1.160**	2205
	(.001)	(.001)	(.007)	
2003	**1.018**	**1.017**	**1.168**	2050
	(.001)	(.001)	(.006)	
2004	**1.024**	**1.016**	**1.174**	1928
	(.001)	(.001)	(.006)	
2005	**1.009**	**1.008**	**1.204**	1951
	(.001)	(.001)	(.006)	
2006	**1.007**	**1.010**	**1.209**	1844
	(.001)	(.001)	(.006)	
2007	**.998**	**1.003**	**1.204**	1892
	(.001)	(.001)	(.011)	
2008	**.998**	**1.005**	**1.197**	1934
	(.001)	(.001)	(.010)	
2009	**.990**	**1.012**	**1.239**	1880
	(.001)	(.001)	(.019)	
2010	**.991**	1.000	**1.219**	1796
	(.001)	(.001)	(.013)	
2011	**.985**	**.983**	**1.271**	1158
	(.001)	(.001)	(.009)	

*Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 1 at the 1 percent level; ** at the 5 percent level; * at the 10 percent level.*

Table 7 shows the measures of scale economies per country. Finland has the highest economies of scale, while Ireland has the lowest on average. Each country has a banking sector that on average experiences economies of scale.

Table 7: Economies of scale per country (inverse elasticities of costs to scale) for 12 EMU countries in the period 2002-2011.

	Baseline estimation	Equity included estimation	Managerial preferences estimation
Austria	0.979	0.973	1.215
Belgium	0.995	1.022	1.210
Finland	0.977	0.946	1.534
France	0.995	1.002	1.373
Germany	1.000	1.000	1.166
Greece	1.026	0.999	1.217
Ireland	0.984	0.964	1.076
Italy	1.030	1.030	1.213
Luxembourg	0.954	0.988	1.285
Netherlands	1.013	1.057	1.323
Portugal	0.990	0.998	1.246
Spain	1.003	1.008	1.172

Another specification is estimated in which variables are added in order to control for the macro environment, and are fully interacted with one another and the input and output variables. As in Bossone and Lee (2004), the size of the financial sector, stock market capitalization and market concentration are considered. The size of the financial sector was approximated by adding total deposits to the financial system together with total credit by the financial system. Besides these variables, a variable was added to proxy for the ICT environment (number of broadband subscriptions) and for the average physical distance, namely population density. Table 8 presents the results. Compared to the simple specification, economies of scale are estimated to be higher for all specifications, and the estimates remain positive during the crisis. As in the estimation, the translog estimations trend downward until 2006/2007, but in contrast to the simple specification, economies of scale go up in 2009 and 2010. This pattern can also be seen in the managerial preferences estimation, which dips during 2007 and 2008, although that estimation stays positive over the entire sample period.

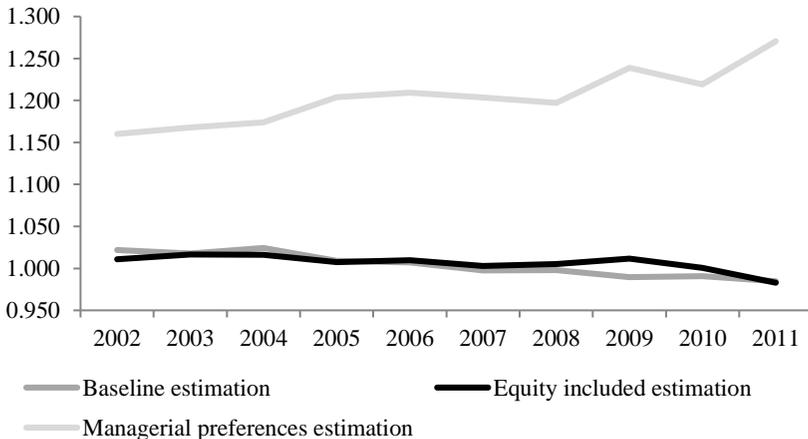*Table 8: Economies of scale (inverse elasticities of costs to scale) for 12 EMU countries in the period 2002-2011, all banks, macro variables included.*

All banks	Baseline	Equity included	Managerial preferences	N
2002	**1.012**	**1.011**	**1.157**	2201
	(.001)	(.001)	(.006)	
2003	**1.021**	**1.018**	**1.176**	2050
	(.001)	(.001)	(.006)	
2004	**1.015**	**1.016**	**1.191**	1928
	(.001)	(.001)	(.007)	
2005	**1.007**	**1.008**	**1.223**	1951
	(.001)	(.001)	(.007)	
2006	.997**	1.000	**1.231**	1844
	(.001)	(.001)	(.007)	
2007	1.000	**1.003**	**1.184**	1892
	(.001)	(.001)	(.006)	
2008	1.002**	**1.005**	**1.160**	1934
	(.001)	(.001)	(.006)	
2009	**1.012**	**1.012**	**1.249**	1880
	(.001)	(.001)	(.018)	
2010	**1.004**	1.000	**1.244**	1796
	(.001)	(.001)	(.009)	

*Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 1 at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Macro data for 2011 was unavailable at the time of writing.*

Besides the effect of the macro environment, the distribution of bank income over interest and commissions is considered as well as the ratings uplift. The income distribution gives an insight into the distribution of relationship banking and transaction banking within the firm. Here interest income is considered as a proxy for relationship banking, while higher commission income signifies more transaction banking. The ratings uplift data gives an indication of the market perception of government support and thus of the size of the implicit government subsidy for banks. Table 9 shows scale estimates when the distribution

over income and ratings uplift data are included in the estimation. The results are comparable to the results found in table 8. All specifications show a dip in economies of scale during 2007/2008 and a recovery afterwards.[45]

In order to see the influence of the macro variables, ratings uplift and the distribution over income, table 10 shows scale estimates for both low and high values of those variables. It can be seen that the income distribution variables have the expected sign and correlate highly with scale estimates: high interest income is associated with low economies of scale, while high commission income is associated with high economies of scale. This alludes to the notion that scale is mostly associated with transaction banking and not as much with relationship banking. For the macro factors, the signs are not as clear, as the managerial preferences estimation frequently is of a different sign than the cost estimations. The signs on the managerial preferences estimation are generally in line with expectations, such as a positive sign on the number of broadband connections and the Herfindahl Index. Very low correlations in combination with changing signs may in itself point towards a low impact of country level variables. Especially for very large internationally operating banks, country level variables may matter little.

---

[45] In chapter 4, ABN AMRO is discussed in depth, so that the estimations for economies of scale for this bank may be relevant. Looking at the economies of scale for ABN AMRO over the period 2002-2007, all specifications show that they are highest in 2006 and most specifications show they are lowest in 2003-2004, even showing diseconomies of scale in some specifications. The finding of large economies of scale in 2006 coincides with a major strategy revision in 2005 after which the bank became more focused on mid-sized clients and more formally attempted to create synergies.

Table 9: Economies of scale (inverse elasticities of costs to scale) for 12 EMU countries in the period 2002-2011, all banks, ratings uplift, distribution over income and macro variables included.

All banks	Baseline	Equity included	Managerial preferences	N
2002	**1.011**	**1.007**	**1.141**	2152
	(.001)	(.001)	(.005)	
2003	**1.017**	**1.014**	**1.171**	1995
	(.001)	(.001)	(.005)	
2004	**1.011**	1.002	**1.193**	1877
	(.002)	(.005)	(.008)	
2005	**1.003**	**1.004**	**1.205**	1908
	(.001)	(.001)	(.006)	
2006	1.000	**.998**	**1.220**	1803
	(.001)	(.001)	(.006)	
2007	1.001	**1.006**	**1.177**	1857
	(.001)	(.001)	(.005)	
2008	1.001	**1.003**	**1.194**	1890
	(.001)	(.002)	(.005)	
2009	**1.015**	**1.014**	**1.236**	1840
	(.001)	(.001)	(.012)	
2010	.998*	**1.002**	**1.244**	1754
	(.001)	(.001)	(.009)	

*Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 1 at the 1 percent level; ** at the 5 percent level; * at the 10 percent level. Macro data for 2011 was unavailable as of yet.*

Table 10: Comparison of scale estimates across high and low values of variables.

		Baseline estimation	Equity included estimation	Managerial preferences estimation
Broadband	Low	1.011	1.008	1.177
	High	1.002	1.004	1.216
	Correlation	-9%	-3%	8%
Financial system size	Low	1.011	1.010	1.222
	High	1.002	1.002	1.171
	Correlation	-8%	-7%	0%
Stock market capitalization	Low	1.008	1.009	1.187
	High	1.005	1.003	1.205
	Correlation	2%	-2%	7%
Population density	Low	1.010	1.010	1.229
	High	1.003	1.002	1.163
	Correlation	6%	3%	-9%
HHI	Low	1.013	1.012	1.168
	High	1.000	1.000	1.225
	Correlation	-3%	-3%	13%
Commission Income	Low	1.000	1.004	1.124
	High	1.013	1.008	1.265
	Correlation	25%	0%	61%
Interest Income	Low	1.014	1.009	1.287
	High	.999	1.002	1.102
	Correlation	-27%	-4%	-72%
Ratings uplift	Zero	1.006	1.005	1.198
	Positive	1.024	1.034	1.150
	Correlation	8%	8%	-3%

In order to focus more directly on the influence of too-big-to-fail, economies of scale were compared between banks with assets over €25 billion that had a positive ratings uplift and banks with assets over €25 billion that did not have a positive ratings uplift. The results are presented in table 11 and graphically presented in figure 2. What can be can be seen is that the translog cost functions show that economies of scale are higher for banks without ratings uplifts before the

financial crisis, while economies of scale are higher for banks with ratings uplifts between 2007 and 2009. Using the managerial preferences estimation, economies of scale are always higher for the banks without ratings uplifts, although the banks with ratings uplifts do catch up from 2007 on. A possible explanation is that banks that are considered to be too big to fail were considered safer and were able to obtain more funds for investment possibilities, therefore creating more economies of scale during the crisis. Meanwhile, the managerial preferences estimation also shows that economies of scale tend to catch up for banks with an uplift during the crisis, although economies of scale always remain lower than for banks without a ratings uplift.

Table 11: Economies of scale for banks with assets over €25 billion, separated by ratings uplifts.

Uplift	Baseline		Equity included		Managerial preferences	
	Zero	Positive	Zero	Positive	Zero	Positive
2002	1.00	.79	1.00	.82	1.14	1.08
2003	1.02	1.05	1.00	1.02	1.19	1.10
2004	1.01	.83	.98	.84	1.20	1.09
2005	.95	.92	.97	1.00	1.25	1.10
2006	1.01	1.03	1.01	1.02	1.20	1.10
2007	1.01	1.06	1.01	1.08	1.15	1.15
2008	1.00	1.06	1.00	1.07	1.18	1.12
2009	1.00	1.10	1.02	1.08	1.24	1.18
2010	1.08	0.99	1.05	1.03	1.28	1.23

The discrepancy during the crisis may be caused mostly by the different ways in which the translog cost function and the managerial preferences estimation treat risk. The uplift variable gives information on the mitigation of default risk and may therefore be a measure of risk taking by management. In the translog cost functions additional risk leads to lower estimations of economies of scale. If an additional variable is included that controls for risk, this may mean that higher estimations of scale economies are found. From this perspective, it can both be

explained that there is a discrepancy between the translog cost function and the managerial preferences function and the difference before and during the crisis. During the crisis, the costs of risk management might have increased, so that adding ratings uplifts has a bigger effect during the crisis. Meanwhile, the managerial preference estimation already controls for endogenous risk taking, so that the positive effect that is found in the translog cost functions due to uplifts controlling for risk is not found in the managerial preferences estimation.

Figure 2: Economies of scale for banks with assets over €25 billion, separated by ratings uplifts.
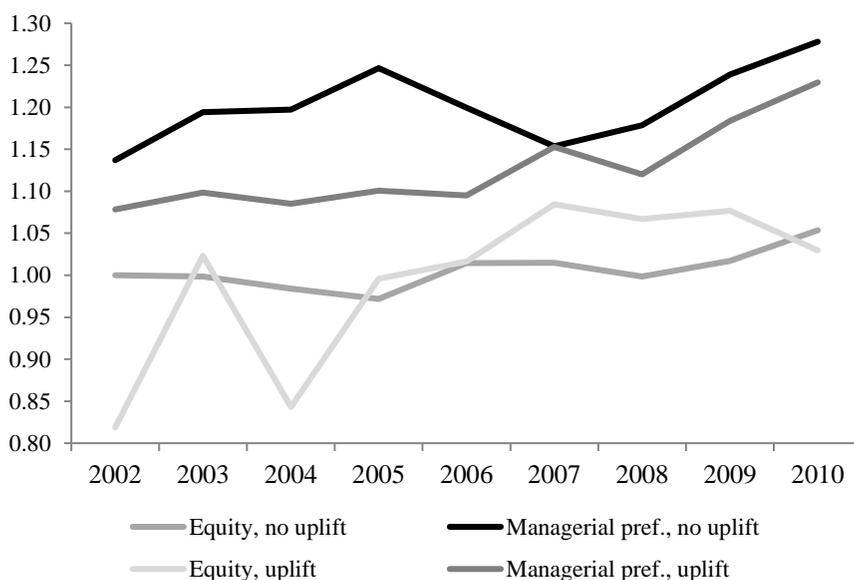
Table 12 compares scale estimates between two estimations for banks with assets over €25 billion, one in which the ratings uplift data is included, and one in which they are not. Perhaps most striking is the overlap of the estimates in the managerial preferences estimation. Scale estimates hardly differ whether or not ratings uplift data is included in the estimation. Meanwhile, for the translog cost estimations, economies of scale are estimated to be lower when uplift data is taken into account before the crisis, and higher afterwards. This means that estimations of economies of scale that do not take the implicit too-big-to-fail subsidy into

account tend to overestimate economies of scale before the crisis, and underestimate economies of scale in the crisis.

Table 12: Economies of scale for banks with assets over €25 billion, estimated with and without ratings uplift.

	Baseline		Equity included		Managerial preferences	
	No uplift	Uplift	No uplift	Uplift	No uplift	Uplift
2002	0.99	0.96	1	0.97	1.2	1.13
2003	1.02	1.03	1	1.01	1.17	1.17
2004	0.99	0.97	0.97	0.95	1.17	1.17
2005	0.94	0.95	0.96	0.95	1.21	1.21
2006	1.01	1.02	1.01	1.02	1.17	1.17
2007	1.02	1.04	1.01	1.06	1.15	1.15
2008	1.01	1.04	1	1.05	1.14	1.14
2009	0.99	1.07	1	1.06	1.21	1.2
2010	1.03	1.02	1.03	1.04	1.24	1.24

3.5.2 Economies of scope

Economies of scope are estimated by comparing costs that are estimated per bank and comparing those costs to hypothetical costs should that bank be split into five banks that each specialize in the production of one product. Economies of scope found in all years and for all three specifications. Tables 12 and 13 summarize the results. A positive sign means that costs are estimated to be higher would the bank be broken up into five entities rather than remain a single institution. The numbers themselves are calculated by taking a Taylor expansion of the logarithmic cost function. A Taylor expansion is chosen, because the cost function is an exponential function and as such extremely outlying values have a very large influence on the mean. In order to combat this, the cost function is approximated as a fourth order Taylor expansion. When costs are calculated as an exponential function, economies of scope stay positive but become insignificant. However, this result is mostly driven by outliers that drive up the standard error.

When the estimates are considered, they stay comparable to one another. In the baseline estimation (table 14) economies of scope do go up during the crisis,

thus suggesting that diversification might have played a bigger role during the crisis in terms of value creation than before the crisis. Given that diversification might lead to additional trust, this result is not surprising. When macro factors and relationship and transaction banking factors are taken into account, this result remain. Especially in 2007, 2009 and 2010 the estimates jump up. The only exception is the 2010 estimate in the baseline using managerial preferences. There scope economies become negative.

Table 13: Economies of scope for 12 EMU countries in the period 2002-2011.

All banks	Baseline	Equity included	Managerial preferences	N
2002	**1.50**	**1.00**	**1.45**	2112
	(.04)	(.03)	(.03)	
2003	**0.54**	**0.15**	**2.77**	1971
	(.03)	(.01)	(.01)	
2004	**0.86**	**0.77**	**3.91**	1882
	(.03)	(.03)	(.03)	
2005	**0.38**	**0.24**	**2.04**	1895
	(.03)	(.03)	(.02)	
2006	**0.57**	**0.53**	**0.86**	1731
	(.03)	(.03)	(.04)	
2007	**5.92**	**2.85**	**4.85**	1796
	(.21)	(.12)	(.03)	
2008	**1.33**	**1.58**	**2.40**	1818
	(.04)	(.05)	(.02)	
2009	**1.69**	**2.41**	**4.23**	1775
	(.05)	(.07)	(.02)	
2010	**4.49**	**3.89**	**-8.69**	1796
	(.18)	(.17)	(1.39)	
2011	**0.66**	**1.73**	**2.66**	1100
	(.09)	(.08)	(.01)	

Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 0 at the 1 percent level.

Table 14: Economies of scope for 12 EMU countries in the period 2002-2011, distribution over income and macro variables included.

All banks	Baseline	Equity included	Managerial preferences	N
2002	**1.24**	**1.88**	**2.46**	2112
	(.03)	(.05)	(.01)	
2003	**0.56**	**0.91**	**1.95**	1971
	(.03)	(.04)	(.02)	
2004	**0.81**	0.99	**1.85**	1882
	(.03)	(.03)	(.02)	
2005	**0.79**	**0.80**	**2.26**	1895
	(.03)	(.04)	(.01)	
2006	**0.46**	**0.67**	**1.27**	1731
	(.03)	(.03)	(.02)	
2007	**7.24**	**4.71**	**1.58**	1796
	(.32)	(.24)	(.02)	
2008	**0.43**	**0.23**	**2.11**	1818
	(.03)	(.02)	(.02)	
2009	**5.04**	**2.97**	**2.43**	1775
	(.13)	(.08)	(.01)	
2010	**6.45**	**3.81**	**1.75**	1796
	(.27)	(.20)	(.02)	

Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 0 at the 1 percent level. Macro data for 2011 was unavailable as of yet.

3.5.3 Robustness: price data

In order to test the robustness of the results, the results have been re-estimated using price data rather than quantity data. When this research was started, Bankscope did not include the number of employees in their data set, so that obtaining an estimate for the wage rate was impossible. As a proxy that is common in the literature, personnel expenses over assets were chosen to proxy for wages. Currently, data on the number of employees is available in Bankscope, which makes it possible to obtain price estimates. The price data does come with its own problems, the biggest of which is the availability of the data. There is limited data available on the number

of employees, which are needed to estimate w_1. Furthermore, data is sparse on the interest expense on customer deposits which is needed to estimate w_3 and w_4. Data on the interest expense on customer deposits is not separated into data on the interest paid on demand deposits and term deposits, so that it is impossible to separate them in two different categories. Finally, other funding (w_5) does not have its own cost basis, so that any estimation of the price of other funding would have to be estimated on a residual series. This was considered, but ultimately led to highly skewed distributions with strong outliers. Rather than letting the outliers drive the data, only three inputs are used. Data on prices was still less available than data on quantities, but there was enough to perform meaningful estimations.

As such, the estimations look as follows for the translog cost estimations:

$$ln(C) = \beta_0 + \sum_i \beta_i \ln g_i + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln g_i \ln g_j$$

$$g = (x, y, z)$$

With C again as total costs, x is a vector of three input quantities (x_1, x_2, x_3), y is a vector of five output quantities $(y_1, y_2, y_3, y_4, y_5)$ as before, and z is a vector of control variables. For the managerial preferences estimation, the system of equations is as follows:

$$\frac{p_\pi \pi}{p \cdot y + m} = F_4 + \sum_j H_{4j} ln y_j + \sum_s L_{4s} ln w_s + \sum_i G_{i4} ln z_i + \mu[ln(p \cdot y + m) - lnP]$$

(Profit)

$$\frac{w_i x_i}{p \cdot y + m} = C_i + \sum_j E_{ij} ln y_j + \sum_s D_{is} ln w_s + \sum_i L_{si} ln z_s + v_i[ln(p \cdot y + m) - lnP]$$

(Inputs)

$$F_1 + \sum_j H_{1j} ln y_j + \sum_s L_{1s} ln w_s + \sum_j G_{1j} ln z_j + \kappa[ln(p \cdot y + m) - lnP] = 0$$

(Equity)

Which is similar to the system of equations used before, but now (Inputs) consists of three equations rather than five. Table 15 shows the baseline results

78

where uplifts and macro variables are not included. The results are comparable to the quantity data, with the exception that economies of scale are estimated much higher than in the quantity data, especially for the translog cost estimations. It should be noted that the dataset is smaller by a factor of four. This is caused by the lack of data on number of employees and expenses on customer deposits. It can be seen that later years tend to include more data, which reflects mostly an increase in data availability rather than an increase in the number of banks, since the same type of increase over time is not observed in the quantity data. The estimations shown in table 15 are comparable to the quantity data results since they show economies of scale for all years. However, the economies of scale found in both translog cost functions are larger than in the quantity data estimation and tend to have larger standard errors. The managerial preferences estimation shows even larger economies of scale in the years before the crisis while they become smaller after the financial crisis. In 2003 diseconomies of scale are found, but standard errors are quite large so that this result is not significant. In 2008, large diseconomies of scale are found, which may be explained by the financial crisis. It is not clear however if this is the result of actual diseconomies of scale during the height of the financial crisis, or if the crisis drove data to more extreme values resulting in a misestimation.

Table 15: Economies of scale using price data.

All banks	Baseline	Equity included	Managerial preferences	N
2002	1.030	**1.092**	**1.681**	593
	(.0927)	(.0353)	(.1535)	
2003	.989	**1.075**	.719	594
	(.0848)	(.0113)	(1.845)	
2004	**1.079**	**1.096**	**1.088**	605
	(.0115)	(.0066)	(.0165)	
2005	**1.136**	**1.142**	**1.464**	527
	(.0216)	(.0104)	(.0317)	
2006	**1.102**	**1.127**	**1.471**	454
	(.0233)	(.0074)	(.0293)	
2007	**1.088**	**1.089**	**1.344**	638
	(.0077)	(.0037)	(.0178)	
2008	**1.078**	**1.077**	**.594**	794
	(.0119)	(.0123)	(.0057)	
2009	1.334	1.284	**1.180**	759
	(.1995)	(.2105)	(.0216)	
2010	**1.304**	**1.223**	**1.035**	731
	(.0702)	(.0513)	(.0170)	
2011	**1.201**	**1.091**	**1.174**	790
	(.0160)	(.0038)	(.0399)	

Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 1 at the 1 percent level; ** at the 5 percent level; * at the 10 percent level.

Table 16 shows the estimations again, but now with the uplift data included. Because there was less data available, the data on the macro environment and income type was not included. Note that data in 2002-2004 was limited, so that it was impossible to perform an estimation with uplifts included in these years.[46] It can be seen that economies of scale for the translog cost functions go down slightly, although in most years positive economies of scale are still observed. For the

---

[46] Both data on input prices and ratings uplifts becomes scarcer as time goes back, so that an estimation that depends on cross-terms of these variables contained insufficient data for estimation.

managerial preference estimation, economies of scale actually increase in most years, although they become insignificantly different from 1 during the 2007-2008 crisis years.[47] This is comparable to the quantity results.

Table 16: Economies of scale using price data, uplifts included.

All banks	Baseline	Equity included	Managerial preferences	N
2002				
2003				
2004				
2005	**1.101**	**1.132**	**1.501**	527
	.0169	.0086	.0712	
2006	**1.163**	**1.145**	**1.528**	454
	.0613	.0281	.0293	
2007	**1.087**	**1.091**	.989	638
	.0075	.0038	.0102	
2008	1.000	1.005	1.605	788
	.0761	.0624	.4478	
2009	**1.172**	**1.103**	**1.116**	752
	.0362	.0337	.0214	
2010	1.167	**1.172**	**1.163**	731
	.0979	.0170	.0232	
2011	**1.169**	**1.069**	1.213	790
	.0154	.0037	.1165	

Standard errors are reported in parentheses. Bold numbers indicate that the measure is significantly different from 1 at the 1 percent level; ** at the 5 percent level; * at the 10 percent level.

---

[47] Note that this is driven by a large standard error during 2008. This high standard error may be the result of the financial crisis which may have affected banks in different ways.

3.6 Discussion

In this chapter, economies of scale and scope are found in Eurozone countries between 2002 and 2011 for all years in all countries and at all asset sizes. The scale measures are consistent with findings of economies of scale for the US such as Hughes and Mester (2015), Feng and Serlitis (2010) and Wheelock and Wilson (2012). Economies of scope are however not found in the majority of the literature, where it is mostly found that diversification is discounted in financial intermediaries (Laeven and Levine, 2007; Schmid and Walter, 2009; 2014). One explanation for the finding of economies of scope might be that this study focuses on Europe with an emphasis on Germany, which has a long tradition of universal banking, while much of the literature on economies of scope in banking has focused on the United States. Furthermore, the results are very sensitive to the model specification. A Taylor approximation was used to approximate the exponential cost function in order to limit the effect of outliers. If the exponential cost function is used instead, the estimated coefficients become insignificantly different from zero, even though the high standard deviation is mostly driven by one or two extreme outliers. Finally, the presence of economies of scope does not automatically imply that a diversification discount is not present. The sample of banks that is considered in this chapter are for the most part unlisted so that market values cannot be used. Finally, Schmid and Walter (2014) find that the conglomerate discount becomes smaller during the crisis, while this chapter also finds higher economies of scope during the crisis.

When explicitly modeling the effect of implicit too-big-to-fail subsidies, economies of scale remained positive for the complete bank sample, and only became negative for the biggest of banks in the period before the crisis, while the during crisis years economies of scale were found to be positive for the biggest of banks even when too-big-to-fail effects are taken into account. This result partly contradicts the findings of Davies and Tracy (2014) who find that economies of scale disappear for the biggest of banks when implicit government subsidies are taken into account. The difference in results may stem from the fact that a different dataset is used. Where Davies and Tracey (2014) compare banks with assets over

$50 billion worldwide, this chapter considers all European banks, which may affect the results as Europe has a long history of large diversified banks. Besides this, a difference is found for crisis years compared to the pre-crisis period. Compared to Hughes and Mester (2015), who also find economies of scale at all asset levels, smaller economies of scale are found, especially when macro variables and ratings uplifts are taken into account. As in Hughes and Mester (2015) scale economies are found to be larger during the crisis than before, especially for the biggest banks.

Even though economies of scale are found after the inclusion of implicit too-big-to-fail subsidies, social economies of scale may still be negative. The ratings uplifts correct for implicit governmental guarantees, but these guarantees may not be the only way in which bank behavior is altered inefficiently by their size. Because large banks are interconnected with many other banks, their losses create an externality on the losses of other banks that is not priced in. As such, large banks may have incentives to create systemic risk beyond the fact that they can expect a government bailout when they experience heavy losses (Langfield and Pagano, 2016). This externality may not be related to external support, so that it is not captured empirically with the inclusion of ratings uplifts in the estimation. The results in this chapter should therefore be interpreted with some amount of caution, as social diseconomies of scale are still possible.

The results in this chapter imply that policy proposals that put limitations on the scale or scope of banks may be costly. Policy proposals that aim to limit the scale and scope of banks either directly or indirectly drive up costs of banks since economies of scale and scope are found at every level of assets, including for the very largest of banks. This result remains when too-big-to-fail factors are taken into account. Therefore, limiting scale and scope might increase bank costs, which may be passed on to consumers. Other measures to enhance financial stability, such as raising capital buffers might be preferable to policies that aim to split up banks or ring-fence them.

In attempting to uncover the sources of economies of scale and scope, it was found that economies of scale correlate negatively with interest income and positively with commission income. This lends support to the hypothesis that transaction banking activities are associated with economies of scale, while

relationship banking activities are not associated with economies of scale (Walter, 2003; Marinč, 2013). As such, it may be more costly to impose size restrictions on transaction banking activities that generate economies of scale than to impose them on relationship banking activities. The results are ambiguous on the influence of several macro variables, such as the quality of ICT infrastructure and market concentration, for which the correlation sign differs across model specifications. If the managerial preferences estimation is followed, a positive relationship exists between the ICT infrastructure and economies of scale as well as between market concentration and economies of scale.

Diseconomies of scale during normal times that turn into positive economies of scale during crisis times might also be consistent with an internal capital market story. During normal times profitable segments of the bank might subsidize unprofitable segments (Boot, 2011) thus causing larger, more diversified banks to be at a disadvantage during normal times. At the same time, divisions of large banks might be hit more mildly by the drying up of capital markets during crisis times because they can rely more on internal capital (Huang, Tang and Zhou, 2012). As such, a large bank might be more able to allocate capital to profitable segments when capital markets dry up, while smaller institutions are unable to obtain capital for their investments on the market. On the basis of this chapter alone it cannot be concluded that internal capital markets are the driving force behind the changes in scale economies over the sample period, but it does hint that this might add an interesting angle to the research on economies of scale and scope in banking that might be worth exploring.

In a broader sense, it may be questioned if the model used to estimate economies of scale and scope in banking still captures the business model of banking in the 21st century accurately. This chapter has focused on a methodology and data selection that is well established in the literature to ensure that the results are comparable to the existing literature as a whole. However, the estimation method takes its roots in studies by Hughes et al. (1996; 2000) and Hughes, Mester and Moon (2001), while the method in which a translog cost function is estimated dates back to the 1980s. As the banking landscape has changed and continues to change, this raises questions on the viability of this method going forward. The

model is flexible in form by remaining agnostic about the exact production function and allows for a great many different forms by using any combination of polynomials, sines, cosines, tangents and logarithmic values. However, in terms of outputs the model relies on asset values, which may not be the most relevant value going forward. For classic bank functions such as loan provision assets values capture bank output well, but for other activities, for instance on derivatives or insurance activities, guarantees may play a much more prominent role in estimating exactly what should be considered bank output. Although outside the scope of this dissertation, BCBS (2014) proposes a standard framework on how to measure bank exposure which may be worth exploring. In this chapter, off-balance sheet items attempt to catch the size of guarantees, as they are included in the Bankscope database. Officially, these include guarantees and securitizations, but these values are simply taken from the annual reports of banks while not following a standard model for measurement of these guarantees. Barrell et al. (2010) note some inconsistencies in the Bankscope database when it comes to off-balance sheet items, although they note that the expansiveness of the dataset has its advantages even if inconsistencies sometimes pop up. Several studies in the literature attempt to circumvent possible inconsistencies in reporting of off-balance sheet items by taking non-interest income as a proxy for off-balance sheet items as that is mostly generated by fees for activities that end up as off-balance sheet items (for example: Clark and Siems, 2002; Wheelock and Wilson, 2012). This does have the disadvantage that outputs are measured both in terms of assets and in terms of income, making it different to compare the size of the activities. Going forward, it may be interesting to investigate the possibilities of creating a more comprehensive database that includes values of exposures by banks.

3.7 Conclusion

This chapter estimates economies of scale and scope for banks within the Eurozone between 2002 and 2011. It attempts to uncover the possible sources of economies of scale and scope to answer the question if these economies of scale and scope are

real or merely the product of implicit governmental subsidies. Economies of scale and scope are estimated both with traditional translog cost functions and with a model specification that takes risk-taking into account, based off Hughes and Mester (2015). To proxy for implicit governmental subsidies, ratings uplifts were used. These ratings uplifts take the difference between Moody's rating of a bank's unsecured debt and the bank's financial strength rating. Because the financial strength rating is defined as the rating of the bank's debt without the possibility of external support, the ratings uplift provides a proxy for the possibility that a bank is rescued if it would otherwise default.

Economies of scale are found to be positive and significant for all years and at all asset levels. When ratings uplifts are included the traditional translog cost functions find that economies of scale disappear, which is consistent with the findings of Davies and Tracey (2014). However, when endogenous risk-taking is accounted for, economies of scale do become smaller for banks with a positive ratings uplifts, but remain positive even at the highest levels of assets. As such, economies of scale are partially explained by too-big-to-fail effects, but not fully.

Furthermore, it is found that banks that focus on relationship banking generally do not experience economies of scale, while banks that focus on transaction banking do experience economies of scale. The influence of the macro environment was found to play an ambiguous role, as the signs differed between simple cost estimations and more elaborate profit maximizing models. Scale is found to correlate positively with the number of broadband connections and the Herfindahl index, which proxy the quality of ICT infrastructure and market concentration. Meanwhile, economies of scope are found to be positive for all years and to increase slightly during crisis years. However, economies of scope are dependent on model selection and become negative or insignificant in certain specifications.

All in all the results found in this chapter do not favor splitting up banks in Europe, as it would imply an increase in the costs of banks, which may be passed on to consumers. Other measures to insure a safer financial system, such as higher capital requirements, might be better advised than splitting up banks or ring-fencing them.

Appendix 3A: Model description

As described in the main text, the system of equations to be estimated is (following Hughes and Mester, 2015):

$$\frac{p_\pi \pi}{\boldsymbol{p} \cdot \boldsymbol{y} + m} = F_4 + \sum_j H_{4j} lny_j + \sum_s L_{4s} lnw_s + \sum_i G_{i4} lnz_i + \mu[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP]$$

(Profit)

$$\frac{w_i x_i}{\boldsymbol{p} \cdot \boldsymbol{y} + m} = C_i + \sum_j E_{ij} lny_j + \sum_s D_{is} lnw_s + \sum_i L_{si} lnz_s + v_i[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP]$$

(Inputs)

$$F_1 + \sum_j H_{1j} lny_j + \sum_s L_{1s} lnw_s + \sum_j G_{1j} lnz_j + \kappa[ln(\boldsymbol{p} \cdot \boldsymbol{y} + m) - lnP] = 0$$

(Equity)

With:

$$lnP = A_0 + \sum_i A_i lny_i + (^1/_2) \sum_i \sum_j B_{ij} lny_i lny_j + \sum_i C_i lnw_i$$

$$+ (^1/_2) \sum_i \sum_j D_{ij} lnw_i lnw_j + \sum_i \sum_j E_{ij} lny_i lnw_j + \sum_i F_i lnz_i$$

$$+ (^1/_2) \sum_i \sum_j G_{ij} lnz_i lnz_j + \sum_i \sum_j H_{ij} lnz_i lny_j$$

$$+ \sum_i \sum_j L_{ij} lnz_i lnw_j$$

And the following restrictions are imposed:

For symmetry:

$B_{ij} = B_{ji}, \forall i, j$

$D_{ij} = D_{ji}, \forall i, j$

$G_{ij} = G_{ji}, \forall i, j$

Adding up conditions:

$\sum_i C_i + F_4 = 1$

$\sum_i D_{si} + L_{4s} = 0, \forall s$

$\sum_i L_{3i} + G_{34} = 0$

$\sum_i E_{ij} + H_{4j} = 0, \forall j$

$\sum_i L_{4i} + G_{44} = 0$

$\sum_i L_{1i} + G_{14} = 0$

$\sum_i L_{2i} + G_{24} = 0$

$\sum_i v_i + \mu = 0$

The variables are:

$y_j, j \in 1, \dots, 5$	Output quantities
$w_s, s \in 1, \dots, 5$	Input prices, taken as $w_s = x_s / Assets$
$x_s, s \in 1, \dots, 5$	Input quantities
$Assets$	Total assets

And:

$z = (k, n, p, p_\pi, uplift, intinc, comminc, fs, smcap, hhi, broadband, density)$

With:

k	Equity capital
n	Loan loss reserves
p	Average interest on assets
p_π	$1/(1 - Tax)$
Tax	Corporate tax rate
$uplift$	Ratings uplift
$intinc$	Interest income over total revenue
$comminc$	Commission income over total revenue
fs	Size of the country's financial system
$smcap$	Total country market capitalization
hhi	Herfindahl index of banking assets in the country
$broadband$	Percentage of broadband connections in the country
$density$	Population density of the country

The model was estimated by a General Method of Moments model, using 2 Stage Least Squares to identify the weighting matrix. Starting values were obtained by estimating the unconstrained system of (Inputs) (Profit) and (Equity) by Seemingly Unrelated Regression.

Appendix 3B: Data series

The following data series are used.

$Assets$	Total assets
$Total\ Revenue$	Total revenue: total income from 4 sources. Interest income, commission income, trading income and other operating income
$Total\ Costs$	Total costs: total expense from 4 sources. Interest expense, commission expense, trading expense and other operating expenses
$Profit$	$Total\ Revenue$ minus $Total\ Costs$
Tax	Combined corporate tax rate

Output quantities

y_1	Liquid assets
y_2	Total securities
y_3	Total loans
y_4	Total other earning assets
y_5	Off-balance sheet items

Input quantities

x_1	Personnel expenses
x_2	Total fixed assets
x_3	Demand deposits
x_4	Savings deposits
x_5	Total other funding
n	Loan loss provisions
k	Total equity
p	Average interest rate on assets
$IntInc$	Interest Income/Total Revenue

CommInc	Commission Income/Total Revenue
Uplift	Difference between the rating on unsecured debt and the Bank Financial Strength Rating

Macro variables

FinSize	Deposits to the financial system (billion euro) + credit from the financial system (billion euro)
StockCap	Stock market capitalization (billion euro)
Popdens	Population density (people/km^2)
HHI	Herfindahl-Hirschman-index of bank assets
Deposits	Bank deposits to GDP
Broadband	Broadband connections per 1000 inhabitants

Table B1: Data sources.

Variable	Bankscope series
Total Assets	DATA2025
Total Revenue[48]	DATA6510 + DATA6560 + DATA6620 + DATA6630
Total Costs	DATA6520 + DATA6560 + DATA6620 + DATA6670
Profit	Total Revenue – Total Costs
k: Total Equity Reserves	DATA6350
n: Loan Loss Provisions	DATA6690
p: Average Interest Rate on Assets	DATA6510 / DATA2025
y_1: Liquid Assets	DATA2075
y_2: Securities	DATA5470
y_3: Loans	DATA2000
y_4: Other Earning Assets	DATA5560
y_5: Off-Balance Sheet Items	DATA2065
x_1: Personnel Expenses	DATA6650
x_2: Total Fixed Assets	DATA5660
x_3: Demand Deposits	DATA5920
x_4: Savings Deposits	DATA5925
x_5: Other Borrowed Funds	DATA6240
Interest Income/ Revenue	DATA6510/ Total Revenue
Commission Income/ Revenue	DATA 6560/ Total Revenue

Variable	Source
Deposits (€ bln)	World Bank
Credit (€ bln)	World Bank
Stock Market Capitalization	World Bank
Broadband connections	International Telecommunications Union
Population Density	Mayer and Zignago (2011)
HHI	Bankscope
Tax Rate	OECD
Ratings uplift	Thomson One, Moody's

[48] Net Commission Revenue (DATA6560) and Net Trading Income (DATA6620) are not disaggregated into revenues and expenses. In order to preserve the data, these series were added to Revenue when positive and added to Costs (in absolute value) when negative. The results have also been tested while leaving out commission and trading income, to results that were similar to the ones presented.

Chapter 4

Scale and Scope in Banking from a Business Perspective: A Case Study on ABN AMRO 1997-2007

Before ABN AMRO was split into parts and sold to three acquirers in 2007, it had become one of the largest banks in the world with assets over € 1 trillion. Although the size of ABN AMRO may have enabled it to capture significant economies of scale, the share price of ABN AMRO lagged behind that of its competitors until it was marked as a takeover target in 2007. Before the takeover, analysts pointed at relatively high costs and a lack of synergies, which may have led to diseconomies of scope within the bank. This chapter analyzes the bank's strategy in three distinct periods, highlighting a potential friction between controlling costs and creating synergies. A key role is found for the Wholesale Clients business unit which was allowed to grow despite underperforming compared to other business units. Ambitions for the business unit may have been too high coming out of a period of economic growth in which investment banking activities were highly profitable. Over time, the bank became more focused on transaction banking rather than relationship banking, which may be attributed to adverse effects from the implementation of the managing for value system. Furthermore, economies of scope between different business units were low over most of the investigated period, while synergies between the different geographic areas were limited.

4.1 Introduction

In 1991 the bank ABN merged with the AMRO bank to form one of the largest banks in Europe.[49] The bank had offices and employees all over the world, and had an ambition to grow further internationally. Furthermore, it had the ambition of becoming one of the largest universal banks in the world. This ambition was not fully realized however, because in 2007 ABN AMRO was acquired by Fortis, RBS and Santander who consequently split the bank up into three parts.

ABN AMRO underwent two major shifts in its strategy. After the merger of ABN and AMRO in 1991, the bank was organized in a matrix organization and its strategy was to become an international universal bank. In 2000, the matrix structure was abandoned to form three strategic business units: Consumer & Commercial Clients, Wholesale Clients and Private Clients & Asset Management. The bank also tried to administer focus in its geographical structure by concentrating on growth in home markets[50] while selling off branches in countries in which ABN AMRO had a small presence. The strategic shift in 2000 corresponds with the succession of Jan Kalff by Rijkman Groenink as chairman of the executive board and was stated to be induced by the desire to better serve the needs of clients and improve shareholder returns (ABN AMRO, 2000a). A second major strategic adjustment took place in 2005 that divided the company along country lines with overarching divisions for wholesale activities and asset management. The shift in strategy was implemented to enhance synergies between business units (ABN AMRO, 2005a). Together with this organizational change, focus was put on servicing clients of intermediate size, which the bank addressed as the sweet spot in which it had a comparative advantage. Finally, in 2007 the hedge fund TCI rallied for the breakup of ABN AMRO into three parts, which were sold to Fortis, Royal Bank of Scotland and Banco Santander. The breakup of ABN AMRO marked the end of the bank as an independent entity, even though the name

---

[49] Bureau Van Dijk's Bankscope data shows ABN AMRO as the 12th largest bank worldwide and the 5th largest European bank in 1991.
[50] Home markets were defined as markets in which ABN AMRO could defend a considerable market share. In 2000, these were the Netherlands, the US Midwest and Brazil.

ABN AMRO has been reinstated when the Dutch government nationalized the Dutch parts of Fortis in 2008 and called the nationalized bank ABN AMRO.

This chapter analyses ABN AMRO over the period 1997-2007 in terms of strategy and structure. The first half of this chapter describes the strategy and structure of ABN AMRO in-depth, while the second half analyzes the chosen strategy and implementation. Key insights from the literature on scale and scope in banking are first discussed. After this, a statistical overview of ABN AMRO is presented. For the periods 1997-2000, 2000-2005 and post 2005 the strategies are described in-depth, as well as the reaction of both literature and media on these strategies. The second half of the chapter, from section 4.8, analyzes the choice of strategy as well as the implementation. It shows what worked well for the bank, and what did not work out, both in terms of strategy as well as in terms of implementation.

4.2 Key insights economies of scale and scope in banking

This chapter provides a brief overview of insights from the literature on economies of scale and scope that are discussed in more detail in chapter 2 of this dissertation. It is useful to disentangle scale, scope and geographical focus. Scale is the size of the activities of the bank, scope is the number of different types of activities the bank undertakes and geographical focus how many geographical areas the bank is active in. Economies of scale, scope and geography are characterized by cost decreases or revenue increases, while diseconomies of scale, scope and geography are characterized by cost increases or revenue decreases.

Theoretically, fixed cost components of ICT investment, investment in the corporate brand and innovation ensure that expanding the total scale, scope and geography of a bank will spread those fixed costs over a larger size, number of activities and number of countries, leading to lower average costs. Diversification of risk is controversial as a source of economies of scale, scope and geography. Traditional finance theory states that diversification will not bring any advantages to the firm, because investors can diversify their own portfolios so that they will

not pay a premium for diversified firms (Ross, 1976). However, diversification may add value through establishing trust and decreasing the possibility of financial distress. Because of the nature of financial distress in the banking sector, which is characterized by bank runs and fire sales, financial distress costs may be especially high. Internal capital markets may also provide economies of scale and scope, depending on the economic situation. During crisis times divisions of a larger company may be able to attract funding internally while markets are hesitant to provide funding (Huang, Tang and Zhou, 2012). Artificial economies of scale and scope can come about for large financial institutions when they become too big to fail, too complex to fail or too interconnected to fail. Furthermore, when a larger scale or scope is achieved through mergers and acquisitions, this may lead to increased market concentration and possibly monopolistic rents.

Increasing scale, scope and geography may come at a cost as well, leading to diseconomies of scale, scope and geography. Agency problems may increase from increasing the size of a bank as well as spreading a bank over a wider range of activities and countries. Furthermore, internal capital markets may lead to diseconomies when profitable segments of a bank subsidize unprofitable segments. Whether or not internal capital markets profit the bank ultimately depends on which effect dominates (Boot, 2011).

Empirical studies on scale in banking from the 1980s and 1990s generally find that the relationship between economies of scale and asset size displays an inverted U shaped pattern. In those studies economies of scale are exhausted at a level of around $100 million to $500 million in total assets (Berger and Humphrey, 1997; McAllister and McManus, 1993). Studies near the end of the 20th century tend to find that the estimate for the asset size at which economies of scale are exhausted has gone up to around $10 billion to $25 billion in assets (Berger and Mester, 1997; Hughes, Mester and Moon, 2001). The most recent studies using data past 2000 tend to find economies of scale at higher levels, even for the largest of banks (Feng and Serlitis, 2010; Hughes and Mester, 2015; Wheelock and Wilson, 2012; Gandhi and Lustig, 2015). While positive economies of scale are mainly found in the banking literature, diseconomies of scope are generally found: Laeven and Levine (2007) and Schmid and Walter (2009; 2014) find that financial

intermediaries that engage in multiple activities are valued less by financial markets than specialized institutions. Similarly, Berger, Hasan and Zhou (2010) and Cummins et al. (2010) find diseconomies of scope through efficiency measures. In terms of geography, results are mixed. Goetz, Laeven and Levine (2013) find that geographic diversification reduces market values of bank holding companies. At the same time, Goetz, Laeven and Levine (2015) find that geographic expansion does tend to decrease risk for banks. Berger (2007) and Claessens and Van Horen (2012; 2013) show that foreign owned banks tend to outperform local banks, but that this is only the case for developing countries, while there is no difference in developed countries.[51]

Why economies of scale materialize but economies of scope do not, is less clear. Diversification benefits might be insufficient to make up for additional costs, agency costs could be higher when activities are stretched over multiple markets, or there may be specialization benefits that are foregone when multiple activities are engaged in. Also, improvements in the ICT environment may make scaling up similar activities more profitable, while not affecting the spread of costs over multiple activities by much. Schmid and Walter (2014) find that the conglomerate discount becomes smaller during crisis years, which supports the idea that internal capital markets enable economies of scope during crisis years. Table 1 provides a short overview of the empirics on economies of scale, scope and geography. This table is not exhaustive, and a more extensive overview is presented in chapter 2 of this dissertation.

---

[51] Interestingly, Claessens and Van Horen (2013) find that for the Brazilian market (one of the main markets ABN AMRO operated), domestic banks tend to outperform foreign competitors.

*Table 1: Empirical evidence economies of scale, scope and geography.*

	Key insights	Recent sample literature
Scale	Economies of scale typically found even at very large asset sizes, not fully explained by too-big-to-fail. Transaction banking activities lend themselves more to economies of scale than relationship banking	Feng and Serlitis (2010); Hughes and Mester (2015); Wheelock and Wilson (2012); Gandhi and Lustig (2015)
Scope	Economies of scope typically not found, explained by agency costs. Problem less severe during crises, suggesting internal capital markets may alleviate problems	Laeven and Levine (2007); Schmid and Walter (2009; 2014)
Geography	Economies of geography typically not found, problem increases in distance, may be explained by agency costs	Goetz, Laeven and Levine (2013; 2015)

4.3 Statistical overview ABN AMRO 1997-2007

This section provides a statistical overview of the structure of ABN AMRO to give some background to the strategic analysis that follows. Figure 1 gives an overview of the size of ABN AMRO in terms of assets. It shows that up until 2001 ABN AMRO was growing with relatively large jumps in assets in 1997 (acquisition Standard Federal Bank), 1998 (acquisition Banco Real), 2000 (acquisition Bouwfonds) and 2001 (acquisition Michigan National). After 2001, divestment of smaller foreign branches took place, as well as a reduction in the office network in the Netherlands. The downward jump in assets from 2001 to 2002 reflects the sale of activities in several markets in which ABN AMRO had a small presence, such as Greece, Argentina, Bolivia, Malaysia, Kenya and Lebanon, and is driven in a

large part by the sale of European American Bank to Citigroup in New York.[52] After this period, another jump in asset size took place in 2005 with the acquisition Banca Antoniana Popolare Veneta, or Antonveneta for short. Before it was split up in 2007, the asset size of ABN AMRO rose to over € 1 trillion.

*Figure 1: Asset size ABN AMRO over time (€ bln)*
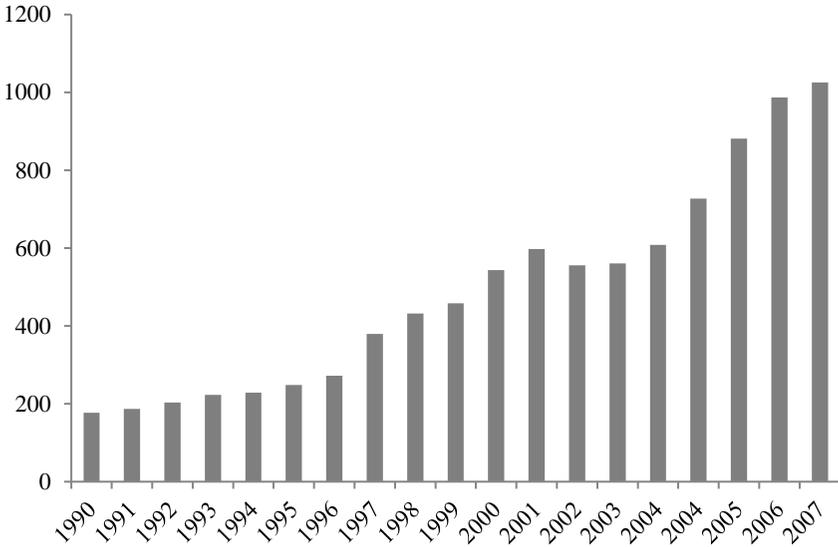
Source: ABN AMRO Annual reports

Figure 2 shows the number of employees of ABN AMRO in the Netherlands and abroad. In the Netherlands the number of employees is decreasing overall, while the number of employees abroad is increasing.[53] Positive jumps in the number of employees abroad in 1998 and 2006 can be attributed to the acquisitions of Banco Real and Antonveneta respectively. Personnel in the Netherlands is reduced from 2000 onwards, especially through a large reorganization program "Zonder Omwegen" (No Detours) that scrapped 6673 jobs in the Netherlands

---

[52] European American Bank represented approximately $15.4 billion in assets (Daily Deal, 2001), or €17 billion, which explains around 40% of the €41.4 billion drop in assets in 2002.
[53] The number of branches follows a roughly similar pattern, with a large increase in branches abroad in 1998, and a steady decline of the number of branches in the Netherlands over the entire period.

between 2001 and 2004 (Financieele Dagblad, 2002). The downward jump in foreign employees in 2004 marks an outsourcing operation of approximately 3000 jobs in addition to an ongoing sale of foreign branches in countries where ABN AMRO had a small presence that started in 2000.

Figure 2: Employees ABN AMRO in and outside of the Netherlands (fte).
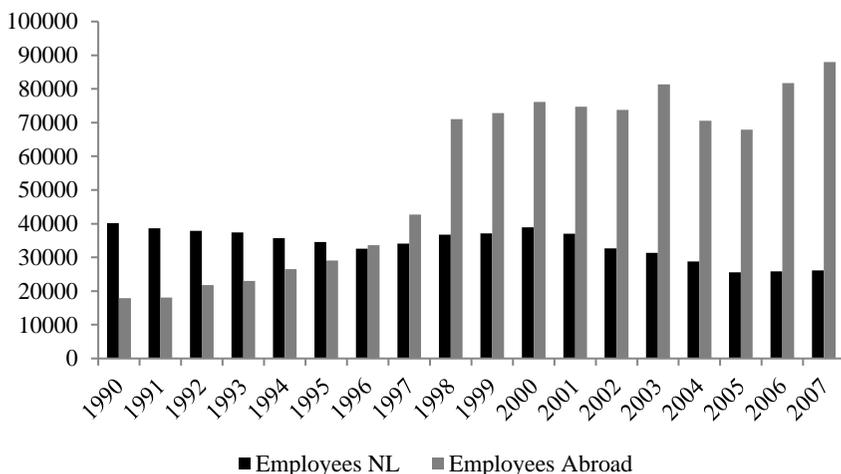
Source: ABN AMRO Annual Reports

Figure 3 shows the number of takeovers and the value of those takeovers over time. The biggest takeovers were made in 1998 (Banco Real in Brazil), 1999 (Great Pacific in the US and Bouwfonds in the Netherlands) and 2000 (Michigan National in the US). After 2000 the volume of takeovers went down both in value and number and remained at a permanently lower level. The exception is the year 2005, which marks the takeover of Antonveneta in Italy.

Figure 3: ABN AMRO, number of takeovers and total takeover payments by year.[†]
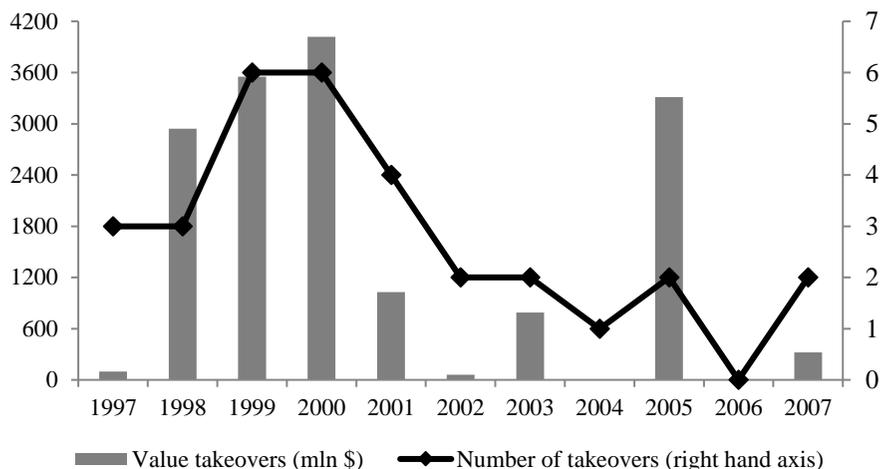
[†]For small takeovers, data on the value of the deal is generally not available, so that total deal value mostly represents the total value of the large deals completed in that year. This also explains why 2004 had a positive number of deals, but a deal value of zero.

Source: Zephyr and Dutch newspapers

Figure 4 shows the share price of ABN AMRO compared to the KBW Index[54] and the average of stock prices of ABN AMRO's peer group, which is a group of 20 investment, retail and universal banks ABN AMRO chose as a peer group.[55] It can be seen that until the end of 2000, ABN AMRO's share price moved in line with the average of its peer group and outperformed the KBW Index. The share price then declined at the beginning of 2001, and lagged both compared to the average of its self-selected peer group and the KBW Index until a strong increase in 2007.

---

[54] The KBW Index is named after Keefe, Bruyette and Woords, and trades on the Philadelphia Stock Exchange. It consists of the stocks of 24 banking companies and is used as a benchmark of the banking sector.

[55] Specifically: Bank One, Barclays, BBVA, BNP Paribas, Citigroup, Crédit Suisse Group, Deutsche Bank, Fleet Boston, HSBC Holdings, HVB Group, ING Group, JPMorganChase, Lloyds TSB, Merrill Lynch, Morgan Stanley, Nordea, Standard Chartered, Société Générale, UBS, and Wells Fargo.

Figure 4: Share price of ABN AMRO compared to the KBW Index and average of ABN AMRO's self-selected peer group (January 1st 1997 = 100).
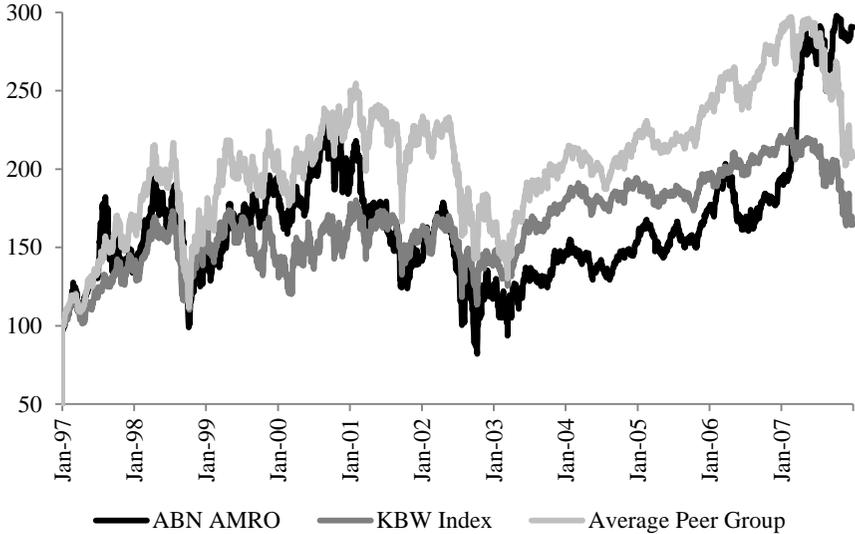
This increase coincides with the letter of hedgefund TCI that urged the board of directors to split up ABN AMRO into three parts. To correct for dividends, figure 5 shows buy and hold returns for ABN AMRO and the average of its self-selected peer group. It shows the value of buying a share and holding it, thus receiving dividends. The figure shows that dividends do not completely explain the difference in share price between ABN AMRO and its self-selected peer group.

Figure 5: Buy and hold returns for ABN AMRO and the peer group average (January 1st 1997 = 100).
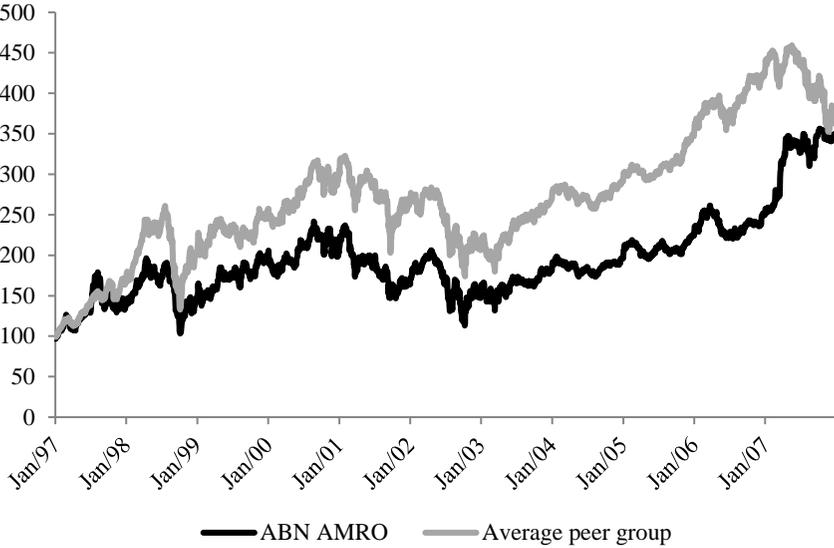
Figure 6 shows the aggregate recommendation of analysts for buying shares of ABN AMRO, as collected by the Institutional Brokers' Estimate System (I/B/E/S). It shows the percentage of analysts that give a buy recommendation for a share of ABN AMRO. It can be seen that over the period 1997-2007, the percentage of analysts that advised buying the shares of ABN AMRO was lower than the average of the peer group of ABN AMRO. Exceptions are the beginning of 2000, which coincides with the announcement of Rijkman Groenink as chairman of the executive board, and most of the years 2003 and 2004, when ABN AMRO was cutting costs through outsourcing operations and personnel reduction in the Netherlands.

Figure 6: Percentage of buy recommendations for ABN AMRO and the average of the peer group.
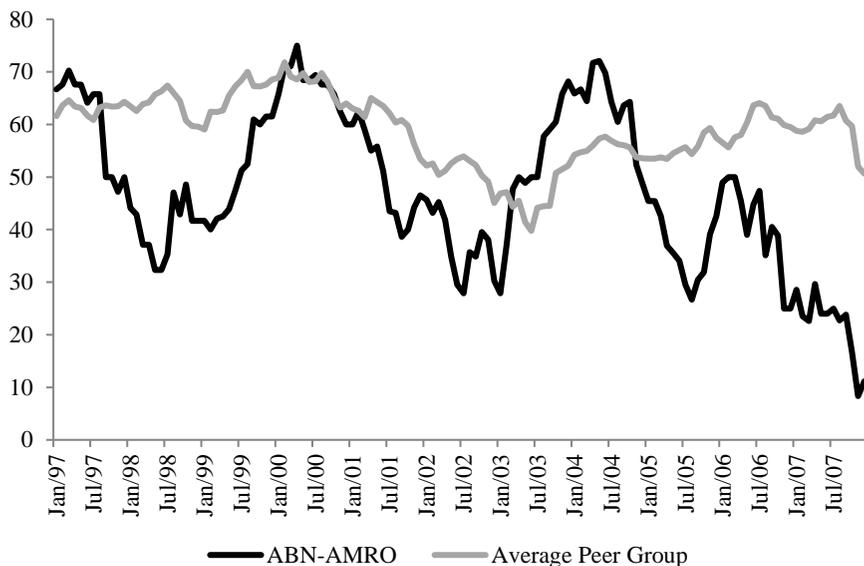

Source: I/B/E/S

Figure 7 shows the cost-to-income ratio of ABN AMRO compared to the average ratio of its peer group.[56] It can be seen that the cost to income ratio was comparable in 1997, after which it increased for ABN AMRO both in absolute terms as well as relative to its peer group. The years 2002 and 2003 marked large scale reorganizations for ABN AMRO that decreased costs, until they started rising again in 2004. The cost-to-income ratio can be high due to high costs or low income, and in the case of ABN AMRO the main driver behind the high cost-to-income ratio is low income. When comparing the costs of ABN AMRO to the average costs of its

---

[56] Cost-to-income ratios for the peer-group were collected from Bureau Van Dijk's Bankscope while ABN AMRO's cost-to-income was collected from the annual reports of ABN AMRO. The cost-to-income ratio for ABN AMRO was collected from Bankscope as well but gave implausible values (over 100%) for 2006 and 2007. In other years, the cost-to-income ratio collected from Bankscope was similar to the one collected from the annual reports. The difference in 2006 and 2007 seems mostly driven by an underrepresentation of the interest income in Bankscope for those years.

self-selected peer group, both costs as a percentage of assets and personnel costs over total employees are lower.

Figure 7: Cost-to-Income ratio of ABN AMRO and average of the peer group.
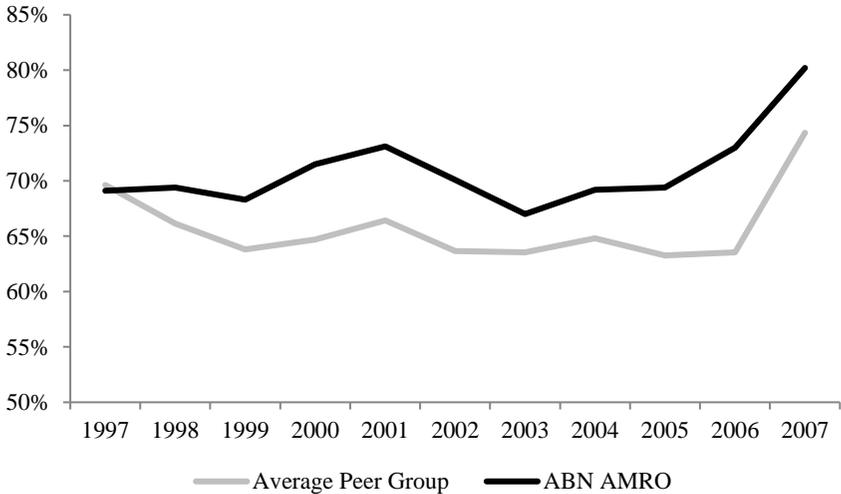
Source: Annual reports ABN AMRO; Bankscope

Figure 8 shows the geographical distribution of ABN AMRO's revenues and shows that it became more focused over time in geographical terms. The share of revenues from the Netherlands increased, with 32% of revenues in 1998 to 41% in 2006. North American revenues made up 15% of total revenues in 1998, going up to 23% in 2000 before going back to 15% in 2006. Revenues in Europe outside of the Netherlands also went up steadily from 12% in 1998 to 22% in 2006. As such, it seems that ABN AMRO generally increased its presence in markets where it already had a large market share, especially in the Netherlands and other European countries. At the same time, the peer group of ABN AMRO tended to become less concentrated over time: on average of the peer group made 65% of its revenues in its home market in 1998, compared to an average of 41% in 2006.

Figure 8: Geographical distribution of revenues over geography in 1998, 2000 and 2006.
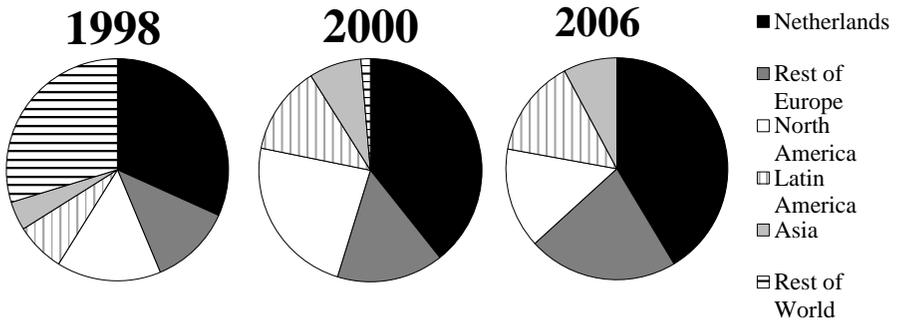
Figure 9 shows return on assets for ABN AMRO as well as return on book equity. ABN AMRO has lower return on assets compared to its peer group, but a comparable return on equity, because of a relatively high leverage of ABN AMRO compared to its peer group.[57]

Figure 9: Return on assets (left) and return on book equity (right).

---
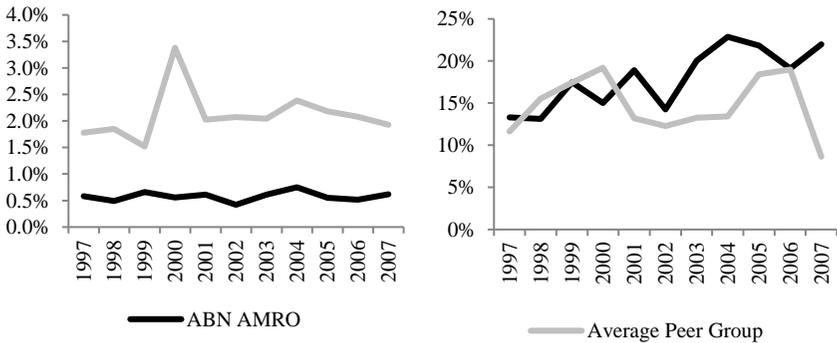
[57] There is a slight discrepancy between the return on equity data from Bankscope and ABN AMRO's annual reports. Specifically, return on equity is systematically higher in the annual reports. The data on return on assets are consistent between Bankscope and the annual reports, so that the discrepancy in return on equity is likely the result from differences in equity definitions, with Bankscope using a broader definition. For reasons of consistency between the data on ABN AMRO and its peer group, the Bankscope data is presented.

An argument can be made that lower return on assets may have been the result of lower risk. Figure 10 shows ABN AMRO also had lower return on risk-weighted assets compared to its peer group until 2007. Although risk-weighted assets may not fully capture the riskiness of a bank,[58] the measure is included here to give an indication of how the return on asset statistics from figure 9 might be interpreted when a correction for risk is made.

Figure 10: Return on risk-weighted assets ABN AMRO and its self-selected peer-group.
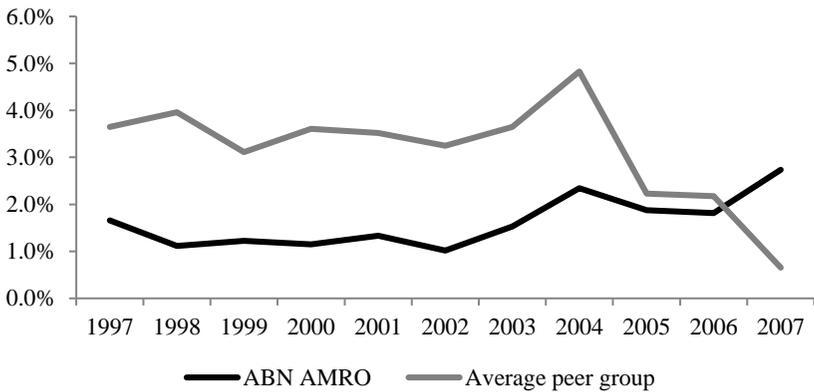
Figure 11 shows the distribution of income over different income classes. Interest income as a percentage of total income went down over the entire period. Meanwhile non-interest income went up, especially income from private equity.[59] This pattern is similar to its self-selected peer group, for which on average interest income as a percentage of total operating income also went down (figure 12), although the rate of decline is faster for ABN AMRO.

---

[58] The problems with using risk-weights as a measure of risk are discussed in-depth in section 4.7.2 where risk management is discussed as a possible core competency of ABN AMRO.

[59] Note that income from private equity would be filed under Other Income before it was officially recorded as a source of income in the annual report of 2005 (ABN AMRO, 2006)

Figure 11: Distribution of income over different income classes for ABN AMRO (mln €).
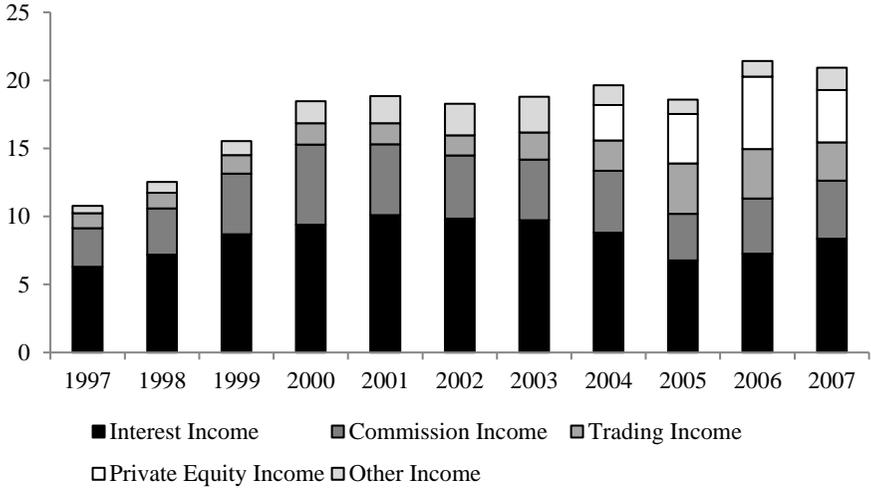
Source: Annual reports

Figure 12: Interest income as a percentage of total operating income for ABN AMRO and its self-selected peer group.
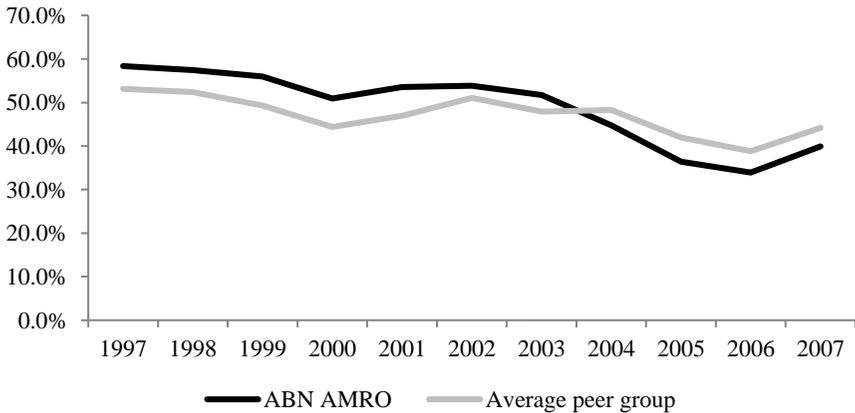
Source: Bankscope and Annual reports

Figures 13, 14 and 15 show different measures of riskiness of ABN AMRO over time. Figure 13 shows risk-weighted assets as a percentage of total assets and show that in terms of this measure, ABN AMRO was less risky than the average

of its peer group. Figure 13 also shows ABN AMRO became less risky in terms of risk-weighted assets compared to total assets over time. When this is compared to figures 14, CDS spreads show that ABN AMRO was also considered less risky than the average of its peer group, although it did not become less risky over time.[60] Furthermore, figure 15 shows reverse leverage and shows that ABN AMRO actually became more levered over time, even more so than the average of its peer group. From these three figures, it is not possible to definitively state that the bank as a whole became more or less risky.

Figure 13: Risk-weighted assets as a percentage of total assets for ABN AMRO and its self-selected peer group.
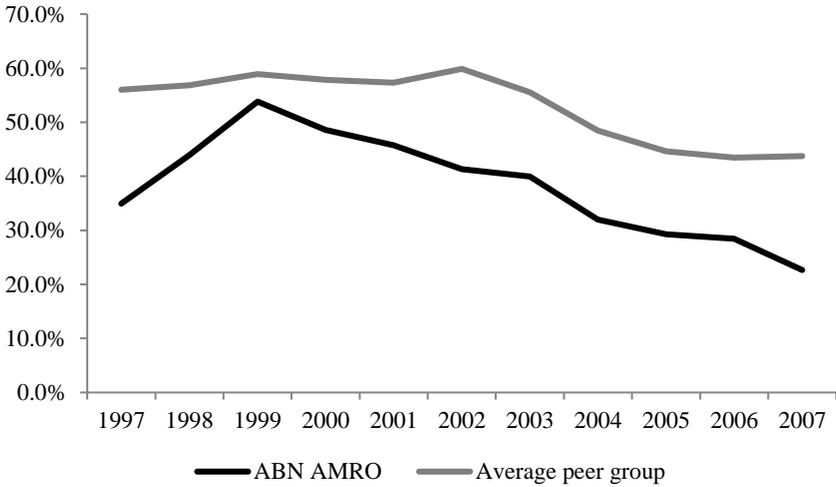
Source: OSIRIS

---

[60] A Credit Default Swap provides an insurance against default, so that the CDS spread can be seen as a proxy for default risk of an institution.

Figure 14: CDS spread on 10 year senior bonds ABN AMRO and average of the peer group (basis points).[61]
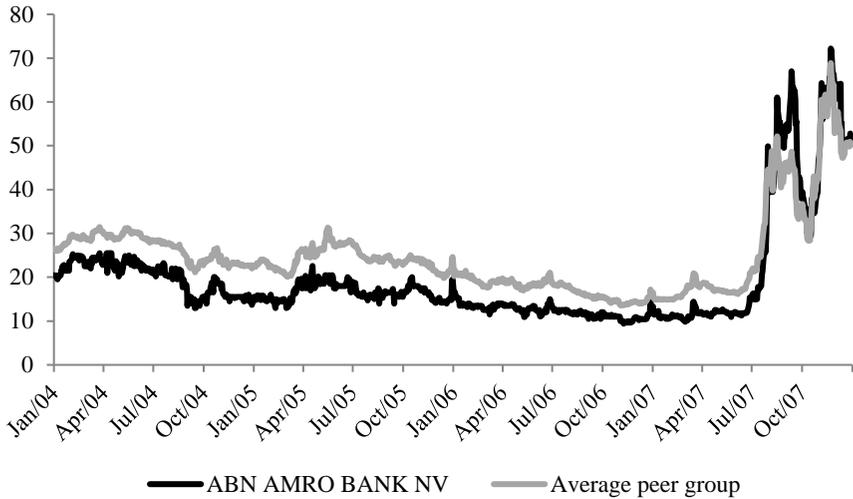
Source: Thomson Datastream

Figure 15: Book equity/assets ABN AMRO and the average of its self-selected peer group.
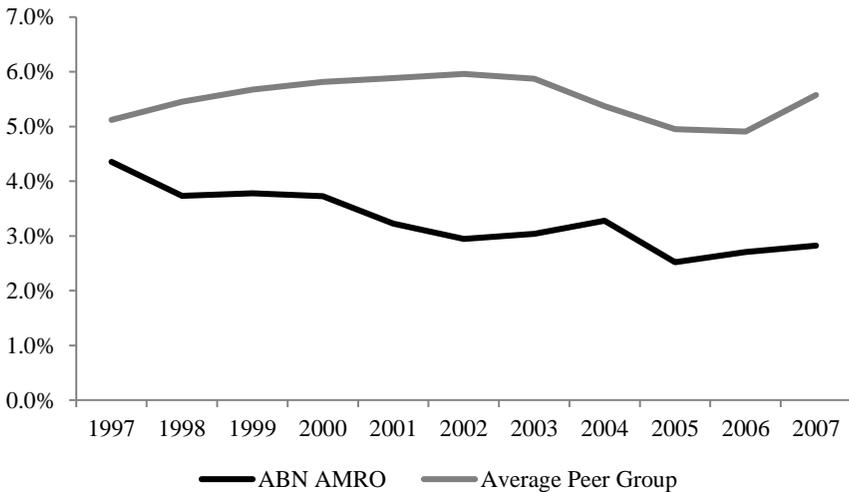
Source: Bureau Van Dijk's Bankscope

---

[61] Appendix 4C shows CDS spreads for the full peer group.

Overall, the statistics show that ABN AMRO underperformed relative to its self-selected peer group over the entire period in terms of share price, analyst recommendations, cost-to-income and return on assets. The bank did attempt to turn this around, and this is reflected especially in analyst recommendations, who gave a buy recommendation during periods where ABN AMRO attempted to follow a new strategy. For example, when the implementation of a new strategy was announced in 2000, analysts' recommendations became more positive, and actually costs did go down initially. When costs were aggressively cut in 2003 and 2004, analysts' recommendations also became more positive and share performance became closer to the performance of its peer group. In terms of operating performance, ABN AMRO's return on assets remained lower than its peer group over the entire period. ABN AMRO did have lower risk-weighted assets and a lower CDS-spread, but not low enough to compensate for its lower earnings since its return on risk-weighted assets was also lower than the average of its peer group.

4.4 Strategy before 2000

4.4.1 Overview key points

For ABN AMRO, the period before 2000 was marked by an ambition to i. become a worldwide universal bank and ii. the integration of ABN and AMRO into a single entity. In order to accommodate these ambitions, the bank implemented a matrix organization that allowed it to offer all of its services to all of its customers. In this period, ABN AMRO became active in many new markets, mostly by takeovers of small banks with an occasional large takeover. Before 1998 ABN AMRO was active in two home markets in the Netherlands and the US Midwest. In 1998 it added Brazil as a third home market with the acquisition of Banco Real.

The strategy of becoming a large international bank that was active in many markets was the result of the nature of ABN and AMRO before the merger of the two banks. ABN was a commercial bank with a large presence in the US Midwest, while AMRO was a Dutch bank that combined commercial and investment

banking activities. By choosing a strategy of becoming an international universal bank, the existing structures of the banks could be integrated. The matrix organization allowed ABN AMRO to engage in multiple activities in every country, since local offices would be able to ask for specialized assistance.

In terms of the structure of ABN AMRO, the period leading up to 2000 was characterized by growth. Growth in size as measured by total assets and total number of employees (figures 1 and 2), growth in takeovers outside of the Netherlands (figure 3), growth in its share price (figure 4 and 5) and growth in its cost-to-income ratio (figure 7).

Over time, analysts focused more and more on these high costs and became more skeptical over the internationalization strategy of ABN AMRO. Analysts mostly noted the high costs and cyclicality of revenues of the investment banking activities. These activities contributed to the profits of ABN AMRO in times of economic prosperity, but lagged when the economy slowed down. The high costs of especially the investment bank near the turn of the century led to questions from analysts about the viability of ABN AMRO continuing as its own independent entity.

4.4.2 Before 2000: The matrix organization

Before 2000, the main strategic objective of ABN AMRO was to become a worldwide universal bank (Berendsen, 1999; Larson et al., 2011). In the literature, universal banking can mean either a bank that combines retail and investment banking, a bank that is active in multiple product markets, or a bank that offers a wide range of services to a wide range of customers (Walter, 2003). The overlap in these definitions is that universal banking means to offer multiple different services. For the period up until 2000, universal banking was communicated as the basis of ABN AMRO's strategy and was interpreted as offering a combination of investment banking and retail banking activities to its customers (ABN AMRO, 2000b; Van den Brink, 1998). The universal banking strategy was assumed to add profit because it created economies of scale, scope and geography (ABN AMRO, 2000b; Van den Brink, 1998).

By 1997, ABN AMRO had a strong presence in the Netherlands as well as in the US Midwest, which were designated as the ABN AMRO's home markets, which it defined as countries in which it had a large and defendable market share (ABN AMRO, 2005). Furthermore, the bank had smaller branches all over the world. ABN AMRO peaked in terms of the number of countries in 1999 when it had branches in 76 countries (ABN AMRO, 2000b). In 1998 ABN AMRO took over Banco Real in Brazil and added it as a third home market. Meanwhile, smaller scale takeovers were completed all over the world with a focus on emerging markets in Asia. After the acquisition of Banco Real ABN AMRO had ambitions to add another (preferably European) home market to its portfolio. To secure these markets it was decided that ABN AMRO would take over a foreign bank rather than enter the market as a new participant. Initiatives for a merger or acquisition were undertaken in Belgium,[62] France,[63] Italy,[64] Sweden,[65] and Germany.[66] These mergers and acquisitions were ultimately unsuccessful, although a new home market was eventually created with the takeover of Banca Antoniana Popolare Veneta (Antonveneta) in Italy.

ABN AMRO's choice for universal banking seems to have been made out of historical considerations as well as a belief that this was the most profitable way to secure a competitive advantage. Before the merger of ABN and AMRO, ABN could be characterized as an international retail bank, while AMRO was closer to a domestic retail and investment bank. After the merger, it was the least disruptive to transition into a bank that could combine both retail and investment banking in an international shell. As such, ABN AMRO would possess a broad scope both in terms of activities as well as geographically. In order to manage this broad scope of activities over a large number of countries, it adopted a matrix structure for its organization, in which team managers reported to both country and functional

---

[62] De Generale Bank in 1998.
[63] Credit Industriel et Commerciel in 1998.
[64] Banca di Roma was considered in 1999, Banca Antoniana Popolare Veneta was later considered and eventually acquired in 2005.
[65] Nordea in 2001.
[66] HypoVereinsbank in 2005.

divisions.[67] Box 1 gives a brief overview of the costs and benefits of a matrix organization.

Box 1: Matrix organization

A matrix structure is an organizational structure in which a team manager reports along multiple command lines (Ford and Randolph, 1992; Saracoglu, 2009). In the case of ABN AMRO this meant that project managers reported along both functional as well as country lines. Theoretically these reporting lines enable flexibility in the use of specialized knowledge across projects. For example if a local client is planning a takeover and needs expertise on mergers and acquisitions, a matrix structure enables the local manager to confer with both the country and M&A divisions. From there knowledge can be assigned to the local manager accordingly leading to a theoretically optimal allocation of knowledge in the firm. Besides the flexibility of employing human capital, a matrix organization ensures a great deal of information sharing. Not only is knowledge spread along country lines, but also through activity lines. Disadvantages of the matrix organization are that it requires a lot of managerial effort both in processing all of the information as well as in allocating human resources. Managers need to constantly ask themselves if the time of their employees is spent optimally and adjust accordingly. Cost allocation can also present a difficulty in the matrix organization, because costs for a single project can be allocated freely over activities. As such managers may be incentivized to allocate costs at a different functional unit, obscuring the profitability of individual units and perhaps leading to overinvestment. Because of these advantages in terms of human capital flexibility and information sharing the matrix organization is well suited to small companies (Ford and Randolph, 1992). For large organizations such as ABN AMRO it may have added too much bureaucracy and insufficient accountability, which may be why ABN AMRO announced to abandon the functional form in 2000 (Larson et al., 2011).

---

[67] For example, management of ABN AMRO's US activities reported both to the division Foreign Activities as well as the division Investment Banking & Global Clients (Westerhuis, 2011).

Theoretically, the matrix organization allowed for a smooth transition into a single bank and would allow ABN AMRO to offer all services in all countries. The matrix organization helped to integrate the two banks and spread information over the bank as a whole. In the period leading up to the merger both banks divided themselves in a domestic and a foreign division that together handled the executive duties of the banks. Additional functional divisions such as risk management and human resources were organized within the head office for both banks (Larson et al., 2011). This meant that for both banks the structure was decentralized with close coordination between the functional divisions and geographical divisions. The choice of a matrix structure left this close coordination between country and functional lines intact, thus ensuring that the integration of the two banks was smooth and without any abrupt disruptions to its organization. Secondly, the matrix structure would allow the bank to be truly universal if it was ideally implemented. Local branches would only need non-specialized executive staff that could form teams with specialized personnel from headquarters when the need arose.

The internationalization strategy and matrix structure can also be viewed in a negative light. The strategy of universal banking that became supplying a full range of services to a broad group of countries could have been a result of not having to choose for specialization towards a certain set of activities or countries and avoiding tough choices (Boot, 1998). Furthermore the matrix structure could have led to opacity resulting in unclear cost allocation. This may have resulted in a lack of cost control that can be seen in the worsening of the cost-to-income ratio before 2001 (figure 7). Accountability became an issue in the matrix structure. Since managers reported along different lines, those managers could allocate costs as they saw fit. It became very hard to figure out who exactly was accountable for which costs, a point that was stressed in multiple interviews that were conducted with ABN AMRO directors to enrich this case study.

4.4.3 Analysts and press on ABN AMRO before 2000

Until around 1998-1999, analysts were largely positive on ABN AMRO's course, noting that profits exceeded their targets. Since 1990, the goal of ABN AMRO was a 7.5% increase in earnings per share per year, which was 10.4% over that period (Brouwer, 1997; Van der Feen de Lille, 1998). During this period, investment banking activities especially contributed to the results, growing in importance from 14% of total revenue in 1992 to 25% of total revenue in 1996 (Brouwer, 1997).

Even so, the matrix structure was criticized for its opacity (Van der Feen de Lille, 1998).[68] Jonker (2008) notes that the matrix organization was designed to balance regional concerns with product-driven attitudes, but led to an increase in intermediate management and a lack of accountability. Because of the matrix structure it was often unclear which part of the organization should bear certain costs so that it was unclear which parts of the organization were profitable and which were not (Jonker, 2008). This lack of accountability and lack of transparency meant that managers were not penalized for pursuing unprofitable projects. Furthermore, partly because of the vision of a large scale universal bank, managers were incentivized to increase revenue rather than profits which further led to unprofitable projects (Claes, 2008). This can be seen in the cost to income ratio, which was not only high in comparison to other banks (figure 7), but also increased from 69% to 71.5% between 1997 and 2000 (Kluis and Van der Feen de Lille, 1999). A higher cost to income ratio was the result of relatively low revenues rather than high costs, because revenues compared to assets were significantly lower than other banks while costs were not significantly higher, neither in terms of costs to assets nor in terms of personnel costs per employee.

Around the turn of the century concerns were raised over the acquisition path of the investment banking activities. Business Week (1996) notes a takeover strategy that involved many takeovers of relatively small banks which caused geographical gaps in the investment banking network, especially in parts of Continental Europe and North America. A similar message is brought by Forbes

---

[68] Specifically, Van der Feen de Lille (1998) notes that income from private banking is divided between the division Foreign and the division Investment Banking, thus obscuring how profitable a significant part of the bank's revenues are.

(1999) which notes the difficulty ABN AMRO has had in taking over European banks and notes that the expansion of investment banking activities through small takeovers and autonomous growth is expensive, pulling down total bank earnings. Van den Brink (1998) defends the takeover strategy by noting that smaller takeovers may keep down costs, foster autonomous growth and allow steady rather than instantaneous change in culture.

Over time concerns arose over the profitability of the investment bank. Kluis and Van der Feen de Lille (1999) observe a negative effect on profits in 1998 because the Russian crisis hit the investment bank hard. Matthew Cziepliewitz, analyst at Salomon Brothers, notes that Hoare Govett (a UK investment bank acquired by ABN AMRO in 1992) had not completed any major deals outside of the UK and the Netherlands (Business Week, 1996). The Financial Times (1997) similarly notes that costs were rising faster than revenues in the investment bank and that the investment bank might not have enough scale to compete on a global level. Profits in the investment bank did rise once again in 1999 when profits increased by 40% (Norbart, 2000).

The takeover of Banco Real also led to concerns. The Financial Times (1998) fears that ABN AMRO may have overpaid, noting that it paid over 3 times the book value of assets, and notes that Moody's cut ABN AMRO's long term deposit rating from Aa1 to Aa2 and its financial strength rating from A to B+. At the same time however, profits in the Brazilian division generally remained high, even in the face of devaluation of the Brazilian real and a severe recession (Financial Times, 1999a).

Finally, the optimality of the universal banking strategy is questioned near the end of the nineties. Van den Brink (1998) notes that universal banking might enable ABN AMRO to achieve economies of scale and scope, but Boot (1998) notes that the universal banking strategy chosen may be just pragmatism rather than an optimal strategy. In formulating core competencies, the existing infrastructure of ABN AMRO seems to be taken as granted and competencies are suggested to justify the existing scale and scope of the bank.

As a result, there is speculation on the possibility of ABN AMRO as a takeover target by the turn of the century. Forbes (1999) speculates that ABN

AMRO might become a takeover target, noting ING as a promising acquirer, while Norbart (2000) states that a merger between ABN AMRO and ING might be allowed by the Dutch central bank because of a need for large banks that survive an international merger wave.

4.5 Strategy 2000-2005

4.5.1 Overview key points

In May of 2000, Rijkman Groenink succeeded Jan Kalff as the chairman of the managing board of ABN AMRO. In popular media this was presented as a step in the right direction. Action was needed to control costs at ABN AMRO and Groenink was seen as someone who could get things done (Elsevier, 2000). Right after his succession Groenink presented a strategic reorientation that addressed the changes that would be implemented to control costs especially. Parts of the strategic reorientation had been planned under Kalff's leadership and the introduction of Groenink as chairman of the executive board marked an opportunity to publically announce the new strategy. In the press conference that accompanied the strategic reorientation, ABN AMRO announced it would reorganize into three strategic business units, accountability would become more important and a measurable goal for shareholder value was introduced (ABN AMRO, 2000a).

Strategically, the year 2000 marked three substantial changes in ABN AMRO. First of all, the matrix structure of the bank was abolished in favor of a structure consisting of three strategic business units (SBUs): Consumer and Commercial Clients, Wholesale Clients and Private Clients & Asset Management. Second, attempts were made to increase accountability by implementing a system of managing for value. Third, a greater focus was placed on creating shareholder value. Specifically, ABN AMRO aimed to be among the top 5 of a self-selected peer group of banks in terms of the creation of shareholder value. In terms of performance, costs went down in 2001 and 2002 and over the entire period an increase in focus can be observed. The number of employees in both Dutch

branches as well as internationally went down (figure 2) and acquisitions were focused in a smaller number of countries (figure 3).

The new strategic focus was at first welcomed by analysts, who saw Rijkman Groenink as a chairman of the board who was more assertive in pursuing targets than his predecessor had been. Although the cost-to-income ratio did improve in 2002 and 2003 (figure 7), the increase in focus and cost controls did not immediately translate into shareholder returns, which lagged behind the competition from 2000 on (figures 4 and 5). Over time analysts' sentiments cooled (figure 6), especially when it became clear that the targets for shareholder returns that were set in 2000 would not be met. Below, the three substantial changes (three SBU's, accountability, shareholder value) will be discussed in detail.

4.5.2 The years 2000-2005: Focus on transparency and accountability

4.5.2.1 Strategic Business Units

In 2000, ABN AMRO was divided into three strategic business units (SBU's): Wholesale Clients, Consumer & Commercial Clients and Private Clients & Asset Management (figure 16; ABN AMRO, 2000a). Wholesale Clients would serve corporate clients and was formed by combining the activities that were previously grouped under investment banking and the corporate banking activities from the domestic and foreign retail activities. Consumer & Commercial Clients would serve small clients and was formed from the bank's domestic and foreign retail activities with the change that the activities were stated to be managed as a global business[69] (ABN AMRO, 2000a). Furthermore, Consumer & Commercial Clients would focus on the home markets of the Netherlands, the US Midwest and Brazil. The third business unit, Private Clients & Asset Management would manage the assets for both affluent private clients and clients from the other two SBU's that required asset management services and was formed out of both retail and investment banking divisions.

---

[69] Managed as a global business is not explicitly defined, but seems to imply that budgets are not allocated at a country basis, but globally.

Figure 16: Organization of ABN AMRO into Strategic Business Units after 2000.
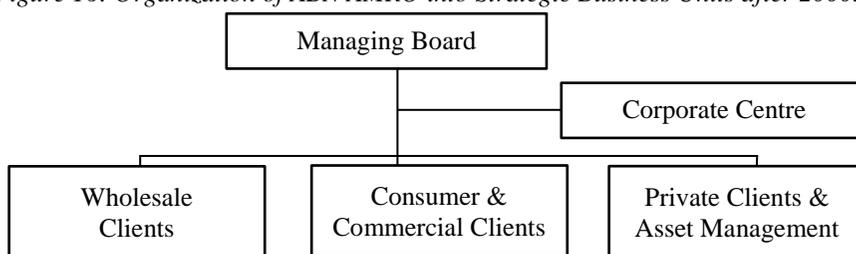
Source: ABN AMRO (2000a)

The Consumer & Commercial Clients SBU (€223 billion) and Wholesale Clients SBU (€270 billion) were of approximately equal size, while Private Clients (€17 billion) was considerably smaller (table 2). The Wholesale Clients SBU was announced to be leading within the bank, which implies that the greatest focus of the bank would be on the Wholesale Clients SBU. This decision was later reversed, so that the Consumer & Commercial Clients SBU was stated to be leading in 2001 (Financieele Dagblad, 2001).[70] Smit (2008) notes that although the Wholesale Clients SBU was supposed to serve large clients, it was never defined precisely which companies were classified as large. When the distinction between small and large clients was not obvious, it would be determined on a case by case basis. The Wholesale Clients SBU was leading in this process, so that it could decide when a client would be served by the Wholesale Clients SBU and when the client would be served by Consumer & Commercial Clients (Smit, 2008).[71]

Table 2 and figure 17 shows the distribution of assets over the divisions and strategic business units over time. It can be seen that the Wholesale Clients SBU is a combination of the investment bank division and corporate clients from the retail division. The asset size of the Wholesale Clients SBU grew most over time while the Consumer & Commercial Clients SBU remained stable with little growth in asset size.

---

[70] This change could be interpreted as a third, smaller change in strategy in between the big strategic shifts in 2000 and 2005.
[71] Interviews with ABN AMRO directors confirm this.

Table 2: Approximate size of divisions before 2000 and SBUs after 2000 in terms of assets and employees.

Divisions before 2000	SBUs after 2000
Investment bank 7500 employees (fte) € 100 bln assets	Asset Management & Private Clients 5500 employees (fte) €17 bln assets
	Wholesale Clients 20000 employees (fte)
Retail bank (domestic and foreign) 85000 employees (fte) € 350 bln assets	€ 250 bln assets
	Consumer & Commercial Clients 70000 employees (fte) € 200 bln assets

Source: ABN AMRO Annual reports

The three strategic business units were intended to operate as stand-alone units and were autonomously accountable for their own profits. Supporting staff and services were allocated in the strategic business units as much as possible, with only pure overhead services concentrated at the holding level.[72] The change towards strategic business units also meant an increase in focus in terms of geography. Branches in countries where the bank had a small presence were sold, such as Hungary, Bahrain and Sri Lanka (Volkskrant, 2007). In 1999, ABN AMRO had branches in 76 countries, to 58 countries in 2005 (ABN AMRO Annual Reports).

---

[72] For example, e-commerce activities were explicitly mentioned to be realized at the business unit level, while IT support was still concentrated at headquarters.

Figure 17: Distribution of assets over business units (€ bln).

Retail bank (domestic and foreign) 1997-1999 ■ Investment Bank 1997 - 1999
Consumer & Commercial Clients 2000-2005 ■ Wholesale Clients 2000-2005
■ Private Clients & Asset Management 2000-2005
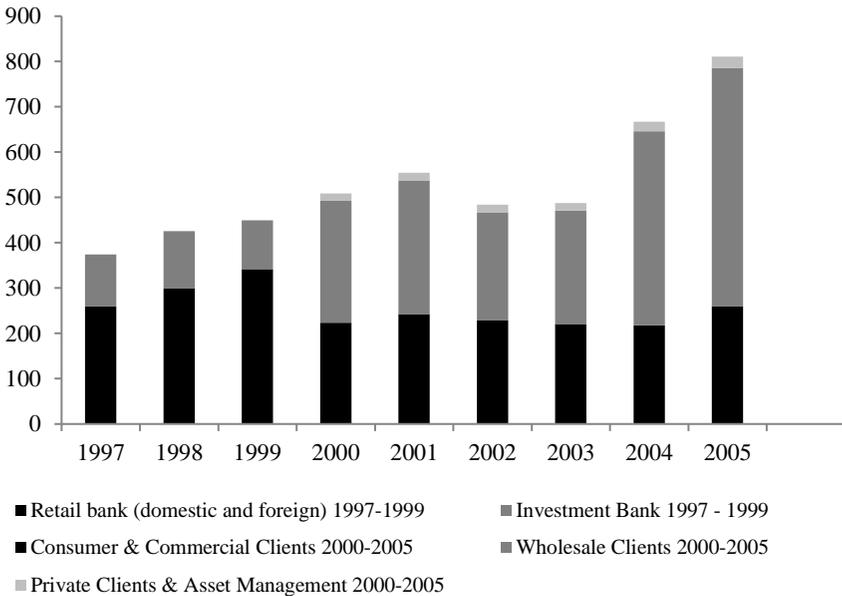
The choice for strategic business units meant that the matrix structure was abolished, and with it the possibility of offering all services in all countries. Because ABN AMRO could not offer all services in all countries, it had to focus on offering specific services in specific countries. The stated focus of ABN AMRO from then on would lie in those areas where the expertise of ABN AMRO would create the greatest value for its clients (ABN AMRO, 2000a).[73] Retail activities were concentrated in those markets where ABN AMRO could defend or establish a leading market share, while retail activities in other countries were mostly supposed to support wholesale banking activities (ABN AMRO, 2000a).

With greater accountability at the business unit level it was less necessary for the board of directors to be involved in every aspect of day to day operations. Operational involvement of the managing board was reduced in 2000 (ABN

---

[73] More specifically, the mission of ABN AMRO became to maximize economic value for its shareholders by taking the needs of customers into account in its relationship management and to strictly adhere to its financial goals in serving selected customer groups (from ABN AMRO website, 3 June 2002).

AMRO, 2000a), even though board members were still assigned responsibility for specific business units or supporting units. Freeing the hands of the managing board of operational matters meant it could focus more on strategic matters (Broersen and Verdonk, 2002). Foremost among these strategic matters was the wish to expand into a new home market within Europe, preferably through a takeover. Attempted takeovers in Belgium and France before had failed and now that the managing board had its hands free, it could focus on a European takeover. ABN AMRO acquired a minority share of Banca Antoniana Popolare Veneta in 2001, but the takeover of which was not completed until 2005, in part through interference from the Italian central bank.

Figure 18 shows the cost-to-income ratio of the three business units over time. In the Consumer & Commercial Clients SBU, improvements were made in terms of efficiency, with costs going down from around 68 to 63 percent of revenues. Meanwhile, the other business units showed periods of cost improvements, but an overall decrease in efficiency over the period 2000-2005.

Figure 18: Cost-to-income ratios (operational costs over revenues) for each strategic business unit.

Source: ABN AMRO Annual reports

123
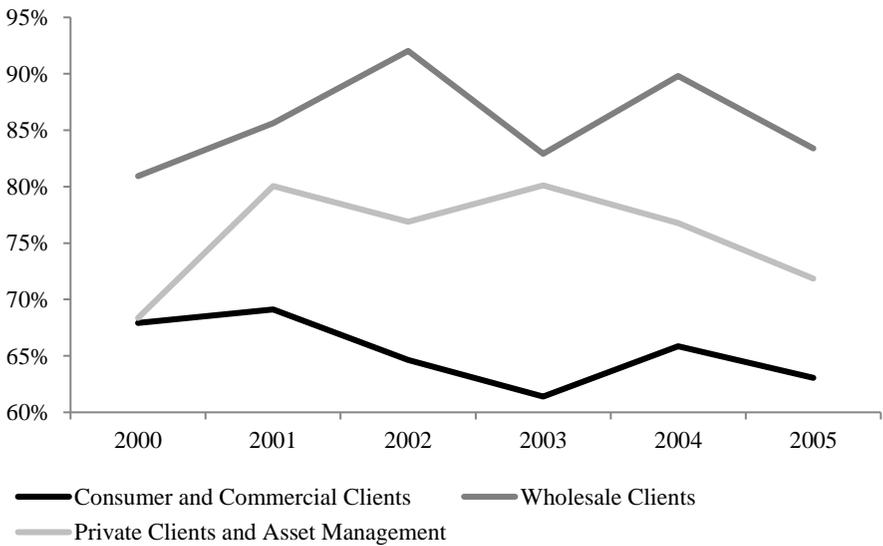
4.5.2.2 Accountability

The second major change to the ABN AMRO's strategy was to create more accountability within the bank. The move towards three SBU's intended to increase accountability at the top of the SBU's and at a lower level a system of managing for value was introduced. Although managing for value was fully implemented in 2000, it is already mentioned in the annual report for 1999 that ABN AMRO would implement a managing for value strategy (ABN AMRO, 2000b). Consultancy firm Marakon Associates was hired to introduce the concept to the bank (Broersen and Verdonk, 2002). Managing for value is a way to measure the value that is added by a project. It not only looks at profits but also includes the costs of capital that are associated with undertaking the project. Ideally, the risk of the project is known, so that the costs of capital can be calculated properly. Box 2 presents a brief overview of the literature on managing for value.

Within ABN AMRO managing for value was not only used to determine the viability of different projects, but also functioned as a management strategy and served as a base for remuneration. As such, employee contracts became more explicitly based on added value created rather than on effort. The implementation of managing for value was accompanied by a change in the nature of contracts within the bank. The typical contract of ABN AMRO's employees before 2000 was an implicit one, in which performance was not formalized. After 2000, this was in many cases supplanted by a contract with more explicit terms and a more explicit focus on performance. Remuneration became based on the managing for value system, so that it was made more transparent what exactly was the added value of each employee. Before, remuneration had been based off the revenues employees generated rather than the economic profit. This meant that employees were more directly accountable for the value they added to the bank (Claes, 2008).

The concept of managing for value is known under different names, including Economic Value Added (Stern Stewart), Economic Profit (McKinsey & Company) and Managing for Value (Marakon). These concepts differ slightly in application, although they all account for the opportunity costs of capital. Accounting for the opportunity costs of capital is achieved by explicitly adding these costs to the calculation of added value of activities. In theory this creates value by avoiding projects that are profitable at face value, but use capital that would have been more profitable had it been employed elsewhere. Merely adding the costs of capital to the budgeting process will not always add value, the application of the process is crucial. For example, higher risk activities should be awarded a higher cost of capital, otherwise risky activities will seem more attractive compared to activities that are less risky. In that case, the risky activities are effectively cross-subsidized by other activities. If this process is allowed to continue it will affect the costs of capital for the entire organization (Boot, 2010). Krüger, Landier and Thesmar (2015) show empirically that companies using a single discount rate indeed tend to overinvest in risky activities and underinvest in low-risk activities.

The implementation of managing for value requires that each activity can be assigned its own costs of capital. Projects are undertaken on their own merits, without taking into account how much value they may provide to other parts of the organization. As such activities should be separable, which may have adverse effects on the creation of synergies. Furthermore, the implementation of managing for value as a management strategy requires that output is measurable. This may mean that projects with more measurable rewards are undertaken over projects with a less easily measured outcome. In the case of banks one might think of underinvestment in projects that rely on soft information, and intangible assets such as company culture. Time horizons should be taken into account as well. If project windows are not long enough, short term projects may be favored over long term projects (Boot, 2010). Furthermore, basing remuneration on managing for value may enhance possible problems by incentivizing managers

throughout the organization to choose projects with highly measurable, separable,

short term outputs. In an evaluation of the capital budgeting system of Bank of America, James (1996) emphasizes that only non-diversifiable risk should be included in the calculation of capital assigned to a product, because this is the only risk that is priced by investors. If this distinction is not adequately made, this creates an incentive to take on projects with relatively large systematic risks and small idiosyncratic risks.

In a literature overview of 112 papers published between 1994 and 2008, Sharma and Kumar (2010) find that companies that adopt managing for value techniques generally experience higher shareholder returns. The evidence is mixed however, as some studies find positive effects on value (Rapp et al., 2010; Ferguson, Rentzler and Yu, 2005), while other studies find an insignificant effect (Cordeiro and Kent, 2001). Furthermore, most studies have their own shortcomings and are plagued by econometric issues that are not easily addressed. For example, the introduction of managing for value is often simultaneous with a replacement of management, so that it is questionable if managing for value is the cause of improvement or if better managers favor the managing for value strategy. Bigger firms are more likely to implement managing for value, which may affect the results as well. Additionally, the effect is often measured by share performance which may simply reflect that the implementation of managing for value can be taken as a signal of management that it will focus more on shareholder interests.

4.5.2.3 Shareholder returns

A third major change in the strategy of the bank was an increased focus on shareholder returns. In August of 2000 chairman Groenink announced a hard target for shareholder gains that the board would facilitate. Specifically, ABN AMRO would be in the top 5 of its peer group[74] in terms of shareholder returns over the following four years (Het Financieele Dagblad, 2000b; Financial Times, 2000b). The managing board was also incentivized to improve shareholder returns by rewarding them with shares and options, a change that can also be seen in the light

---

[74] The peer group consisted of 20 self-selected banks. Footnote 55 contains the exact list.

of accountability. Although shareholder returns were explicitly stated as the most important objective for the bank, the share price itself did not increase after 2000. Over the period 2000-2007 the share price stayed approximately the same and lagged behind ABN AMRO's peer group as well as bank share indices (figures 4 and 5). Cutting costs was at the forefront in creating shareholder value. The program "Zonder Omwegen" (No Detours) cut approximately 6000 jobs between 2001 and 2004. This is reflected in improvements in the cost-to-income ratio (figure 7) and the number of employees in the Netherlands (figure 2) that went down during this period.

The three major changes can be divided into smaller arguments that are presented in table 3. It shows the changes that were implemented within ABN AMRO in 2000 compared to the previous period.

Table 3: Overview of changes before and after 2000.

Characteristic	Until 2000	2000-2005
Internationalization	As many countries as possible	Focus on home markets
Organization	Matrix structure	Three strategic business units
Profit responsibility	Whole bank	Per strategic business unit
Supporting functions	Centralized	Per strategic business unit
Board style	Consensus based	Less consensus based
Management style	Collective bargaining, autonomy over budget	Dedicated task management, budget based on managing for value
Resource management	According to budget process	Based on value added
Performance measurement	Revenues and profits	Profits corrected for costs of capital
Culture	Implicit contracts	Explicit contracts
Focus	Integrating ABN and AMRO	Creating shareholder value

Source: Broersen and Verdonk (2002); Claes (2008); Van den Brink (2003)

127

4.5.3 Analysts and press on ABN AMRO 2000-2005

In the years before 2000 reports tend to focus more and more on cost controls and the need for an overhaul of the organization. With the arrival of Rijkman Groenink as chairman of the executive board and the change of strategy, most analysts were positive and expected changes for the better within ABN AMRO (Financial Times, 2000b). Elsevier (2000) notes that Groenink is a more gutsy leader than his predecessor, while the Financial Times (2000a) notes that the division in three SBU's would increase transparency and allow the bank to increase profitability by focusing on activities that are central to the bank's strategy while cutting peripheral activities. Het Financieele Dagblad (2000a) and the Financial Times (2000c) place qualifying remarks by pointing at a declining share price of ABN AMRO and profits that were below expectations. Concerns are also aimed at rising costs in the Dutch retail division and the wholesale division (Financieele Dagblad, 2000a; Financial Times, 2000c).

The focus on costs becomes central in the years 2000-2001, not only for ABN AMRO but for all Dutch banks, partly because the Dutch market appeared to be saturated (Koelewijn, 2000). Beleggersbelangen (2001) notes that ambitious plans for cost controls are set in place, providing possibilities for future profitability. ABN AMRO did improve its cost-to-income ratio between 2001 and 2003 (figure 7), but this ratio remained high compared to its peer group. A high cost-to-income is observed especially in the Wholesale Clients SBU (Van der Feen de Lille and Czíria, 2001; figure 18).

Because of an economic downturn, the Wholesale Clients SBU turned out to be less profitable than had been foreseen. Investment banking activities were hit especially hard in 2001 through the burst of the internet bubble, the attacks on the World Trade Centre and the Enron scandal (Czíria, Koning and Mulders, 2002). Even beyond the economic downturn, the Economist (2002) notes that ABN AMRO may have insufficient scale to make its Wholesale Clients SBU profitable. Investment banking activities tend to create the highest return but require large fixed costs. When the scale of these activities is large profits are also large, but when the scale is insufficient high fixed costs ensure low profits.

Beleggersbelangen (2002a) similarly notes that at the beginning of 2002 ABN AMRO had not been able to attract sufficient scale to its wholesale bank and tried to temper its ambitions for the Wholesale Clients SBU. When ABN AMRO moved its Consumer & Commercial Clients SBU to the forefront of operations, the Financial Times (2001) considered scaling back the Wholesale Clients SBU a smart move, but Beleggersbelangen (2002a; 2002b) states that scaling back seemed to be given in by opportunism rather than strategy because retail banking activities seem more attractive than wholesale activities in bad times by their nature. In good times the strategy may very well shift back towards the Wholesale Clients SBU.

When ABN AMRO failed to reach its goal of a position within the top 5 of its peer group in terms of shareholder returns in 2004, analysts were still optimistic about the bank. ING analyst Sigrid Baas stated that Groenink had brought more focus in the bank. ABN AMRO succeeded in slimming down its branch network and cutting costs, causing optimism about the bank's course (FEM Business, 2004). However, Beleggersbelangen (2002c) claims that ABN AMRO had become a risky bank by 2002. Loan loss reserves were relatively low and might increase because of a global economic downturn. Analysts of Merrill Lynch qualified ABN AMRO as one of the world's riskiest large banks, noting high leverage with a tier 1 ratio close to 7 percent. Beleggersbelangen (2002c) notes that the report for the third quarter of 2002 features lower profits, but is positive over the cost savings and increases in efficiency. In 2002, ABN AMRO experienced strong growth in profits, which was accompanied by a share price increase (Beleggersbelangen, 2003). The growth in profits was mostly due to strong growth in mortgage income from the US. However Beleggersbelangen (2003) also notes that this growth is not sustainable and wonders how ABN AMRO is going to keep up its performance.

4.6 Strategy after 2005

4.6.1 Overview key points

The year 2005 marks a second strategic reorientation that attempted to increase focus and enhance synergies. This reorientation consisted of two parts: return to a country focus for the Consumer & Commercial Clients SBU and a focus on mid-market clients for the entire bank. The strategic reorientation attempted to find a middle ground between the matrix organization of ABN AMRO before 2000 and organization in strategic business units after 2000. The Consumer & Commercial Clients business unit was once again split along country lines, while the Wholesale Clients and Private Clients & Asset Management business units were organized to serve clients on a worldwide basis. Meanwhile, two additional segments were formed that were superimposed over the entire bank, with the goal of creating synergies between the worldwide product business units and the locally operating branches. ABN AMRO stated it would focus on one particular client segment, the mid-market segment. The bank called this segment its "sweet spot" and noted it might especially be able to add value for these customers, which consisted of medium sized enterprises and affluent consumers. The years after 2005 were also marked by integration of Banca Antoniana Popolare Veneta, or Antonveneta for short, into ABN AMRO.

Analysts were less than impressed with the performance of ABN AMRO in this period. It was noted that the takeover of Antonveneta was expensive while synergies were mostly absent. Analysts also noted high costs of the existing business especially in wholesale banking activities. As in the period 2000-2005, the share price of ABN AMRO lagged compared to its self-selected peer group as well as market indices. Eventually, this led to a letter from activist hedge fund, TCI, which stated the bank would be worth more in parts. Although the managing board of ABN AMRO resisted and attempted to sell ABN AMRO as a whole to Barclays, shareholders decided to sell ABN AMRO to a consortium of RBS, Fortis and Santander to be split up, marking the end of ABN AMRO as an independent entity.

4.6.2 After 2005: Recapturing synergies

In 2005 ABN AMRO's focus was shifted from the strategic business units to countries once again. Rather than a complete overhaul of the strategy as in 2000, the 2005 shift in strategy was one of smaller adjustments. In a presentation to shareholders, chairman of the managing board Groenink states that a shift in strategy was undertaken to focus on ABN AMRO's strengths and to increase the cohesion over the entire bank by returning to a country focus and recentralizing certain overhead activities to the holding level (ABN AMRO, 2005c). Strengths were identified to lie in the mid-market segment, while the focus on cohesion pointed towards a desire for greater synergy between parts of the bank.

4.6.2.1 Recentralizing activities

The biggest change to the organization was to split the Consumer and Commercial Clients SBU into country divisions rather than managing the SBU as a global business. Divisions were created for the home markets of the Netherlands, US Midwest, Brazil and for new growth markets in Asia. An additional European division was added when Antonveneta was fully acquired at the end of 2005, creating a fourth home market in Italy. Two cross business units were added for services across the country divisions, for wholesale clients as well as private clients. Figure 19 shows the new organizational structure.

The new organization had matrix elements because a country focus was more at the forefront, but the strategic business units were still accountable. The Consumer & Commercial Clients SBU had already been moved to the forefront of operations in 2001 and would now, through the focus on mid-level clients, become even more leading within the bank.

Figure 19: Organizational structure after 2005.
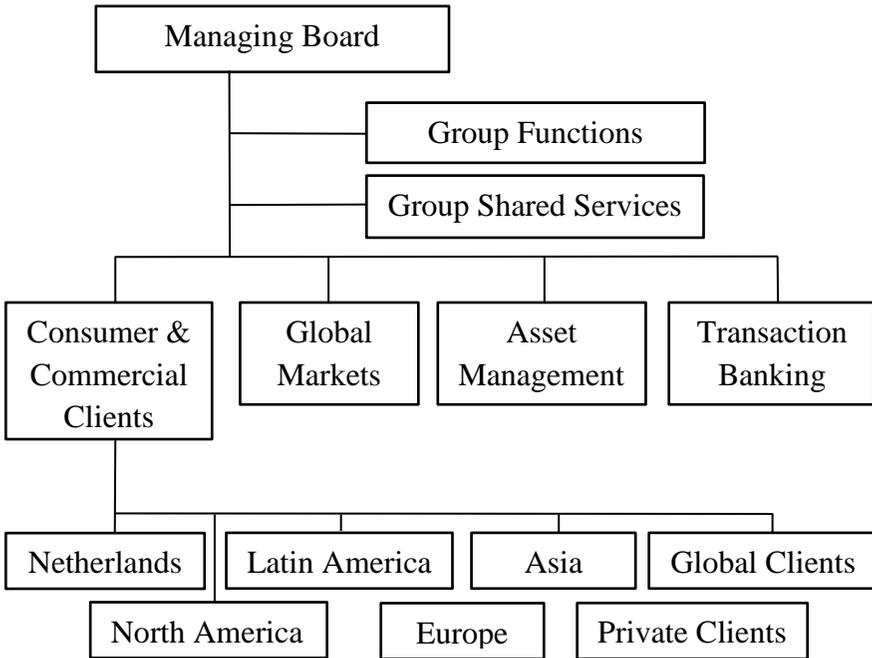
Meanwhile the Wholesale Clients business unit was split up so that part of the business unit would become integrated with the Consumer & Commercial Clients business unit, and part of the business unit would become the Global Markets division. In practical terms, this meant that corporate banking activities were moved into the Consumer & Commercial SBU so that the investment banking activities remained in the Global Markets division. Global Markets would create value both by providing support to the country units, as well as developing new financial products that could be used throughout the company. The strategic reorientation of 2005 was a move towards more centralization that already started in 2003, when it was decided to re-centralize some decentralized activities such as risk management and IT (Claes, 2008).

4.6.2.2 Focus on mid-market segment

Chairman of the managing board Groenink expressed an ambition to focus on the mid-market size segment: Affluent consumers, mid-market enterprises and other financial institutions (ABN AMRO, 2005). Groenink states that these clients presented 200% of economic profits in 2004 (ABN AMRO, 2005).[75] Mid-market clients were thought to prefer ABN AMRO because they want a local office, look for an extensive product suite, expect quality and efficient delivery, and expect the bank to know the industry and appreciate a bank that can go across national borders (ABN AMRO, 2005). ABN AMRO stated it had an advantage in these areas compared to other banks because of their universal banking strategy: Country specific knowledge was available through the office network, while the Global Clients SBU offered a broad supply of products. Thus, revenue economies of scope could be realized. Other sources of economies of scope were thought to occur through innovation and client wealth growth. Innovative financial products could be achieved by the top segment and add value for mid segment clients. Also, consumer clients could become wealthy or start an enterprise to find their way into the middle segment. These clients were also needed to capture economies of scale: without them, the bank would become too small. Finally, economies of scope could be realized for trading activities. These activities were centralized, but could use local knowledge of the country branch network. For example, if a country branch had information on market developments in the country, it could inform the traders at head office (ABN AMRO, 2005).

4.6.2.3 Integration of Antonveneta

In 2005, ABN AMRO was able to add a fourth home market when it completed its takeover of Banca Antoniana Popolare Veneta, or Antonveneta for short. This takeover was initially obstructed by the president of the Italian central bank,

---

[75] Since this number is higher than 100 percent, this implies that ABN AMRO experienced negative economic profits on its other clients (Financieele Dagblad, 2005).

Antonio Fazio, lengthening the takeover process considerably. [76] When the takeover of Antonveneta materialized, markets and media were positive over the first large acquisition of ABN AMRO in years. Elsevier (2005) awarded Rijkman Groenink the award 'Dutchman of the year' for his performance during the takeover of Antonveneta. Although the bank was organized along different lines, the focus on managing for value as a central strategy remained. Furthermore, managing for value as a strategy remained so that accountability and transparency were still at the forefront. Finally, culture in the bank had been directed towards investment banking (Van den Brink, 2007; 2008) which ensured that it would take time to adjust towards a mid-market focus.

In a letter to the board of directors, The Children's Investment Fund (2007) urged to split up the bank. Their main points of criticism were that the takeover of Antonveneta was too expensive and that the bank might be worth more by splitting it up into parts. Although the managing board of ABN AMRO resisted this notion, it did realize that ABN AMRO could not continue as an independent entity. It proposed a merger with Barclays which was rejected by the main shareholders in favor of selling the bank in parts to a consortium of Royal Bank of Scotland, Banco Santander and Fortis, which together could offer a higher takeover bid. Royal Bank of Scotland was to obtain the American activities and the investment banking activities, Banco Santander would get the Italian and Brazilian activities and Fortis would obtain the asset management and Dutch activities. In a defensive move in 2007, the managing board was able to sell its US activities to Bank of America, but this move mattered little in the end. The consortium bid was accepted by the shareholders, so that ABN AMRO was broken into three pieces near the end of 2007.

---

[76] Battes and Elshout (2008) provide an in depth look into the takeover process of Antonveneta.

Table 4: Overview of changes before and after 2005.

Characteristic	2000-2005	After 2005
Organization	Three strategic business units	Country focus
Supporting functions	Per strategic business unit	Centralized
Home markets	Netherlands, US Midwest, Brazil	Netherlands, US Midwest, Brazil, Italy
Client focus	Wholesale, then Consumer	Mid-market clients

Source: Claes (2008); Annual reports

4.6.3 Analysts and press on ABN AMRO after 2005

Analysts were mostly negative on ABN AMRO in the period after 2005 (figure 6). Common themes for comments from analysts and press after 2005 are that ABN AMRO lacked strategic focus, had high costs, the Wholesale Clients SBU underperformed and that the bank paid too much for the acquisition of Antonveneta.

The Volkskrant (2007) notes that under Rijkman Groenink focus of the bank improved by selling off branches in countries where the bank had a relatively small presence, but states that the bank still lacked focus compared to other banks. FEM Business (2005c) attributes a lack of strategic focus to Groenink's unpredictability: When the ambitions to be among the top of the peer group were formulated in 2000 focus was placed on the Wholesale Clients SBU. After a year, the Consumer & Commercial Clients SBU became leading and in 2005 focus was placed on clients of medium size. The strategic reorientation was also met with negatively: Het Financieele Dagblad (2005) notes that stock markets reacted unfavorably in the first two days when the new strategy was announced, stating that the change in strategy was insufficiently concrete.

Besides a lack of focus, analysts pointed at increasing costs, especially in the Wholesale Clients SBU. Compared to the peer group ABN AMRO's costs were high and improvement was slow (figure 7). Beleggersbelangen (2006b) cites

analyst Rahul Shah of Standard & Poors who noted that the Wholesale Clients SBU underperformed the other parts of ABN AMRO by about a percentage point in terms of return. In his words, the Wholesale Clients SBU had the cost structure of a pure investment bank, but the revenues of a less focused and less specialized investment bank such as those in France and Germany. Beleggersbelangen (2006b) was not optimistic over cost reductions, but noted that Shah sees positive points in that the new structure might allow ABN AMRO to abandon unprofitable divisions more easily. Between 2001 and 2004, ABN AMRO reduced activities and costs in the Wholesale Clients SBU, but may have reduced revenue possibilities even further. Costs per employee were 40% lower than competitors, but revenues were 54% lower (Beleggersbelangen, 2006c). Beleggersbelangen (2006a) notes that the cost to income ratio in 2005 had improved compared to the year before, but states that this improvement was mostly due to well performing financial markets and had less to do with policies implemented by ABN AMRO itself.

The takeover of Antonveneta resulted in both praise and criticism. Although Groenink was elected Dutchman of the Year because of the takeover (Elsevier, 2005), analyst Matt Spick from Deutsche Bank called ABN AMRO a mixed bag of assets with insufficient focus in 2005 (FEM Business, 2005b), noting that investors prefer a portfolio of specialized banks over shares of a universal bank. FEM Business (2005a) notes that other banks at the same time tended to specialize either geographically (such as Société Générale that focused on French firms) or in terms of activities (such as Barclays that focused on bond markets), while ABN AMRO was neither specializing in terms of geography or activities. The Dutch Association of Shareholders (VEB, 2005) sent a letter to the shareholders of ABN AMRO concerning the performance of the bank in 2004. In the letter, the VEB notes that ABN AMRO had a good year in 2004, but raises concerns over the stagnation of earnings growth and seemingly unrelated geographical spread of the bank. Furthermore, the VEB cautions against the takeover of Antonveneta, stating cultural differences and Italy as a risky market. It states that it can't see how Italy adds favorably to the geographical spread of the bank. With the benefit of hindsight, Groenink (2010) notes that the acquisition of Antonveneta may have made strategic sense, but may have come at the inappropriate time, depleting cash

reserves. An unnamed director states that ABN AMRO might just have a problem of poor presentation (Financial News, 2006). Poor performance might be explained by startup problems in finding synergies between its business units. Although shareholders may have been too active in disassembling ABN AMRO, Koelewijn (2008) states that ABN AMRO was ultimately underperforming. The bank had high costs, lacked a coherent strategy in its home market, and its wholesale division was of insufficient scale to be competitive internationally.

4.7 Summary strategy ABN AMRO

For ABN AMRO major strategic shifts took place in 2000 and in 2005. Before 2000, ABN AMRO was organized in a matrix structure, in which managers reported along both country and functional lines. The matrix structure facilitated a transition into one organization after the merger of ABN and AMRO. The matrix structure offered ABN AMRO flexibility to operate as an international universal bank and to offer a full range of services in a broad group of countries. However, the matrix organization is generally better suited for smaller companies, because accountability in a big organization can become problematic. Indeed costs went up before 2000, which analysts noted as well. The period before 2000 also marks the acquisition of Banco Real in Brazil, which marked expansion into the third home market (after the Netherlands and US Midwest) of ABN AMRO.

When Rijkman Groenink succeeded Jan Kalff as chairman of the managing board in 2000, ABN AMRO's strategy changed in three major ways. First of all, the bank was divided into three strategic business units which were each responsible for their own profits. The second major change was to increase accountability within the firm. Managing for value was introduced, so that projects were not only judged by their profitability, but also on the basis of the costs of capital associated with the project. And third, a greater emphasis was placed on shareholder returns. Specifically, the bank aimed to be in the top 5 of a peer group of 20 banks before 2004 in terms of shareholder returns. The period 2000-2005 is characterized by an increase in focus: the office network in the Netherlands was

reduced and ABN AMRO gradually divested out of countries had a relatively small presence. Meanwhile, the bank sought to increase its scale by acquiring a large foreign bank in order to create a new home market. This goal was reached in 2005 when the bank acquired a majority share in the Italian bank Antonveneta. Initially, the strategy did reduce costs, but after 2002 costs crept up again, driven mostly by relatively high costs in the Wholesale Clients SBU.

        In 2005, a second strategic shift was made. This strategic shift was made to increase synergies between the business units and to place focus on medium sized clients in each of the home markets, with an overarching wholesale division that operated worldwide. During this period, analysts focused on a lack of focus in the bank and relatively high costs, noting that although ABN AMRO had increased focus, change was not fast enough. Once hedge fund TCI urged to break up the bank into multiple parts, shareholders decided to sell the bank to a consortium of RBS, Fortis and Santander near the end of 2007.

4.8 Analysis

4.8.1 Overview key points: what went right and what went wrong

This section primarily analyzes why the reorganizations of ABN AMRO did not lead to favorable market reactions. It discusses which strategies were profitable and which were not. On the surface, the strategy that was chosen by ABN AMRO could have been profitable. From the literature on economies of scale and scope in banking, the decision to expand the scale of ABN AMRO made sense because studies that use data from the period after 2000 tend to find an existence of economies of scale even at very high levels of assets. Furthermore, a focus of the Wholesale Clients SBU made sense because economies of scale are generally found more for transaction banking than relationship banking. As such, it could be expected that by expanding its scale, especially in the Wholesale Clients SBU, ABN AMRO would reduce costs. Furthermore, the strategy of expanding in

markets in which it could obtain a large market share was consistent with the literature, in which market shares of banks are positively associated with profits, especially for banks that are active in a foreign market (Claessens and Van Horen, 2012; 2013).[77] Also, the choice of increasing accountability in 2000 seems to have worked in the short run by decreasing costs (figure 7) and the pattern of acquisitions suggests that ABN AMRO applied more focus in its acquisition strategy (figure 3).

As the share price continued to lag behind that of competitors, its strategy was discussed by market participants as work in progress at best. Theories that have been put forward are that ABN AMRO was unfocused and spread out too thin, the strategy of ABN AMRO was misunderstood by investors causing stock markets to judge too harshly and in particular a lack of willingness to scale down its underperforming wholesale activities. Below, these arguments will be addressed and analyzed in addition to explanations that focus on the role of the managing for value system and soft factors such as culture.

Before analyzing more specific critiques of ABN AMRO's strategy, first an attempt will be made to identify the core competencies of ABN AMRO. This allows an analysis of the strategies chosen by ABN AMRO and if the chosen strategies were consistent with the competencies of ABN AMRO. The reaction of the stock market to ABN AMRO's strategy will be analyzed based off an analysis of stock market reactions to acquisitions made by ABN AMRO. This will show if markets reacted differently to acquisitions made of retail banks or wholesale banks, and if acquisitions in home markets were valued differently than acquisitions in other countries.

After this, specific criticisms of ABN AMRO's strategy will be addressed, starting with the notion that ABN AMRO's activities were spread out too thin. The spread of activities of ABN AMRO will be analyzed compared to other banks in its peer group, both in terms of geographical spread and in terms of spread over different activities. Furthermore, a lack of focus and synergies will be addressed. An attempt at a more fundamental explanation will be formalized by analyzing

---

[77] Note that this result is found for banks operating in emerging markets, while the effects are much smaller for developed markets. As such, this strategy may have been best suited for the expansion in emerging markets such as Brazil.

incentive effects created by the implementation of managing for value as a strategy. From the implementation of managing for value, the bank may have become too focused on transaction banking activities. Finally, soft factors such as culture and personnel commitment are discussed.

4.8.2 Core competencies

In a reaction to Van den Brink (1998), Boot (1998) notes that the internationalization strategy chosen by ABN AMRO seemed a result of the existing structure of ABN AMRO rather than a result of carefully considering the core competencies of the bank. A core competency is a strategic advantage that allows a firm to distinguish itself from its competitors and as such is able to create value for its customers. In their seminal paper on core competencies, Prahalad and Hamel (1990) note that a core competency should adhere to at least three prerequisites: First of all, a core competency should provide access to a wide variety of markets (breadth of application). Second, a core competency should make a significant contribution to the benefit of the customer (relevance). Finally, a core competency should be difficult to imitate (difficulty of imitation).

4.8.2.1 Identifying core competencies

Before analyzing if ABN AMRO's strategies were well chosen, it makes sense to identify what ABN AMRO's core competencies were. This is more easily said than done, because the concept of core competency may be interpreted in multiple ways. For example, according to the bank itself, one of its core competencies is "servicing clients and distributing financial services which help clients to realize their ambitions" (ABN AMRO, 2004a). However, the distribution of financial services is the core business of every financial institution, so it can hardly be qualified as something that is unique to ABN AMRO. Another core competency put forward by ABN AMRO is its risk management (ABN AMRO, 2004a; 2005; 2006; 2007). Again, an argument could be made that risk management is central to every bank's

strategy and as such is hard to qualify as a core competency. However, if the risk models of ABN AMRO are indeed more sophisticated than its competitors, it may have been able to obtain a better risk-return frontier than its competitors, thus creating additional value.[78] Figures 13 and 14 already revealed a partial indication that this may be the case. Figure 13 showed that ABN AMRO had a lower than average ratio of risk-weighted assets to total assets and figure 14 showed a lower CDS-spread than the average of its self-selected peer group. It is by no means a perfect measure of risk-management as a possible core competency, because it only shows ABN AMRO was considered less risky than the average bank in its peer group, without providing information on the risk-return frontier. In fact, return on assets (ROA) for ABN AMRO was lower than the average ROA for its self-selected peer-group (figure 9). Also, ABN AMRO lagged behind its peer group in terms of return on risk-weighted assets, although it caught up and rose above the average of its peer group in 2007 (figure 10).

In addition to the correction that needs to be made for return, risk itself might be difficult to measure and different measures for risk may not be consistent. In the case of RWA density (i.e. risk-weighted assets divided by total assets), Le Leslé and Avramova (2012) note that RWA density differs a great deal across countries and banks and this can be explained by the regulatory framework at least as well as it can be explained by the inherent riskiness of the assets. Furthermore, Acharya, Engle and Pierret (2014) do not find a relationship between risk weights and risk based on market data, suggesting that risk-weighted assets do not effectively measure riskiness of assets. Figure 20 shows a scatterplot between RWA density and CDS spreads and shows that the two series are mostly uncorrelated.

---

[78] Difficulty of imitation of risk management is more difficult to argue, but may be possible insofar as risk management partially depends on key employees.

Figure 20: Scatterplot between RWA/Assets (horizontal axis) and CDS-spread for ABN AMRO and its self-selected peer group (panel data, 2004-2007).
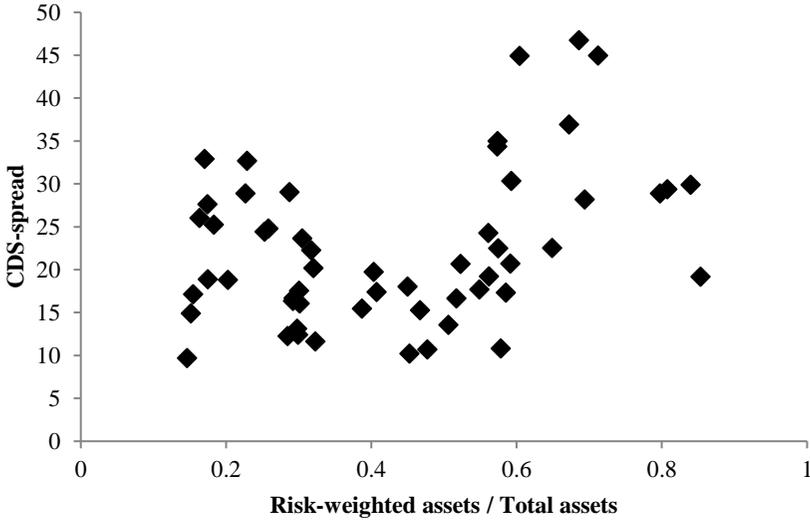
Source: Thomson Datastream; OSIRIS

Other risk measures, such as leverage (figure 15) and credit ratings might even point in the opposite direction. Figure 21 show baseline credit ratings from Moody's for ABN AMRO and its peer group. The baseline credit rating offers a credit rating that excludes the possibility of external support and as such offers insight into the opinion of the credit rating agency into the overall soundness of a bank's financials. In figure 21 it can be seen that the rating of ABN AMRO declines over time, while the average of its peer group stays approximately the same.[79] As such, it is impossible to conclude with certainty that the riskiness of the bank went down over time.

---

[79] Note that the pattern closely mirrors the buy recommendations of figure 5, probably because analysts use credit opinions when forming their recommendations.

Figure 21: Moody's credit ratings (baseline credit rating) for ABN AMRO and average of its self-selected peer group (numerical scale from 1-21, where Aaa represents 21).
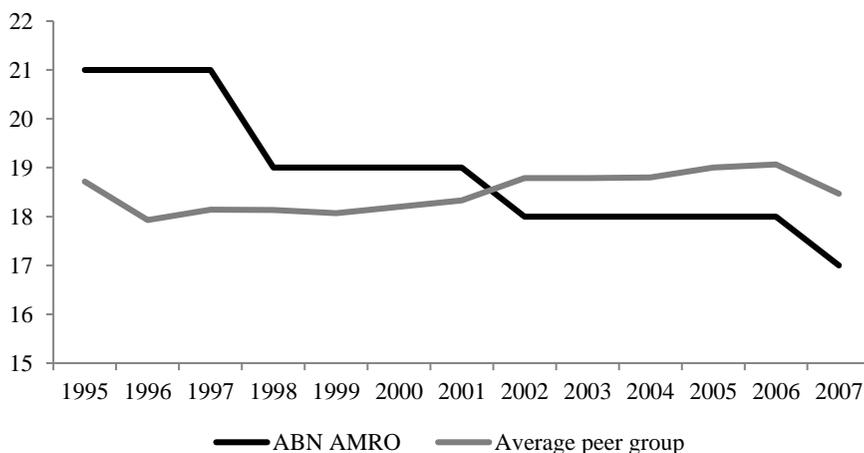
All in all, the possibility of risk management as a core competency cannot be easily defended or refuted. However because risk management is repeatedly communicated as a core competency in every annual report of ABN AMRO, it can at least be assumed that the board believed it to be a core competency of ABN AMRO. As such, risk management can be considered a core competency in terms of the way the board formulated the strategy of the bank, even if the strategy is not in accordance with its actual core competencies.

Although not mentioned explicitly by ABN AMRO, its network of foreign banks could point to a core competency. The network itself could be replicated by another bank by simply building an office network and as such does not qualify as a core competency. However, a network of foreign banks may point towards an underlying core competency that enables the network to be profitable. One might think of relationships that have been built with foreign governments and local communities. These relationships are not easy to imitate, provide access to multiple product markets and provide value to clients insofar that these relationships may enable cost advantages for ABN AMRO. As such, the foreign branch network

143

signals an underlying advantage that qualifies as a core competency by the requirements set by Prahalad and Hamel (1990).[80]

Another core competency might reside in the education and career development of ABN AMRO's personnel (Financial Times, 2006). The traineeships provided by ABN AMRO are mentioned as distinguishing for the bank (Van Beek and Gunther, 2004), with Smit (2008) noting that ABN AMRO had been the most important supplier of banking talent in the Netherlands.[81] In 1996, ABN AMRO founded ABN AMRO Academy with training centers in Amsterdam, New York and Singapore (Westerhuis, 2011). ABN AMRO was seen as a provider of banking talent by entering new employees into an intensive traineeship as well as providing in house training to its more experienced staff. These employees enrolled into a special class and were educated in a multitude of talents, ranging from financial analysis to etiquette.

Once stock is taken of the core competencies of ABN AMRO, the validity of its strategy can be assessed. Taking risk management, foreign connections and education as core competencies, it can be analyzed which business units benefit most from these core competencies. From this, an assessment can be made of the competitive strengths of ABN AMRO: in which areas would one expect it to outperform relative to its competitors. The three strategic business units of ABN AMRO means that the competitive strengths of Consumer and Commercial Clients, Wholesale Clients and Private Clients & Asset Management can be analyzed.[82] Note that each business units might profit from the core competencies even if certain business units may profit more than others.

---

[80] Internationally, ABN AMRO may have also enjoyed a comparative advantage in the United States before 1994, because as a foreign bank it was allowed to operate across state lines, while local banks were not. The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 removed many restrictions on opening bank branches across state lines.

[81] Smit (2008) uses the Dutch term 'hofleverancier van bankiers' which translates literally to 'purveyor of bankers'.

[82] Prahalad and Hamel (1990) note that the organization of a firm in strategic business units may be at odds with the analysis in terms of core competencies, because core competencies are usually the result of talent, which would be hoarded in the SBU's so that economies of scope tend not to arise.

4.8.2.2 Application of core competencies to the SBU's

Risk management may help the entire bank in obtaining funding at low cost. Furthermore, risk management may be especially important in managing the portfolios of clients. As such, one would expect the division Private Clients & Asset Management to perform well given risk management as a core competency.

A worldwide network may be good for the entire bank because of possibilities for economies of scope and geography. However, it may be especially helpful for servicing medium sized clients. Very big firms can be assumed to find their own way across the globe without needing the services of a single bank, but for medium sized clients the transaction costs of obtaining a new banking partner for each country they operate in may be high in comparison to the expected benefits from operating in that country. As such, it can be assumed that the international network would benefit the business unit Consumer and Commercial Clients especially because they serve smaller clients.

Education can again help the entire bank by providing human capital to all divisions. However, since relationship management is part of the educational track, it seems especially helpful in creating and maintaining relationships. These aspects seem to favor Consumer and Commercial Clients and Private Clients and Corporate Banking division within Wholesale Clients, while the transaction nature of the investment banking activities Wholesale Clients seems relatively less helped by this type of education. In terms of Wholesale Clients, one would expect industry expertise to be of critical importance in creating a comparative advantage.

4.8.2.3 Strategic implementation

To see if a strategy could actually be expected to be profitable, it is not only the question if a company has a competitive advantage in that activity, but also if the activities themselves are profitable. After all, being the best at an unprofitable activity might not create value to a company. One way to think about profitability is to arrange activities in a McKinsey-GE matrix to determine investment strategies. In such a matrix, the attractiveness of an activity is put on the vertical

axis, and the competitive advantage on the horizontal axis (McKinsey, 2008). Figure 22 depicts this matrix schematically. Activities in the top right hand corner are most attractive: not only is the activity profitable, the company also has a competitive advantage in this activity. Meanwhile, the bottom left hand side contains activities that should be considered for divesting, as they are neither profitable nor is there a competitive advantage.

Figure 22: McKinsey-GE strategic matrix (schematically).
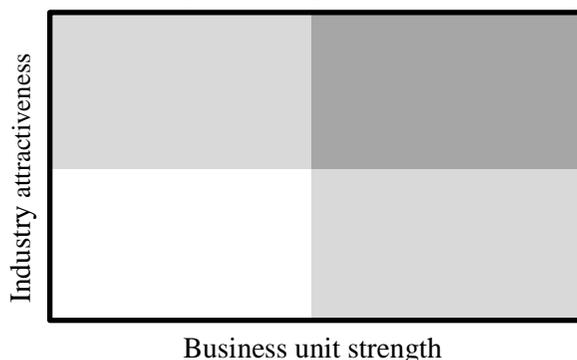
Given the core competencies outlined above, ABN AMRO is expected to have a competitive advantage in Private Clients and Consumer and Commercial Clients, so that it can be expected that these activities will be graphically further to the right than the Wholesale Clients SBU.

An internal document to the managing board (ABN AMRO, 2001) provides an analysis of the perceived competitive position of the strategic business units as well as the perceived attractiveness. The document gives a crude estimation on a scale of four [83] on nine categories for the competitive positions [84] for market characteristics of the subdivisions of the strategic business units and of eight market characteristics.[85] The results of this exercise are presented in figure 23. Figure 23

---

[83] Specifically the scale goes from 0 to 1 in steps of 0.25.
[84] Specifically these are: Market share, market ranking, critical mass, current profitability, internally forecasted EPS growth, differentiating cost base, differentiating client perception, differentiating product perception, and innovation.
[85] Specifically these are: Size revenue/fee pool, market growth, profitability, stability of earnings, competitive environment, capital efficiency, need for scale, and consolidation.

shows that the Wholesale Clients SBU was thought of to have the most attractive business opportunities. Furthermore it shows that the bank thought Consumer & Commercial Clients had the best competitive position, especially in the Netherlands and the United States.

Figure 23: Perceived competitive position and perceived market attractiveness by ABN AMRO in 2001.
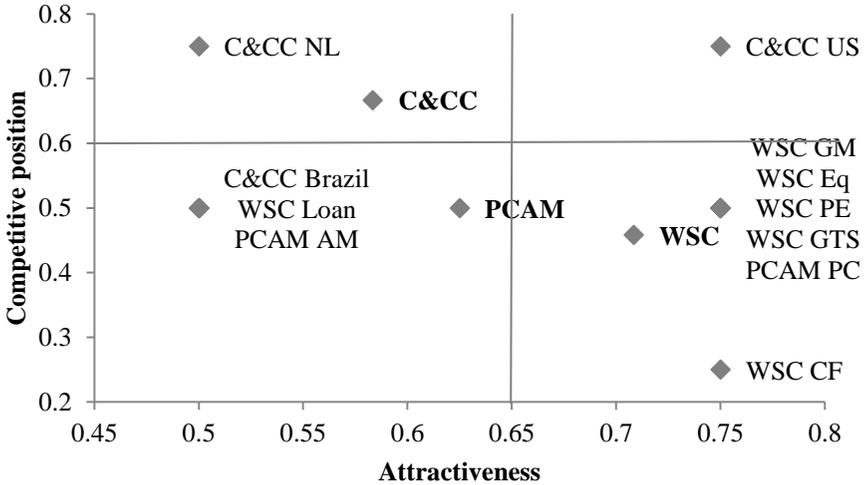
Source: ABN AMRO (2001)

Getting more into specifics, the internal report (ABN AMRO, 2001) notes that none of the divisions that make up the SBU's truly stand out, and that only the US division of Consumer & Commercial Clients is big enough and has enough potential for growth to carry the profitability of the entire bank. The SBU's are mostly concentrated in the top left and bottom right parts of the strategic matrix, with only the US division of the Consumer & Commercial Clients SBU in the top right corner. As such, it may have been expected that a focus would have been placed on the US division of Consumer & Commercial Clients as that is the division with both the best perceived competitive position as well as the highest perceived market attractiveness.

With the benefit of hindsight, it is also possible to give an estimate of how accurate the perceived competitive position and market attractiveness were. Figure 24 presents a crude estimation over the period 2000-2005.[86]

Figure 24: Return on Assets (vertical axis) and Market growth (horizontal axis) 2000-2005.
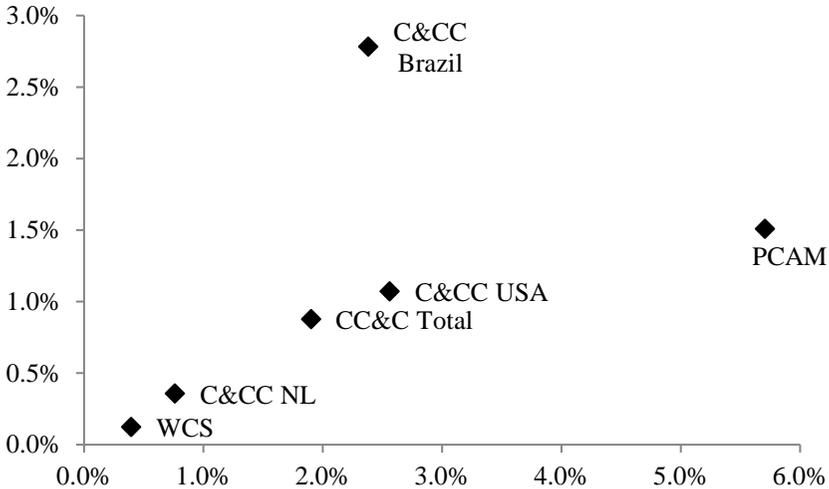
Source: ABN AMRO Annual reports, IMF World Economic Outlook, Thomson Datastream and Cap Gemini

Return on assets for each business unit is presented on the vertical axis and is calculated by dividing net income by assets for each of the Strategic Business Units. It gives a crude approximation of how well each of ABN AMRO's SBUs performed. Note that this measure does not explicitly measure if ABN AMRO is better than its competitors at a given activity, because if the market for a certain activity is doing well, the ROA for that activity is expected to do well regardless of ABN AMRO's strength in the activity. By only looking at the vertical axis, it can be gathered that Private Clients & Asset Management performed the best while Wholesale Clients did worst.

---

[86] After 2005, the Wholesale Clients SBU was consolidated into the other business units, so that a comparison after 2005 becomes impossible.

To obtain a crude estimate of how attractive a certain market had been, several growth measures are estimated. To estimate the attractiveness of the consumer markets, per capita GDP growth over the period 2000-2005 is taken for the Netherlands, USA and Brazil from the IMF World Economic Outlook. For the attractiveness of Wholesale Clients, the growth of the S&P500 between December 31st 2000 and December 31st 2005 is taken. Finally, for Private Clients, worldwide growth of the number of individuals with net worth over $1 million was taken from Cap Gemini reports. It is unsurprising that a positive relationship can be seen because business units in fast growing markets tend to perform well. The figure does give some insight in how much of a business unit's success is determined by market factors. For example, Wholesale Clients performed worst out of the three business units, but the growth in the relevant market for Wholesale Clients was also lowest.

From figures 23 and 24 it can be gathered that ABN AMRO may have overestimated the attractiveness of the Wholesale Clients business and may have underestimated how attractive Private Clients & Asset Management would become. The focus on the Wholesale Clients SBU may have been the result of the performance of the stock market before 2000. For example, Van der Feen de Lille (1998) notes that the investment bank of ABN AMRO had been very profitable in the years before. The performance of the investment bank before 2000 may have set ambitions that were too high for the period that followed and may have skewed the perception of the core competencies of the bank. [87]

Figure 25 shows the growth in assets and return on assets of the SBUs. It can be seen that Wholesale Clients grew most out of the three SBUs in terms of assets. This is in line with the perceived attractiveness of the market and competitive position (figure 23). However, the division that was perceived as both most competitive as well as attractive (the US division of Consumer & Commercial Clients) actually declined in terms of assets.

---

[87] In interviews, great ambitions were repeatedly cited as the main reason the Wholesale Clients SBU was allowed to grow.

Figure 25: Return on assets (vertical axis) and growth in assets (horizontal axis) in 2000-2005.
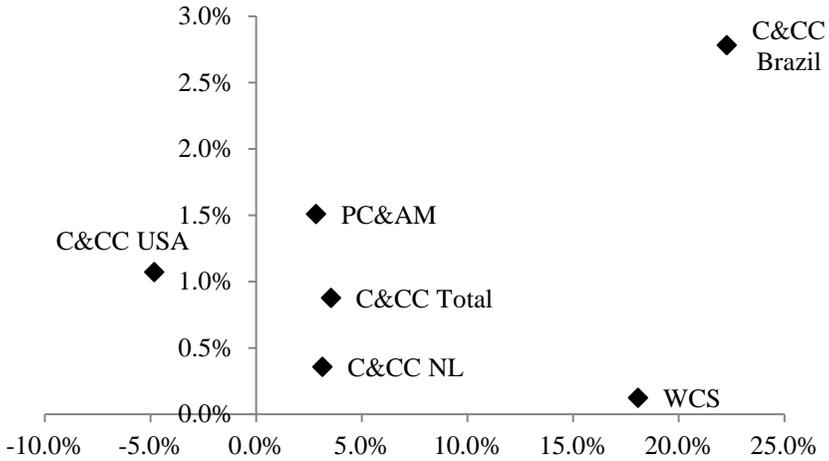
Source: ABN AMRO Annual reports

The question arises why Wholesale Clients was favored even though it was not as profitable as the other divisions. The next sections will go into this question, analyzing why the Wholesale division might have seemed more profitable than it actually was ex ante, while the other business units may actually have seemed less profitable. First, stock market responses to acquisitions will be analyzed in order to gauge how the stock market responded to different types of acquisitions.

4.8.3 Stock market responses

In order to analyze the reaction of the stock market to actions of ABN AMRO, this section analyses cumulative abnormal returns to acquisitions of ABN AMRO. By observing the abnormal returns, shareholder reactions to each of the takeovers can be gauged and numerically compared. As such, it is possible to see if the market responded differently to takeovers in retail or wholesale banking, small or large takeovers and takeovers that took place in markets in which ABN AMRO already

had a strong presence versus markets in which ABN AMRO did not have a strong presence.[88]

In order to analyze the market reaction to these acquisitions, cumulative abnormal returns (CAR) are estimated. Abnormal returns are defined as the realized return of a share minus the expected return of that share, or:

$$CAR_i(T - n, T + n) = \sum_{t=T-n}^{T+n} R_{i,t} - E(R_{i,t})$$

Where $CAR_i(T - n, T + n)$ is the cumulative return between day $T - n$ and day $T + n$ for a share of ABN AMRO during the acquisition of target i, and $R_{i,t}$ and $E(R_{i,t})$ are realized and expected return of a share of ABN AMRO respectively. Expected return is calculated by estimating a CAPM equation out of sample, and using the coefficients from that equation to obtain expected returns within the sample. The equation that is estimated is therefore:

$$R_{i,t} - R_{f,t} = \beta_0 + \beta_1(R_{m,t} - R_{f,t}) + \varepsilon_{i,t}$$

Where $R_{f,t}$ and $R_{m,t}$ are the daily risk-free rate and market portfolio returns respectively, and $\varepsilon_{i,t} \sim N(0, \sigma)$. For the risk-free interest rate, the 10 year rate on US treasury bonds was taken, and for the market portfolio, returns on the KBW Bank Index. This index, named after investment bank Keefe, Bruyette and Woods, serves as a benchmark to returns in the financial sector. It measures the returns to a portfolio comprised of 24 banks. This model is estimated out of sample over the period August 22nd 1990 (the first observation of ABN AMRO share prices) and December 31st 1996. The estimated coefficients were subsequently used to calculate expected daily returns for the period 1997-2007. The cumulative abnormal returns are used as the dependent variable in the following regression:

---

[88] Figure 3 shows the number and value of the takeovers that ABN AMRO performed between 1997 and 2007. A complete overview of the acquisitions is presented in Appendix 4A.

$$CAR_i = \alpha_0 + \beta_1 Retail_i + \beta_2 Wholesale_i + \beta_3 Private_i + \beta_4 Home_i$$
$$+ \beta_5 Payment_i + \beta_6 log(distance_i) + \beta_7 Size_i$$
$$+ \beta_8 Post2000_i + \varepsilon_i$$

Where $Retail_i$, $Wholesale_i$ and $Private_i$ are dummies that measure if the acquired company could be considered for integration into ABN AMRO's Consumer & Commercial Clients, Wholesale Clients or Private Clients & Asset Management business units respectively. These dummies are not mutually exclusive. Antonveneta for example offers all three services to its clients, so that all three dummies equal 1 for that acquisition. Furthermore, there are acquisitions such as property development (Bouwfonds) and car lease (KPN Autolease) that were not easily classified in one of these categories, so that all dummies for these types of acquisitions equal zero. These dummies are included to infer if the stock market responds differently to different types of acquisitions.

$Home_i$ is a dummy that equals 1 when the acquisition takes place in a country that is labeled as a home market by ABN AMRO. These countries are the Netherlands, the United States, Brazil and Italy. This dummy measures if the market responds differently to acquisitions that expand markets in which ABN AMRO is already active compared to acquisitions in countries in which it does not have a large foothold. $Payment_i$ is the value of the payment for the acquisition in millions of euros. Payments were not disclosed for all acquisitions, especially the smaller acquisitions. Non-disclosed payments are assumed to be zero, which may be justified for acquisitions of very small banks. $Size_i$ is the relative size of the takeover target compared to ABN AMRO. Unfortunately, not all information on takeover targets can be obtained because information (especially for the smaller takeover targets) is frequently not disclosed. For some targets, the number of employees is mentioned while others show the target's market capitalization or its assets under management. In order to turn this information in a comparable measure, each was related to the same measure of ABN AMRO. When employees were disclosed, it was divided by the number of ABN AMRO employees. The same was done for assets under management, total assets, total equity and the number of

branches. This measure controls for the size of the acquisition since bigger acquisitions may be expected to have a larger impact on the share price. $Distance_i$ is the distance of the takeover target from Amsterdam. This variable controls for the possibility that branches that are further away may be more difficult to manage. Finally, $Post2000_i$ is a dummy that equals 1 after May of 2000, when Rijkman Groenink became chairman of the executive board and a new strategy was put in place.

Data on acquisitions was collected from Zephyr, annual reports and news sources. Each acquisition was manually investigated in newspaper reports to ensure the validity of the details of the acquisition. The acquisitions considered were all completed, with the exception of two observations. An announcement for a minority shareholding in Banca di Roma in 1999, and in Antonveneta in 2001. These minority stakes were added because there was an intention of an acquisition behind these stakes that was clearly communicated in the press.[89] All in all this resulted in 46 acquisition announcements over the period 1997-2007. The majority of these acquisitions are of small banks, with a few large takeovers in the Netherlands, Brazil, the US and Italy standing out.[90]

Table 5 shows the summary of statistics for the takeover data. What can be observed for this table is that the average acquisition is small, relatively 3% of the size of ABN AMRO, with a maximum of 36%, which is observed in the takeover of Bouwfonds. The average of the cumulative returns for all acquisitions is negative for both the three day as well as the forty day window, although this is not significantly different from zero. In the forty day window, it can be seen that the negative average is skewed by several very negative observations, since the median cumulative abnormal return is found to be positive. The largest negative cumulative return over forty days is from the announcement of a minority shareholding in Antonveneta.

---

[89] For robustness, the analysis was repeated while excluding these two observations, which led to similar results.

[90] Appendix 4A shows the full list of acquisitions over the sample period.

Table 5: Descriptive statistics takeover data ABN AMRO 1997-2007.

	Average	Median	Std.Dev.	Min	Max
Assets ABN AMRO (€ mln)	581391	549600	172287	379500	1025200
Payment (€ mln)	590	259	835	−156	3260
Size (ratio to ABN AMRO)	.034	.004	.076	.000	.362
CAR(−1,1)	−.004	−.004	.033	−.118	.052
CAR(−20,20)	−.008	.006	.092	−.229	.206

Table 6 presents descriptive statistics on takeovers by the type of acquisition. All in all takeovers in retail banks tend to be associated with larger takeover sums, and takeovers in home markets are larger than those outside of home markets. Stock market reactions are most positive about retail banking takeovers, while they react most negatively to takeovers that fall into the other category, such as car leasing and property development.

Table 6: Descriptive statistics takeover data ABN AMRO 1997-2007 by type of takeover (averages).

	Retail	Wholesale	Private	Other	Home
N	11	18	19	7	20
Payment (mln euro)	914	420	569	522	1001
Size (ratio to ABN AMRO)	6.85%	3.92%	5.19%	3.12%	7.34%
CAR(−1,1)	.0005	.0061	−.0025	−.0311	.0006
CAR(−20,20)	.0321	.0028	.0023	−.0748	−.0249

Table 7 presents the results of the regression. It shows that in the three day CAR(−1,1) window, wholesale banking acquisitions tend to lead to positive abnormal returns, while over the forty day CAR(−20,20) window retail acquisitions lead to positive abnormal returns. In itself expanding in a market designated as a home market does not affect abnormal returns significantly.

Table 7: Results analysis cumulative abnormal returns ABN AMRO 1997-2007.

	CAR (-1,1)	CAR (-20,20)	CAR (-1,1)	CAR (-20,20)	CAR (-1,1)	CAR (-20,20)
Retail	.22	7.19**	-2.13	1.46	-1.91	3.01
	(1.18)	(3.31)	(1.45)	(4.03)	(1.42)	(4.02)
Wholesale	2.05**	1.85	1.08	1.03	-1.64	-4.44
	(1.01)	(2.84)	(1.09)	(3.03)	(1.58)	(4.52)
Private	1.23	.72	.81	.67	.77	-.67
	(1.08)	(3.05)	(1.19)	(3.34)	(1.20)	(3.40)
Home market	1.36	-4.56	1.23	-4.27	1.21	-10.17*
	(1.11)	(3.12)	(1.24)	(3.47)	(1.96)	(5.60)
Log(Payment)			.28	.88	.24	.72
			(.22)	(.63)	(.22)	(.61)
Size (relative)			4.37	-7.79	6.13	2.92
			(8.83)	(24.61)	(8.74)	(24.65)
Log (Distance)			.47**	.71	.47**	.50
			(.20)	(.56)	(.20)	(.56)
Post2000			-.84	-6.46**	-2.41	-13.43***
			(.94)	(2.68)	(1.45)	(4.29)
Post2000* Wholesale					4.19**	8.62
					(1.84)	(5.25)
Post2000* Home					.11	7.49
					(1.96)	(5.61)
Constant	-2.35**	-1.59	-4.87***	-2.91	-3.89*	3.70
	(1.06)	(2.98)	(1.80)	(5.08)	(2.12)	(6.16)
R²	.114	.139	.302	.332	.392	.469
N	46	45	46	45	46	45

*Standard errors in parentheses, ***, **, * Significant at 1%, 5%, and 10% respectively.*

This does not change once the dummy after May of 2000 is introduced by itself. However, once the post-2000 dummy is interacted with dummies for a home market expansion and wholesale expansion, it becomes significant for wholesale expansions. For the three day window, wholesale acquisitions have a positive effect after the strategic change in 2000, but no significant effect before then. Furthermore, the post-2000 dummy is negative for the forty day window. It is interesting that the return on assets was actually lowest for wholesale activities

(figure 24), but expansions in wholesale activities are not associated with negative stock market reactions.

There is some evidence that markets interpreted takeovers after the strategic shift of 2000 differently. Shareholders value takeovers in wholesale banking activities more. Although there is no shift in the absolute way in which takeovers are valued after 2000, takeovers of banks with wholesale activities are valued more in the short run. However, there is no evidence that there is a trend in the data where takeovers are judged more harshly over time, or if takeovers after 2000 are valued differently compared to takeovers before 2000.

4.8.4 Focus and synergies

Analysts condemned ABN AMRO especially after 2005, claiming that the bank was too dispersed and lacked focus (FEM Business, 2005a; 2005b; The Children's Investment Fund, 2007). This section analyses how dispersed ABN AMRO's activities actually were. Figure 8 already showed ABN AMRO became more focused over time in geographical terms.[91] The distribution over income groups can be obtained through Bankscope and is presented in figure 26.[92] It shows that ABN AMRO becomes more dispersed in terms of distribution of its income, with interest income declining from 73% to 64% of total income and increases in the other sources of income.

---

[91] For example, the share of revenues from the Netherlands increased from 32% of total revenues in 1998 to 41% in 2006

[92] Bankscope was chosen as a datasource rather than Thomson Worldscope because of data comparability over time. Thomson Worldscope does provide data on the dispersion of activities of different banks. However, this data is less comparable over time, because the organization of activities changes over time. For example, the 1998-1999 data is distributed over income groups, while the 2000-2005 data is distributed over the strategic business units, and the data after 2005 is distributed over both countries and activities. As such, the data can't be used to compare the dispersion of activities over time. The advantage of using Bankscope data over Thomson Worldscope data on activities is that the results are more comparable. The disadvantage is that the Bankscope data does not measure income from different activities. For instance, interest income might be obtained from both consumer clients and wholesale clients. Bankscope does not make a distinction between interest income from one group or another, so that a focused bank that fully focusses on earning interest income from wholesale clients cannot be distinguished from a bank with interest income that is dispersed evenly over wholesale and consumer clients.

Figure 26: Income spread over categories for ABN AMRO in 1997 and 2007.
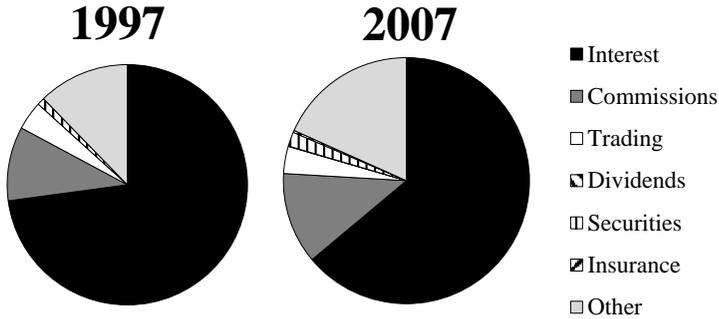
Source: Bureau van Dijk's Bankscope

Still, these numbers do not say anything about the relative position of ABN AMRO compared to its competitors. To get an idea of how dispersed ABN AMRO was compared to its competitors, a single measure of concentration is needed to compare over multiple banks. To obtain an estimate of the concentration of activities, a Herfindahl index[93] can be constructed:

$$HHI = \sum_{i=1}^{n} (share_i)^2$$

The Herfindahl index is usually calculated to give an indication of the concentration in a market and sums up squared market shares. A higher Herfindahl index indicates a more concentrated market. If the bank's activities are completely concentrated in one market, the Herfindahl index equals one, while if it is infinitely spread out, the index is equal to zero. Here, the Herfindahl index is used to measure the concentration over geographical earnings shares[94] and concentration over

---

[93] Additional possibilities for dispersion measures were considered, such as the entropy measure introduced by Palepu (1985). These measures gave similar results to the Herfindahl index.
[94] Because the geographical Herfindahl index considers spread over five geographical regions (North America, South America, Europe, Asia and Other), the lowest possible value is 0.20.

income groups. [95] Constructing a Herfindahl index creates a single number to measure the dispersion of activities for a bank, and as such makes it possible to compare the dispersion of activities for multiple banks. Figure 27 shows the dispersion of activities over both geography and income groups for ABN AMRO and the average of its self-selected peer group of banks. A full comparison in which each peer group member is included separately is included in Appendix 4B.

Figure 27: Herfindahl index over geography (left)[†] and income groups (right) ABN AMRO and peer group.
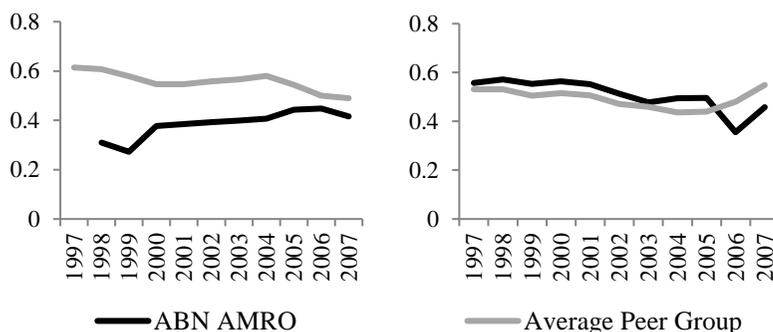
†Data for ABN AMRO are missing from Thomson Worldscope for 2001-2004. Data for 2004 were obtained from the 2005 annual report of ABN AMRO (2006), while data for 2001, 2002 and 2003 were linearly interpolated between 2000 and 2004.
Source: Thomson Worldscope, Bankscope, ABN AMRO annual reports

The left hand side of figure 27 shows that ABN AMRO did not become more dispersed over time geographically. While the average geographical concentration of the peer group went down, ABN AMRO became more focused geographically. Still, over the entire period, ABN AMRO was among the most geographically dispersed banks. In 1998 and 1999, ABN AMRO had the lowest Herfindahl index out of the entire peer group, as well as in 2006 and 2007. In the period in between, only ING and Barclays were geographically more dispersed over continents (Figure B2 in Appendix B).

---

[95] Because the income group Herfindahl index considers spread over seven income groups, the lowest possible value is 0.14.

The right hand side of figure 27 shows dispersion over activities. It can be seen that that ABN AMRO follows the average closely and is slightly more focused, until 2006 when it becomes more dispersed than the average. When looking at the peer group members individually, ABN AMRO follows the average closely with the exception of 2006 and 2007, when its income is more dispersed than any other bank except Société Générale and JPMorgan Chase (Figure B3 in the Appendix B).

As such, even though ABN AMRO was highly dispersed geographically, it did become more concentrated over time, hinting at an increase in focus. However, even though there was a tendency towards greater concentration, ABN AMRO did remain the most dispersed bank of its entire peer group. The opposite can be seen in terms of income distribution, where ABN AMRO was slightly more focused than its peer group in 1997, but became more dispersed over time.

4.8.4.1 Creation of synergies

A high degree of dispersion may not in itself have any meaning in terms of either economies or diseconomies of scope. If a bank is highly dispersed but is able to create value in this dispersion, its dispersion may be a net positive for the bank. As such, it should be analyzed if ABN AMRO was able to create synergies through economies of scope and geography. There is some evidence that the bank was struggling to create these synergies. In an internal document to the managing board discussing the long-term strategy of the bank, ABN AMRO (2001) analyzes potential synergies across its business portfolio, noting that "since project Arrow no major attempts have been made to enhance and capture the synergy potential among different activities within our portfolio". Internally, few synergies are found between the SBUs and within SBUs the CC&C SBU is found to have no synergies between the home markets of the Netherlands, Brazil and the USA. In a follow up project called Spaghetti that was specifically implemented to examine how synergies could be created (ABN AMRO, 2002), it is noted that the product offerings of the WCS and PCAM do not align as well within ABN AMRO as they

do in competitors. [96] In 2003 another internal document (ABN AMRO, 2003b) notes that no significant synergies had been created since the previous strategic sessions. The lack of progress is attributed in part to group culture and the document notes that a culture of silo-thinking exists, where employees are concerned with their SBU or division and not with ABN AMRO as a whole. The lack of synergies is repeated in ABN AMRO (2004b). In a sum of the parts analysis, ABN AMRO (2004b) estimates the value per share at €19.90, while the share price is €17.00 at that time, a conglomerate discount of approximately 15%.

Throughout the internal documents, it is noted each time that synergies have not been realized and plans are initiated in every subsequent document to increase synergies in the short term (ABN AMRO, 2001; 2002; 2003b; 2004b). Common among these documents is that the strategies to achieve these synergies remain vague, it is stated that synergies should be improved without suggesting exactly how. Internal documents after 2006 present strategic options to the board in terms of clear choices. For example a suggestion could be made to divest all operations in Hungary. It is after this time that interviewed parties note that the bank was doing better in terms of creating synergies.

Besides synergies within and between SBUs, synergies were possible in geographical terms. In interviews it was noted that the international network of ABN AMRO added little value, and analysts also stated that the bank was unable to fully lever its international network. Below, an analysis is made of the possibilities of economies of scope within ABN AMRO's home markets outside of the Netherlands.

4.8.4.2 Synergies from Lasalle, Banco Real and Antonveneta

In its home markets of the Netherlands, Brazil, the US Midwest and Italy ABN AMRO offered a large range of services. Banco Real was one of Brazil's largest

---

[96] Specifically, the report notes that out of 360 leads for new business in the Asset Management division, 20 originated from the WCS SBU while 60 were brought in by outside consultants, suggesting limited synergies between the strategic business units. Similarly, C&CC is noted to insufficiently capture additional clients for PCAM.

private banks and offered a wide range of commercial bank services (Schipper, 2005). In the US, takeovers were performed of retail banks (e.g. Michigan National Corporation), as well as private banks (e.g. Alleghany Asset Management) and investment banks (e.g. Furman Selz). In Italy, Antonveneta also offered a wide range of financial services. As such, ABN AMRO attempted to create economies of scope within each of its home markets as well as economies of geography between its home markets.

As for the synergies in its home markets, ABN AMRO expected gains in cost efficiency for Banco Real and Antonveneta, and may have exploited regulatory arbitrage for the US Midwest. For Banco Real, gains were projected from better management, reductions in superfluous personnel and the integration of the ABN AMRO ICT infrastructure into the activities of Banco Real (ABN AMRO, 2000b). For Antonveneta, ABN AMRO projected cost savings and especially an increase in revenue in the North of Italy, noting relatively low use of banking services in that area (ABN AMRO, 2005c). Furthermore, ABN AMRO projected a strategy of focusing on mid-market clients, which would increase profitability for Antonveneta. Notably missing from the synergies explanation for both Banco Real and Antonveneta is why exactly ABN AMRO was needed as an acquirer to realize these profits, as most of the strategies seem to be achievable without an acquirer, but might just as well be realized with a managerial buyout for example. ABN AMRO (2005c) notes a number of different channels for enhancing synergies. However, not all of these channels enhance synergy. For example, it is noted that Antonveneta might profit from ABN AMRO's higher credit rating, which is put forward as a synergy. If this is true, it would also automatically mean that ABN AMRO's credit rating would be affected by the acquisition of Antonveneta and become worse as a result unless the increase in credit rating is the result from other increases in synergy. Other factors, such as reduced overhead costs from the use of an integrated ICT network may indeed have led to synergies, but the inclusion of factors such as credit rating most likely meant that the €160 million reduction in costs due to synergies was an overestimation. A case could be made that ABN AMRO was instrumental in making improvements in Antonveneta, which could create synergies. However, in the years following the acquisition, the

cost-to-income ratio of the European business unit worsened rather than improved. Data on Antonveneta by itself were not publically available, so that the deterioration of the cost-to-income ratio may have been caused by performance of other subsidiaries in Europe. However, given the relative size of Antonveneta in the European business unit, it is probable that the cost-to-income ratio deteriorated for Antonveneta as well. It can also be argued that improving efficiency takes time. However, in ABN AMRO (2005c), efficiency gains rather than efficiency losses are projected in 2006 and 2007 for Antonveneta. ABN AMRO also held a minority share in Antonveneta since 2001. If ABN AMRO had already suggested some of the possible efficiency gains as a shareholder this would have dampened the possibilities of creating synergies.

For the US Midwest, Westerhuis (2008) argues that part of the gains for ABN AMRO was from regulatory arbitrage before 1994. While domestic banks were prohibited through the Glass-Steagal Act from combining investment banking and retail banking activities and operating over state lines, foreign banks were not subject to these rules and as such were able to exploit economies of scale from multiple geographic regions as well as economies of scope from the combination of activities. These regulatory barriers were reduced and abolished over time. [97] However, as with Banco Real and Antonveneta, Westerhuis (2011) notes that synergies were mostly absent between ABN AMRO and LaSalle due to the geographic distance between ABN AMRO's home markets, relative size of the US activities and the different demands of investment and retail banking on an organization. In 2007, LaSalle was sold to Bank of America. ABN AMRO was split up shortly after, so that it is impossible to estimate if this sale led to synergy losses, but analysts at the time were positive about the sale and Bank of America seemed to be able to create more synergies than ABN AMRO had. LaSalle was mostly focused on supplying mortgages in the US Midwest. This meant that the acquisition of investment banks in New York led to little synergy because there was little overlap both geographically and in terms of activities. Multiple

---

[97] The Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 removed many of these restrictions.

interviewed parties noted that it may have been a mistake to expand into investment banking in the US given the lack of synergies.

A closer look at the different home markets of ABN AMRO reveals relatively few possibilities for economies of geography. Although the addition of these home markets might very well have led to increases in profits through better management, these are not gains from economies of geography per se, as they could have come about without the acquisition by ABN AMRO. In other words: they may not have added to the creation of a synergistic multinational bank, even though they might have added to the overall profits of ABN AMRO.

4.8.5 Value based management and risk shifting

A reason for the relatively large investment in the wholesale division may have been that the new management system, managing for value, was favorable to the activities in the Wholesale Clients SBU. Managing for value was formally introduced in 2000 to reduce costs by increasing transparency and accountability in the organization.[98] Claes (2008) notes that before 2000 budget requests were always approved while managers were rarely held accountable for not meeting their targets.[99] Profit and loss accounts were attributed to countries rather than business lines, so that it became impossible to observe which lines of business were profitable and which were not. The implementation of managing for value added accountability and addressed costs. The cost-to-income ratio improved from 73.1% in 2001 to 67% in 2003, suggesting that the implementation of value based management was successful in managing costs at least shortly after its introduction (figure 7).

As mentioned in box 2, managing for value adds the costs of capital to the costs of any project in order to exclude projects that are profitable at face value,

---

[98] Note that managing for value has a longer history in the bank, and is already mentioned in the annual report of 1999.

[99] In interviews, it was similarly noted that little information about profits was available before 2000 and that bonuses were always granted without considering actual performance too much.

but for which the capital that is used would have gained a higher return at a similar risk profile. The implementation of managing for value was taken further than just a tool for deciding which projects would be undertaken and which would not, it was intended as a change of culture in the entire organization (ABN AMRO, 2001). Managing for value was implemented as a tool to measure financial compensation as well, further establishing managing for value as a centerpiece of the company's strategy. And it remained a centerpiece of the firm's strategy, as was reiterated in practically every annual report.

Broersen and Verdonk (2002) describe how managing for value was implemented in the Wholesale Clients strategic business unit specifically. The concern goal, total return to shareholders, was translated into Economic Value as a strategic goal and Economic Profit as an operational goal. The operational goal of Economic Profit was calculated as follows (Broersen and Verdonk, 2002):

$$Economic\ Profit = Net\ Income - k_e * (Assigned\ Capital)$$

This formula not only takes profit at face value into account but also, through the second term, the amount of equity capital needed to fund the project in combination with the costs of equity capital k_e. Economic Value is calculated as the discounted value of Economic Profit over a longer time period, defined as:

$$Economic\ Value = \sum_{t=1}^{4} \frac{Economic\ Profit_t}{(1 + k_e)^t} + \frac{Economic\ Profit_{t=5}}{(k_e - g)(1 + k_e)^4}$$

So that any calculation of economic value would take into account the economic profit in the first four years (first term in the formula) as well as the residual value of the investment (second term). In these formulas, k_e is the cost of equity and g is the growth rate, which is assumed to be constant after the fourth year of the project. Together these operational measures would lead to the overall concern goal of shareholder value creation: As long as projects are undertaken with positive economic value shareholder value is created.

In the formula, the cost of equity is taken as constant at 10.5% for ABN AMRO, based off calculations using risk weights from the Basel 2 accord (Claes, 2008). Therefore, projects are assigned the same costs of equity capital independent of their risk. The variation in the costs of risk that are allocated to each project comes from the amount of equity capital that is assigned to the project. If this formula is ideally implemented, it would optimally correct for risk in every project by assigning more capital to riskier projects. In practice, it may be difficult to assess the riskiness of a project so that the estimated risk of a project may differ from the actual risk. The result is that projects that have a low risk expectation relative to its actual risk will tend to be favored, which will be true not only for ABN AMRO but for any organization that implements similar measures. Eventually, this may lead to additional risk at the holding level, slowly spiraling to an increased required return for shareholders and an increase in the costs of equity. Uncontrolled, this would be self-reinforcing, so that the incentives for risk increase even more.

Besides possibly incentivizing operational risk use of this formula also incentivizes financial risk. As the value of any project is negatively related to k_e and k_e is assumed constant, the natural tendency will be to use as little equity for any project as is possible, instead favoring debt financing. This may then result in chosen projects that generally have lower capital assigned than is mandated by their actual risk level. At the holding level this may eventually lead to an increase in leverage, thus again requiring a higher required rate of return. Again, these incentives will not only be in place for ABN AMRO specifically but any company implementing similar measures. Over time, it can be observed that ABN AMRO became more levered in terms of book equity over total assets (figure 15). James (1996) notes that capital allocation may be a misleading term in itself, since certain activities such as equity underwriting or issuing commitments take little funding, but may require a large capital buffer to protect against losses. If the purpose of capital is insufficiently communicated within the organization so that employees do not think of capital as loss protection but as funding, this will also create an incentive to allocate little equity capital to projects that require little funding even if they are risky.

Figure 28 gives an indication that the measurement of risk may help to explain why the Wholesale Clients SBU seemed so attractive. Looking at asset risk density (risk weighted assets over total assets) the Wholesale Business has risk weights of 0.15-0.3 on average, while the risk weights for the Consumer and Commercial SBU are closer to 0.6-0.7. This seems striking, as wholesale banking activities are generally thought of as riskier and thus as requiring a larger risk weight. An explanation for the difference could be that Basel 2 required a risk weight of around 75% on retail products, while claims on rated companies were generally lower (20% for AAA to AA- rated companies).

Figure 28: Assets and Risk Weighted Assets (RWA) for two Strategic Business Units (€ mln).[100]
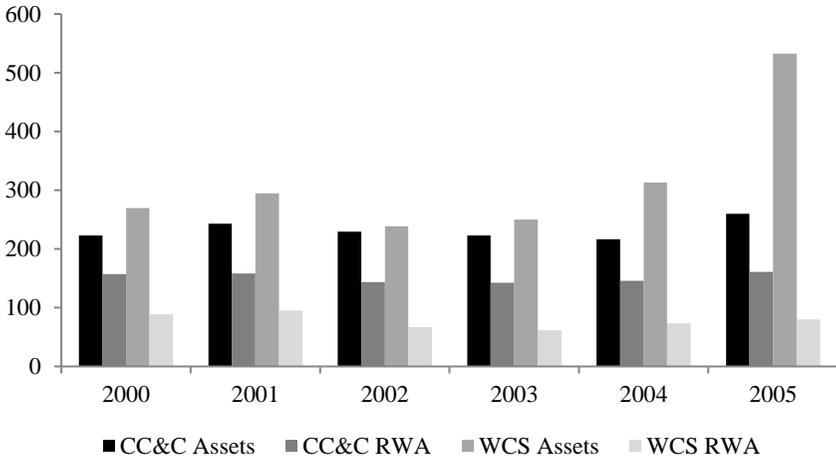
Source: Annual reports

Over time the average risk weight of Wholesale Clients SBU also went down from year to year while it stayed practically the same for the other business units. This can point to a reduction in risk, although as noted above other risk indicators such as CDS spreads actually did not point to a reduction in risk and Acharya, Engle and Pierret (2014) do not find a relationship between asset risk density and market based risk measures.

---

[100] Data for Private Clients and Asset Management is not shown, because its assets are more than a factor 10 smaller than the Consumer and Wholesale division.

The reduction in the average risk weight may also point toward other factors. For example, Mariathasan and Ouarda (2014) note that Basel 2 risk weights are manipulable and that evidence points towards banks manipulating risk weighted assets, especially when they are highly levered. Although it cannot be proven with certainty that this is the case, it would explain why only risk weighted assets in the Wholesale Clients SBU went down while risk weighted assets remained practically constant for the Consumer & Commercial Clients SBU. Individual projects are generally smaller for the Consumer & Commercial Clients SBU, so that there was less of an incentive to seek out the optimal way in which to present risk weights in that SBU. As such, the Wholesale Clients SBU may have looked less risky and, through managing for value, more profitable than the Consumer & Commercial Clients SBU.

One anonymous executive to a strategic business unit noted that the short term measure of economic profit over four years got most of the attention (Claes, 2008), and an increased focus on the short term after the turn of the century was mentioned in multiple interviews as well. In interviews it was mentioned that it was not deemed practical to manage on longer term projects, because most of the value stems from the opaque residual value, while the bank is operating in an environment that is changing quickly. This meant that short-term projects got favored over longer-term projects regardless of their profitability. One interviewed person noted that there was a pressure to focus on the short term which got reinforced by shareholders and analysts that demanded better performance by the next quarter. This focus may have been self-reinforcing, so that myopia led to worse performance which led to myopia. A focus on the short term may have favored investment in the Wholesale Clients business unit, as that unit was generally more involved in transactions and less in relationship building than the other divisions.

Managing for value may favor transaction banking rather than relationship banking for other reasons as well. First of all, transaction banking is thought to be based more strongly in hard information rather than soft information which is more important to relationship banking (Berger and Udell, 2002). By its nature, relationship banking focusses on building relationships which are characterized by

the use of soft information (Boot and Thakor, 2000). Transaction banking focuses more on one time transactions and the use of hard information. As such, transaction banking is more suited to the accountability enforced by managing for value, since its value is more easily measured. Secondly, transaction banking by its nature is focused on transactions which occur over a shorter time span than relationship banking activities, which only pay off over a longer time period. Because the focus of managing for value is said to be in the short term, this would have favored transaction banking activities. Third, the payoff of transaction banking activities tends to be more dependent on economic conditions. This implies a higher systematic risk of these activities, and a higher expected rate of return as a result. The higher expected return would favor these activities over more stable returns from relationship banking if risk taking is insufficiently penalized by allocating capital. Finally, Boot (2010) notes that investment bankers tend to be less committed to an organization than relationship bankers and favor explicit contracts that are focused on remuneration rather than job continuation. The move towards managing for value was accompanied by an increase in the amount of pay for performance contracts. In turn, this made ABN AMRO attractive to transaction bankers relative to relationship bankers.

The data suggests that relationship banking activities may have taken a backseat to transaction oriented activities, especially within the Wholesale Clients SBU. Figure 29 shows the distribution of interest income over the divisions before 2000 as well as over the strategic business units from 2000 on. From this figure it can be seen that interest income was mostly concentrated in the retail banking division before 2000, and was split between Consumer & Commercial Clients and Wholesale Clients after 2000. In 2001, the amount of interest income generated by the Wholesale Clients SBU was approximately €2.4 billion, which was more than halved by 2005, when it was approximately €1.1 billion. At the same time, interest income from the Consumer & Commercial Clients SBU actually went up. From the data it seems as if less credit was supplied to corporate clients and large corporations especially, scaling back corporate lending (Financial Times, 1999b).

Figure 29: Interest income by division and SBU (€ mln).

Investment Bank 1997 - 1999
Retail bank (domestic and international) 1997-1999
Private Clients & Asset Management 2000-2005
Wholesale Clients 2000-2005
Consumer & Commercial Clients 2000-2005
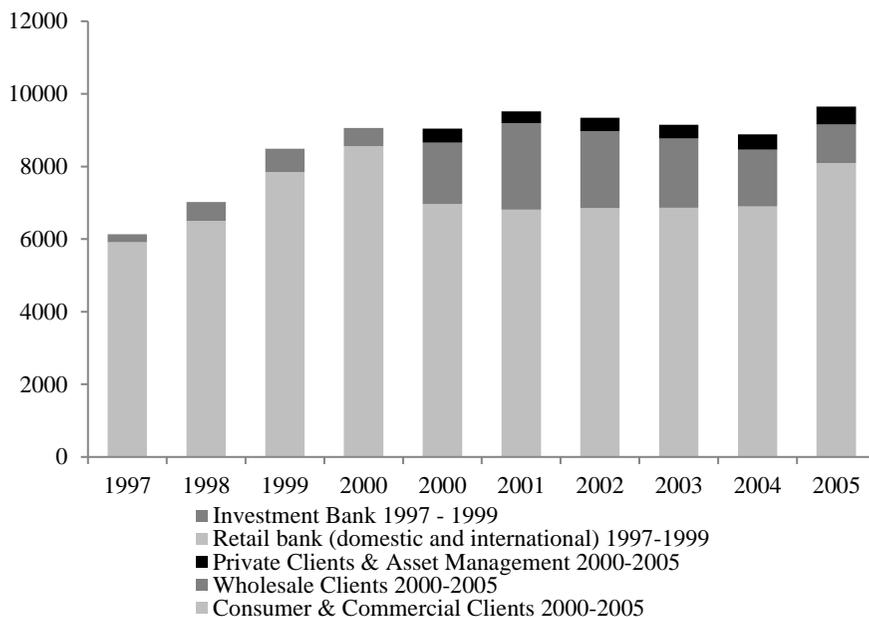
Source: Annual reports ABN AMRO

In interviews it was noted that the Wholesale Clients SBU was mostly interested in conducting traditional investment banking activities and less interested in supplying credit to large corporations. This is consistent with the idea that managing for value was favorable to transaction oriented activities rather than relationship activities. Wilco Jiskoot, joint head of the Wholesale Clients SBU in 2000, stated that out of six divisions the credit business was running at a structural loss but that this division was necessary because ABN AMRO would not be able to sell products to clients if it does not provide them loans as well (FEM Business, 2002). This view is consistent with the decline in interest income, where transaction oriented activities may have been favored over relationship activities.

Figure 30 points to more evidence of a decline in the amount of loans to corporate clients between 2001 and 2004, while loans to consumer clients remained relatively steady over time. After 2004, loans to corporate clients picked up again, which may point towards a change in attitude after the strategic reorientation of 2005. In interviews, it was noted that Wholesale Clients did put more focus on

supplying loans to corporate clients after 2005, especially when the bank's focus was placed on mid-sized clients.

Figure 30: Loans supplied to corporate and consumer clients (€ million).
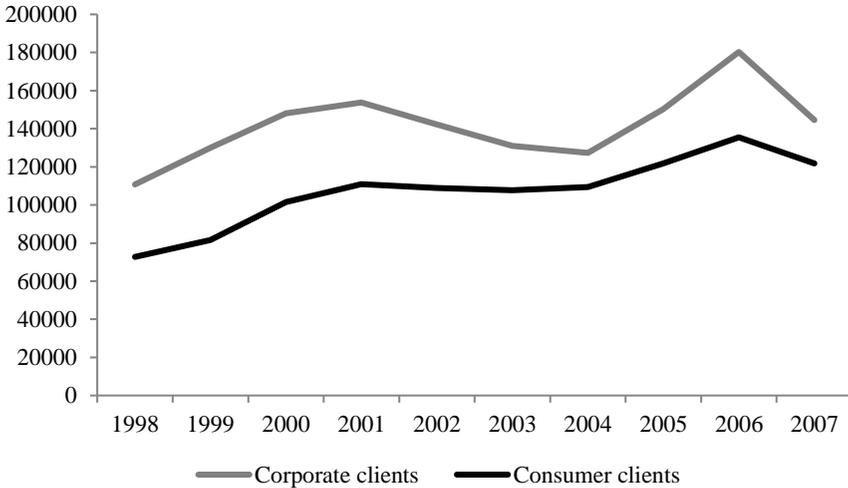
To conclude, managing for value was introduced to increase transparency within the bank so that costs could be controlled better. In the short run, costs did go down as a percentage of revenues, but ultimately went up again. The increase in cost-to-income was a result of low revenue rather than high costs, because costs to employees and costs to total assets were lower than competitors. From the distribution of interest income over the SBU's, it seems as if the business unit focused more on transaction banking rather than relationship banking, as interest income declined most sharply within the Wholesale Clients SBU. Furthermore, loans to corporate clients declined between 2001 and 2005, which were the clients that the Wholesale Clients SBU was supposed to supply credit to. Meanwhile, the Wholesale Clients SBU did increase its size in terms of assets. Activities in this SBU may have seemed more profitable than other parts of the bank because of their transaction rather than relationship nature. Profits from transactions were more

170

measurable and occurred over a shorter time span, which made them seem more attractive in the calculations of managing for value. The activities of the Wholesale Clients SBU may have also seemed more attractive in terms of risk than they actually were, since risk weights were significantly lower for the Wholesale Clients SBU than for the Consumer & Commercial Clients SBU.

4.8.6 Soft factors: Culture and commitment

Another reason why ABN AMRO was reluctant to disinvest in the Wholesale Clients SBU might have been because the top of the bank became dominated by investment bankers. Van den Brink (2003) notes that investment banks tend to have a less vertical organization than retail banks and as such will have more people at the top of the bank. This meant that even though the Consumer & Commercial Clients and Wholesale Clients SBUs were of similar size, two thirds of the top 200 employees had an investment banking background (Van den Brink, 2003). Together, this ensured that the culture at the top of the bank was more focused on investment banking rather than relationship banking, leading to an overemphasis on characteristics that make a good investment bank, such as flexibility and a short term focus, without focusing on synergies with the bank as a whole. All in all, this may have led to an organization that was disproportionally focused on transaction banking that was out of sync with its contribution to the profits of the bank.[101]

In the strategic reorientation of 2005, the strategy of enhancing synergies across the different divisions seemed to have been thought out more carefully and the centralization of certain overhead tasks should have enhanced synergies at face value. At the same time however, it is questionable if the quest for accountability during the first strategic reorientation had not overshot its target. Implicit contracts

---

[101] The clash of cultures may not only have affected the costs of the retail bank because of high costs in the wholesale division. It may also have worked the other way around: An unnamed investment banker of ABN AMRO states that the investment bank was run by retail bankers (Financial News, 2006), never paying top dollar for the talent that was required to become a world class investment bank.

for employees had been supplanted by explicit contracts, making it difficult to return to the old situation.

The typical contract of ABN AMRO's employees before 2000 was an implicit one, in which performance was not formalized. After 2000, this was in many cases supplanted by a contract with more explicit terms and a more explicit focus on performance. This shift in culture is positive in as far as it led to an internal organization in which employees were more aware of costs and accountability. At the same time however, the change may have had adverse effects on commitment in the organization, which is a form of an implicit contract within the organization. Greenberg and Baron (2008) define three types of commitment: continuation commitment, affective commitment and normative commitment. Continuation commitment is commitment because employees want to keep their jobs. It's mostly dependent on transaction costs and negative in nature: employees are committed because changing jobs means incurring costs. Affective commitment means that employees intrinsically care about their business. This type of commitment is hard to quantify, but positive for the organization, because more committed employees will automatically work harder. Normative commitment is dependent on the expectations of the surroundings. For instance, an employee could be committed because he wants to impress colleagues. The forms of commitment can mutually reinforce one another, for instance a higher degree of caring about surroundings may enforce affective commitment, through bonding with the company. Breach of an implicit contract has consequences for commitment (Greenberg and Baron, 2008). This was perhaps best seen when the Dutch division of ABN AMRO sent a letter to all of its employees in September of 2001. This letter was sent as part of an ongoing process to cut costs and told 75% of the employees that they were not indispensable. This letter caused tensions among employees and was later regretted by management (Schipper, 2005). All in all this resulted in 6500 people leaving the bank. This type of letter fits with a culture in which everything is as transparent as possible, but it may have had a strong negative effect on commitment. While it may have increased continuation commitment because employees became more aware of the possibility of losing their jobs, it may also have had negative effects on

affective commitment and normative commitment, because employees realized ABN AMRO might not care about them as much as they might have thought.

Within the Wholesale Clients SBU, the cultural difference may have been felt the hardest. Since that division was a combination of the previous investment bank together with corporate banking, investment bankers tended to demand high compensation, which the corporate bankers felt undeserved (FEM Business, 2002). Furthermore, members of the board that were responsible for the Wholesale Clients SBU reiterated that corporate banking was unprofitable, perhaps due to a lower risk profile. Also, the corporate bankers had to compete at a global level, which they were unaccustomed to. Compared to their international counterparts, they were not aggressive enough according to an anonymous investment banking colleague (FEM Business, 2002). In interviews it was noted that the ambitions for the Wholesale Clients SBU were set too high without taking into account that the culture within the Wholesale Clients SBU was not ready to fulfill those ambitions. An internal document (ABN AMRO, 2004b) notes that a culture of silo-thinking exists within the SBUs. It was noted in interviews that SBUs were incentivized to compete against one another, not work together.

4.8.7 Checks and balances

A question of interest is if there were insufficient checks and balances in place to adjust the strategy before the bank became a takeover target. The supervisory board, employees and shareholders may have insufficiently acted as a countervailing power to the executive board. A first source of countervailing power may have come from the supervisory board. Like most Dutch companies, ABN AMRO had a two-tier board in which the managing board is separated from a second non-executive supervisory board. ABN AMRO's supervisory board had always been large and consisted mostly of CEO's of Dutch multinationals. When ABN and AMRO merged in 1991, the supervisory board consisted of 18 members (Elsevier, 2015). The number of supervisory board members was reduced over time, but was still at 12 members in 2004 and still consisted mostly of CEO's of Dutch multinationals (VEB, 2004). The number of board members together with

their busy schedule may have negatively affected the monitoring function of the supervisory board. The supervisory board may also have been at an information and knowledge disadvantage, with only a few bankers on the supervisory board, although this increased over time. All in all, this meant that the supervisory board may not have been able to exercise enough countervailing power to the executive board.

Another countervailing power might have come from employees in the layer just under the executive board. However, these consisted predominantly of members of the Wholesale Clients division (Van den Brink, 2003), who were well off with the status quo, because the Wholesale Clients SBU was relatively overinvested in. Furthermore, a Dutch employee protection regulation called structured regime was modified for ABN AMRO in 2003 (NRC Handelsblad, 2003). The structured regime was imposed in the 1971 for large Dutch corporations and limited the influence of shareholders in the proceedings of the corporation (Ginneken, 2010). The structured regime specifically allowed employees (through an employee council) to decide on the appointment of directors in the supervisory board (Ginneken, 2010). In 2003, ABN AMRO was allowed to enter in a weak form of the structured regime in which the general meeting of shareholders was allowed to make decisions on the composition of the supervisory board rather than the employee council. As such, the influence of employees as a countervailing power also diminished after 2003.

Finally the shareholders: before 2003, ABN AMRO featured a number of takeover defenses. Priority shares were in place that the board could use to prevent hostile takeovers. This takeover defense was abolished in 2003. Furthermore, preference shares were issued that were held for 80 percent by other financial intermediaries in the Netherlands. These preference shares would give a deciding vote in crisis situations. By using the preference shares, approximately half of the votes would land in favor of the board (De Graaf, 2005). This takeover defense was abolished in 2004. As such, shareholders could not be expected to seriously interfere in the operations of the executive board before 2004. The influence of shareholders may also be questioned conceptually. Boot (2010) describes how shareholders may focus mostly on the short term and may push companies to

implement short term rather than long term policies. When the takeover defenses were abolished after 2004, it became possible for activist shareholders such as TCI to demand a change of strategy. This hedge fund had a short time horizon, because when it first met with the managing board of ABN AMRO, it gave it half a year to implement a new strategy, but changed its stance before this half year was up, expecting swifter results. As such, it may not be realistic to expect the shareholders to act as a countervailing power, when shareholders themselves may have driven the short term focus of the bank.

4.8.8 Strategies of other banks

As noted, ABN AMRO followed a strategy of scaling up. The increase in scale before 2000 was achieved through takeovers of smaller banks all over the world, while a focus on home markets was in place after 2000. After 2000, the strategy was accompanied by a focus on shareholder returns and the implementation of managing for value.

Over the investigated period, other banks tended to scale up their operations as well. Banks such as Barclays and UBS had chosen similar strategies to ABN AMRO with similar degrees of success. These banks also focused on scaling up with a focus on wholesale banking, implementing these strategies a couple of years before ABN AMRO had. Barclays pursued a worldwide expansion strategy with a focus on investment banking during the 1990s and UBS aimed to become the world's largest investment bank after 2000.[102] Banks such as Santander chose slightly differing strategies. This bank was mainly a retail bank and also had a global ambition. However, it chose its retail operations as leading, only offering wholesale products in markets where it had already established a retail position (Fortune, 2012). Similar to ABN AMRO, Santander pursued a strategy of home markets, in which it attempted to gain large market shares in markets it entered. It had more of a regional focus than ABN AMRO, focusing mainly on Latin America. The focus on retail banking shows from the degree of interest income, which was

---

[102] UBS had already become the world's largest wealth managing bank in 2003 (Larson et al., 2009).

relatively steady over time for Santander, while Barclays and UBS (like ABN AMRO) generated a larger share of income from non-interest sources over time. Furthermore, UBS set return on equity as its primary goal in 1998 (Larson et al., 2009), while ABN AMRO became focused on shareholder returns after 2000.

UBS had chosen a strategy of profit responsibility per division during the 1990s as ABN AMRO pursued with its strategic business units, but reverted back to a 'One firm' initiative in 2003 (Larson et al., 2009), while ABN AMRO waited until 2005 to amend its strategy in order to capture additional synergies. Barclays had similarly divided itself into strategic business units, but these business units were frequently reshuffled and renamed (Larson et al., 2009). The structure of Santander was also split into different business areas, with the difference that private banking and wholesale banking were supportive of retail activities rather than individually accountable for their profits.

4.9 Conclusions

Over the period 1997-2007, ABN AMRO went through two major strategic shifts. The first strategic reorientation took place in 2000 when the matrix structure of the bank was abolished in favor of a structure with three strategic business units that operated autonomously. Shareholder returns were set as the bank's main goal and managing for value was implemented throughout the bank. This reorientation was implemented mainly to increase transparency and accountability within the bank and control costs. The Wholesale Clients business unit was leading in the bank's strategy in 2000, while the Consumer and Commercial Clients business unit became leading a year later in 2001. However, even though the Wholesale Clients business unit was no longer leading, its growth in terms of assets still outpaced growth in the other business units within the bank. In 2005, a second major strategic reorientation took place in which ABN AMRO re-applied a country focus and focused on mid-market clients. This reorientation aimed to increase synergies between business units and to increase focus. Analysts were positive over the strategic changes when they were first implemented both times, welcoming the increased focus of the bank. Over time their sentiments cooled, while they focused

more and more on high costs and a perceived lack of synergy between the business units and country operations.

In the end, the question remains what lessons can be learned from ABN AMRO both in terms of what the literature on economies of scale and scope notes about ABN AMRO as well as what new lessons can be drawn from the ABN AMRO case. From the literature on economies of scale and scope in banking, economies of scale are potentially positive at all asset levels and economies of scope tend to be negative as potential synergies do not weigh up against agency costs of engaging in multiple activities. This seems to be no different for ABN AMRO, which was well aware of the lack of synergies and discussed them again and again in internal documents. However, translating the creation of synergies in concrete proposals did not start until approximately 2004, which may have been too late. Furthermore, ABN AMRO introduced a system of managing for value which may have had adverse effects on the creation of synergies between business units. When this system was introduced, the creation of synergies was not the chief concern of the bank, while a focus on cost controls was. In 2005, a second strategic reorientation attempted to recapture synergies and increase focus but came too late. Synergies between business units that had been marginalized by introducing the strategic business units were not easily recaptured and the continuation of managing for value as a strategy meant that few incentives were present to capture synergies between business units.

The way in which scale and scope are measured may also not tell the full story. In measuring the overall dispersion of ABN AMRO, it can actually be seen that the bank became less dispersed over time, especially concerning the dispersion over geography. Branches in countries in which the bank had a small presence were closed off, while it focused more on home markets. In all of these cases the bank expanded to these home markets by engaging in multiple activities in each country, so that negative economies of geography are difficult to disentangle from negative economies of scope. However, even though the bank became less dispersed over time, sentiment remained that ABN AMRO was very widely spread out and it was unable to capture synergies from different markets. ABN AMRO became more concentrated as it focused geographically on fewer markets, but the bank seemed

unable to create synergies between the geographic markets it was active in. The home markets in the Netherlands, US Midwest, Brazil and Italy operated more or less as independent entities and many of the arguments put forward as synergies came from operational improvements that could also have been implemented without ABN AMRO as a principal.

The Wholesale Clients SBU remained the fastest growing SBU between 2000 and 2005 in terms of assets despite having the worst performance in terms of returns. The discrepancy between investment and performance in the Wholesale Clients SBU may be explained by a combination of the implementation of managing for value, focus on risk-weighted assets and a change in culture. When managing for value was introduced in 2000 it increased transparency and helped control costs, the top priorities at the time. However, the practical implementation of managing for value may have led to an increase in risk taking and short-sightedness. Because projects were attributed a relatively rigid cost of capital, an incentive for additional risk taking was present both by taking on additional leverage as well as additional operational risk. Furthermore, the calculation of economic profits focused on the first four years, ensuring a short-term focus. The focus on short-term returns may have made favored the Wholesale Clients business unit over the Consumer & Commercial Clients business unit. Furthermore, a focus on risk-weighted assets may have obscured the growth of the Wholesale Clients business unit, because the business unit actually shrank in terms of risk-weighted assets. The decline in risk-weighted assets may have resulted in a relatively high return on risk-weighted assets for the Wholesale Clients business unit compared to its return on assets. Another immeasurable factor that may have played a role was the friction in culture between investment bankers and more traditional relationship oriented bankers. The transaction orientation of the 1990s may have shifted the power to the investment bankers. The prevalence of investment bankers in the top of the bank may explain why the Wholesale Clients SBU was growing even though it was underperforming.

Appendix 4A: Takeovers

Table A1: Takeovers by ABN AMRO 1997-2007 (Source: Zephyr and Dutch newspapers).

Announced	Target name	Type of bank
8-1-1997	Banque de Phenix	Private Banking
23-4-1997	Demachy Worms & Cie	Private Banking
23-12-1997	Barclays de Zoette Wedd (BZW)	Investment bank
19-3-1998	Bank of Asia	Universal
15-5-1998	KPN Autolease	Lease cars
9-7-1998	Banco Real	Retail
5-10-1998	Energex	Investement Bank
18-11-1998	Banco do Estado de Pernambuco	Retail
6-3-1999	Banca di Roma	Universal
6-4-1999	Great Pacific Savings Bank	Private Banking
20-5-1999	Bank of America	Private Banking
9-6-1999	Delta EAB	Investment bank / Private Bank
27-8-1999	Bouwfonds	Home building
16-10-1999	Atlantik	Private Banking
19-11-1999	Atlantic Mortgage & Investment	Retail Banking
8-3-2000	Merrill Lynch&Co Energy futures	Investment Bank
16-3-2000	Kwang Hua	Private Banking
25-4-2000	Dial Group	Retail
23-6-2000	Skoda Pension Fund	Private Banking
26-9-2000	Jostota a Koruna	Private Banking
18-10-2000	Alleghany Asset Management	Private Banking
26-10-2000	Consolidated Service Corp.	Lease cars
24-11-2000	Michigan National Corporation	Retail Banking
13-1-2001	Furman Selz	Investment bank
10-5-2001	Mellon Financial Corporation	Wholesale
31-5-2001	TA Bank	Investment Banking
6-7-2001	Marignan	Home building
21-9-2001	Banca Antoniana Popolare Veneta	Universal
9-11-2001	Banco do Estada da Paraiba	Retail
11-6-2002	Artemis Investment Management	Private Banking
20-9-2002	Delbrueck	Private Banking
20-9-2002	Stienstra Projectontwikkeling	Home building
18-2-2003	KBC	Private Banking
18-4-2003	Banco Sudameris	Retail
15-5-2003	Protection One Europe	Investment Banking
8-10-2003	Asset Plus Securities	Investment Banking
3-12-2003	Absolute Capital Group	Investment Banking
10-12-2003	BethmannMaffei	Private Banking

15-7-2004	MAB	Home building
10-11-2004	Servimedia	Investment Banking
14-3-2005	Bank Corluy	Private Banking
26-9-2005	Banca Antoniana Popolare Veneta	Universal
20-1-2006	IAM	Investment Banking
10-1-2007	Societá Gasdotti Italia	Gas Network
24-1-2007	Prime Commercial Bank	Universal
8-6-2007	Taitung Bank	Wholesale

Appendix 4B: Activity dispersion

Figure B1: Activity distribution of revenues over activities in 1997, 2001 and 2006.
Source: Thomson Worldscope.

1997

- Interest Income
- Commission Income
- Foreign Exchange Income
- Trading Income
- Other Operating Income

2001

- Consumer/Commercial
- Wholesale Clients
- Private & Asset Mgmnt
- Corporate Centre
- LeasePlan Corporation

2006

- Private Equity
- Netherlands
- North America
- Latin America
- Europe
- Global Clients
- Asia
- Private Clients
- Asset Management
- Group Functions
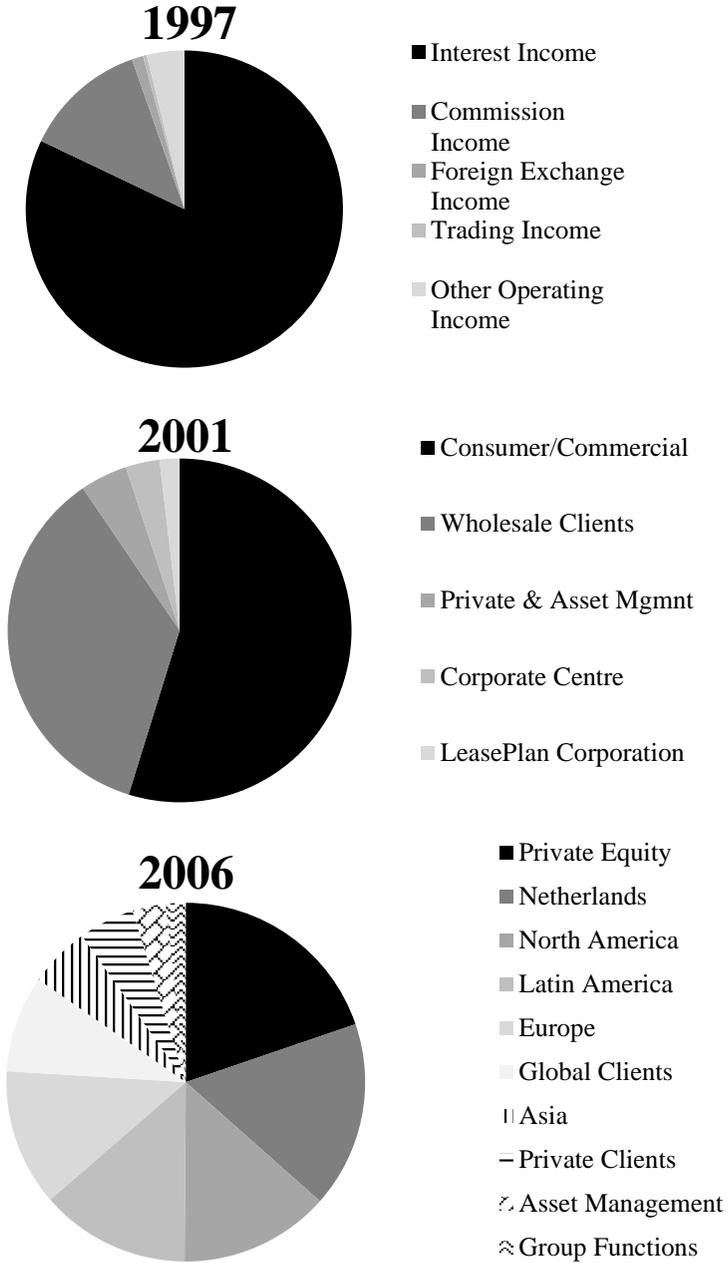
Figure B2: Herfindahl Index geographical spread for the entire peer group.[103]

---
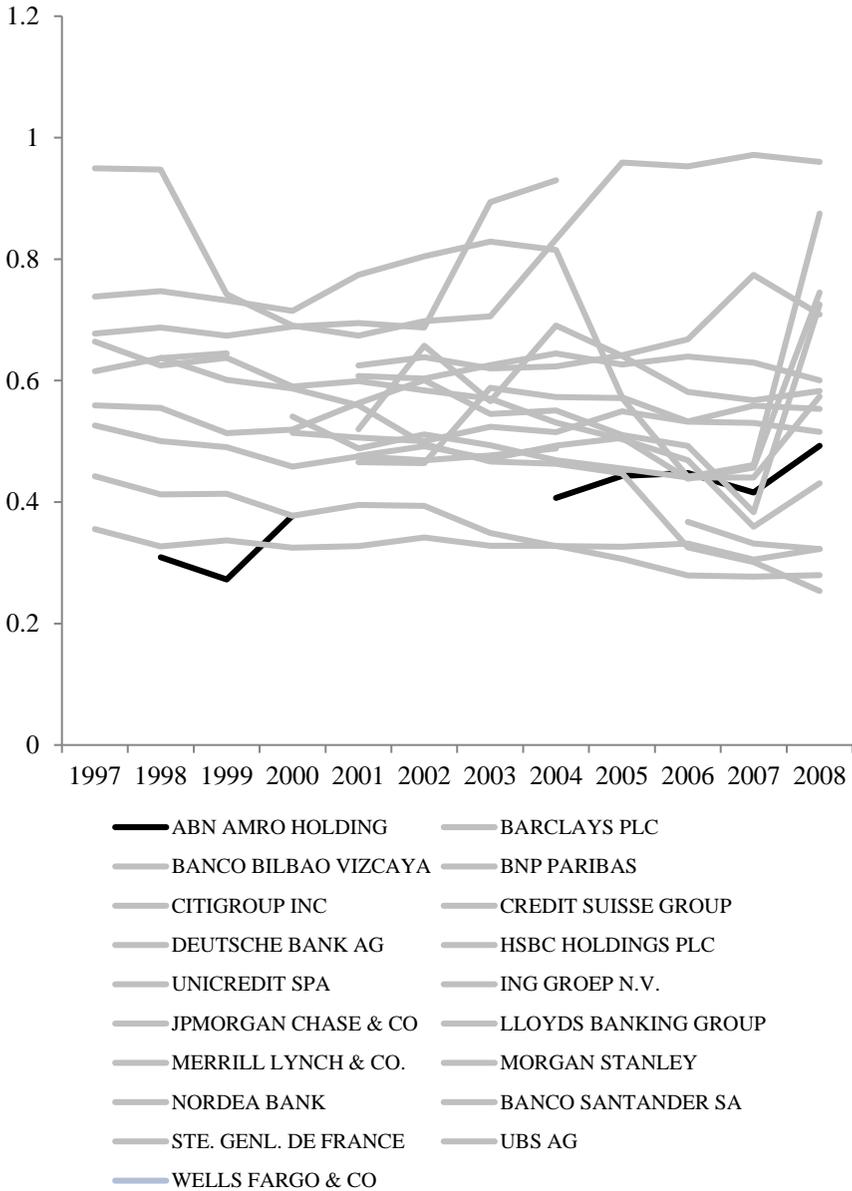
[103] Note that all series outside of ABN AMRO were given the same color as there was no possibility to differentiate so many series in a meaningful way. In these figures, the series only serve to compare ABN AMRO to other banks.

Figure B3: Herfindahl Index income spread for the entire peer group.

	ABN AMRO		BNP Paribas
	Société Générale		Deutsche Bank AG
	Banco Santander SA		Barclays Plc
	Nordea Bank AB (publ)		Wells Fargo & Company
	Bank One Corporation		FleetBoston Financial Corporation
	BBVA USA Bancshares,Inc		Morgan Stanley
	Citigroup Inc		Credit Suisse AG (Old)
	JPMorgan Chase & Co		UniCredit Bank AG
	UBS AG		HSBC Holdings Plc
	Average Peer Group		
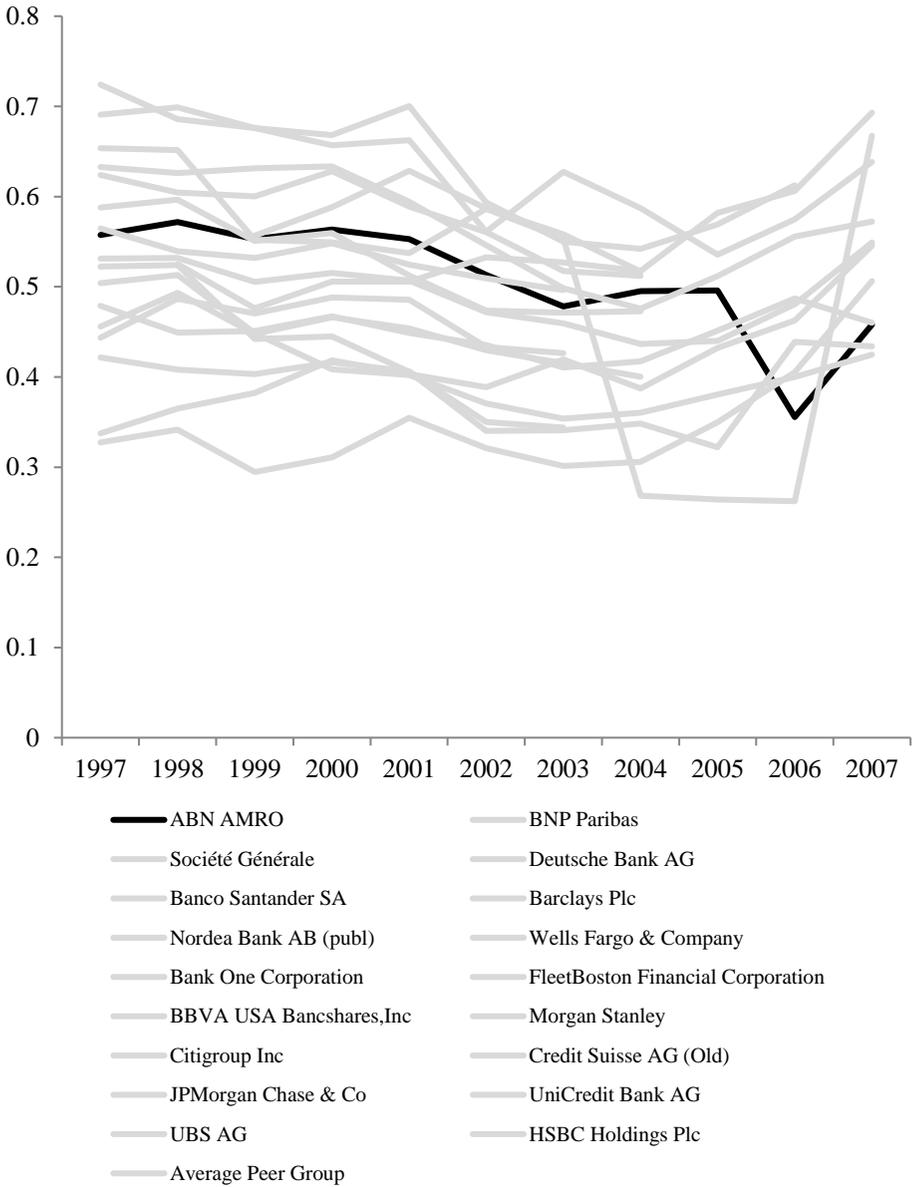
Source: Bureau Van Dijk's Bankscope

Appendix 4C: CDS Spreads

BARCLAYS BANK	BBV ARGENTARIA SA
BNP PARIBAS	CITIGROUP INC
CREDIT SUISSE GROUP	DEUTSCHE BANK AG
HSBC HOLDINGS PLC	ING BANK NV
JPMORGAN CHASE & CO	LLOYDS TSB BANK PLC
MERRILL LYNCH & CO. INC	MORGAN STANLEY GP. INC
NORDEA BANK AB SEN	SANTANDER UK PLC SEN
SOCIETE GENERALE SA SEN	UBS AG
WELLS FARGO & CO	ABN AMRO BANK NV

184
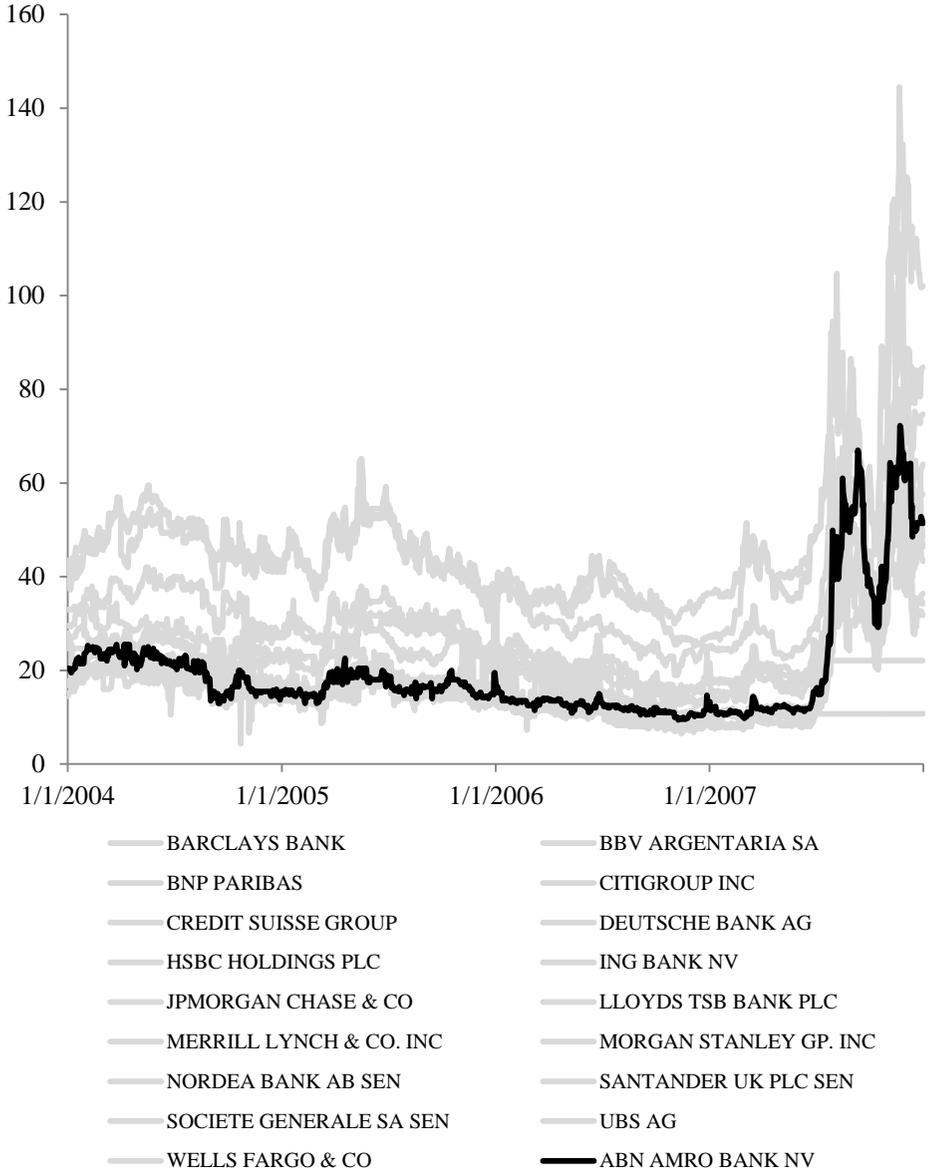
Chapter 5

State-Aided Price Coordination in the Dutch Mortgage Market

In the spring of 2009, mortgage rates in the Netherlands started to depart from the European average to become much higher than those charged in almost all other countries in Europe. Several explanations for this price increase have been suggested, including that competition was softened as a result of price leadership bans (PLBs) imposed on the main mortgage providers as part of the European Commission's State aid remedies packages. This chapter reports on empirical evidence that the highly concentrated Dutch mortgage market indeed changed from a competitive to a collusive price leadership equilibrium the moment the PLBs were anticipated. The mortgage market is empirically investigated using data on mortgages under the National Mortgage Guarantee (NHG) between 2004-2012 consisting of approximately one million observations. The interest rate set by the price leader became more important in the price setting behaviour of price following banks after the price leadership bans were put into place, leading to the conclusion that the price leadership bans facilitated tacit collusion in the Dutch mortgage market.[104]

5.1 The Dutch mortgage rate puzzle

Since the spring of 2009, Dutch mortgage rates differ structurally from those charged in the rest of Europe. Everywhere else in the Eurozone, the interest rates

---

[104] The anonymous data was generously supplied by the foundation Waarborgfonds Eigen Woning (WEW). The suggested identification on the basis of public information is our responsibility.

for mortgage loans followed the Euribor- and swap-rates steeply down, induced by stepwise reduced ECB policy rates. Yet suddenly in May 2009, mortgage rates in the Netherlands rose sharply against this downward trend to a level that remained structurally higher by a margin. Figure 1 displays the monthly average mortgage rate in the Netherlands, Germany, Belgium and France, as well as the Eurozone average, as published by the ECB. Where the Netherlands used to track the European average closely before the credit crunch, Dutch rates have risen and remained above the Eurozone average after. Since September 2008, mortgage rates in The Low Countries have been higher by 0.84 percentage points on average; a price overcharge of around twenty percent.

Figure 1: Average lending rate for house purchase in the Netherlands and surrounding countries (percentages).

— • Belgium   ▪▪▪ Germany
▪▪▪▪▪▪ France   Netherlands
▪ — ▪ — Euro area (changing composition)
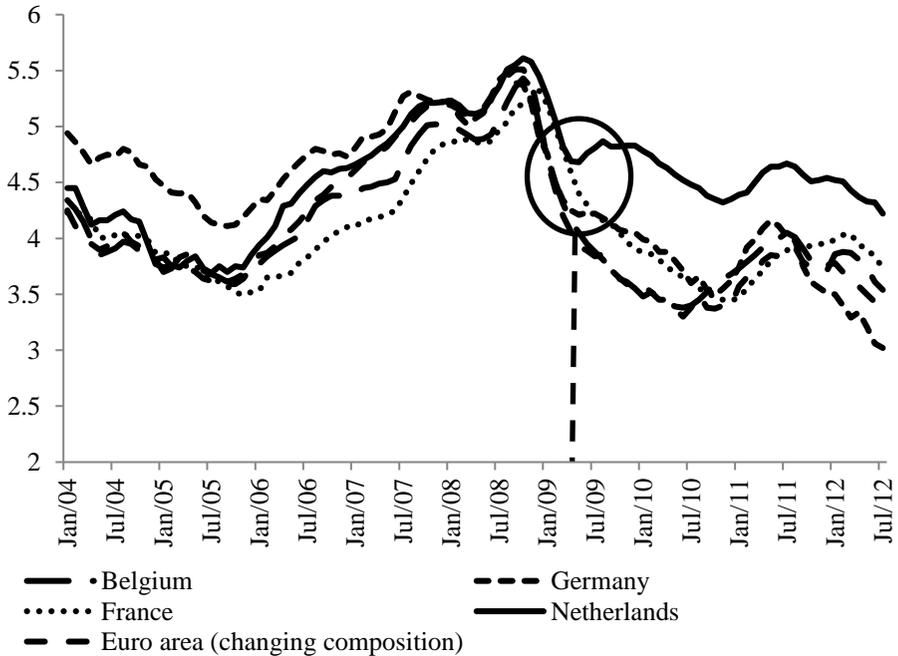
Source: ECB Statistical Data Warehouse

The remarkably high Dutch mortgage rates were noticed early on by the Dutch Consumer Organization (Consumentenbond) and the Association of

Homeowners (Vereniging Eigen Huis). They suspected collusion amongst mortgage providers and called upon the Netherlands Competition Authority (Nederlandse Mededingingsautoriteit, NMa) to investigate (Consumentenbond, 2011; VEH, 2011). In a preliminary inquiry, published in November 2010, the NMa followed suspicions and chairman Pieter Kalbfleisch announced deeper investigations (NMa, 2010). The banks denied any wrong-doing and claimed their costs for attracting funding had risen strongly since the financial crisis, forcing them to raise prices.

In May 2011, the NMa published its report (NMa, 2011). No longer did it contain the international comparison that had triggered the investigation, which the banks had argued would fall short because mortgages are differentiated across countries, for example in loan-to-value ratios, loan maturity and conditions for repayment. Instead, the NMa relied on an analysis of price-cost margin calculations it had formulated, in consultation with the banks. The authority concluded that there had been historically high margins on mortgages indeed, which the NMa attributed primarily to an increased degree of market concentration. In particular did the NMa point to the fact that several small foreign competitors, so-called challengers had left the Dutch market in the crisis. The authority said to have found no evidence of collusive conduct. Moreover, the NMa stated dismissively that the high margins had only been temporary, and would have returned back to pre-crisis levels by the end of the first quarter of 2011 – which was the end of its data.

The NMa's conclusions received mixed reviews. Whilst the banks seemed mostly satisfied in silence, home owners interest groups protested the NMa's decision not to intervene. The cartel investigation had consisted essentially only of a mean-variance test on mortgage rates since 2003 that had not raised a red flag – which, however, by no means excludes the possibility of collusion. When mortgage rates subsequently appeared to remain high, and a carefully reconstructed update of the NMa's margin calculations revealed price-cost margins had risen steeply shortly after the NMa had concluded things were back to normal, a hot public debate unfolded (Dijkstra and Schinkel, 2012a; 2012b). It came to involve the Dutch Central Bank (De Nederlandsche Bank, DNB) (Jansen et al., 2013), the Netherlands Bureau for Economic Policy Analysis (Centraal Planbureau, CPB,

2013), the Ministry of Finance (2013), and the competition authority again – now under its new name, Authority for Consumers and Markets (ACM, 2013). [105] Participants made and weighted suggestions for solutions to the Dutch mortgage rate puzzle differently. The media widely reported on them. Questions were asked in the national Dutch, as well as the European Parliament. Some policy measures were taken and others prepared. However, views on the main causes of the peculiar Dutch mortgage rate patterns still differ widely and disagreements are strong.

Whilst the puzzle of the high mortgage rates in The Low Countries remains to be solved, and new pieces are still being suggested and studied, this chapter first takes stock of the debate before providing its own analysis. Two groups of explanations can be distinguished: higher cost and softer competition. Increases in funding costs include those resulting from a gap in The Netherlands between the volume of mortgages and deposits, more expensive capital market funding, and from recapitalization in order to satisfy tighter Basel 3 regulation. Softer competition might have come about through an increase in concentration due to exit, the wide imposition of price leadership bans on Dutch banks by the European Commission, (regulatory) funding capacity restrictions, and barriers to entry. In sections 5.2 and 5.3, each of these explanations is presented and discussed briefly. In Section 5.4, it is concluded that quite likely the European Commission's price leadership bans consolidated high prices in market conditions rife for margin increases through coordination. Then from section 5.5 forward, an empirical analysis of the Dutch mortgage market is presented using a dataset of insured mortgages that spans the period 2004-2012. This analysis shows that the price leader in the Dutch mortgage market was followed more closely after the price leadership bans were imposed, suggesting that indeed the mortgage market became less competitive after the price leadership bans were imposed.

---

[105] In 2013, the Dutch Competition Authority (NMa), the Consumer Authority (Consumentenautoriteit) and Telecommunications Competition Authority (OPTA) merged to become the Dutch Consumer and Competition Authority (ACM).

5.2 Funding cost explanations

5.2.1 Deposit rate differences

A first possible explanation for the Dutch mortgage rates being high in international comparison is found in deposit rate differences between the Netherlands and its neighboring countries, in particular Germany (Boonstra and Treur, 2012; 2014). Dutch banks did indeed pay relatively high interests on deposits, possibly, as argued by the banks, in part because Dutch savings fall short to fund the outstanding national mortgage debt – which is the so-called 'funding gap' – discussed more extensively below (DNB, 2012). Yet, this has historically been the case, also far before the crisis when the Dutch mortgage rates were at the European average. Figure 2 displays the difference between the variable mortgage rate (less than one year fixed) and the rate for deposits redeemable at notice (under three months) in The Netherlands, Germany and the Eurozone average since 2000.

Figure 2: Variable mortgage rate minus the rate on deposits redeemable at notice under three months (percentage points).
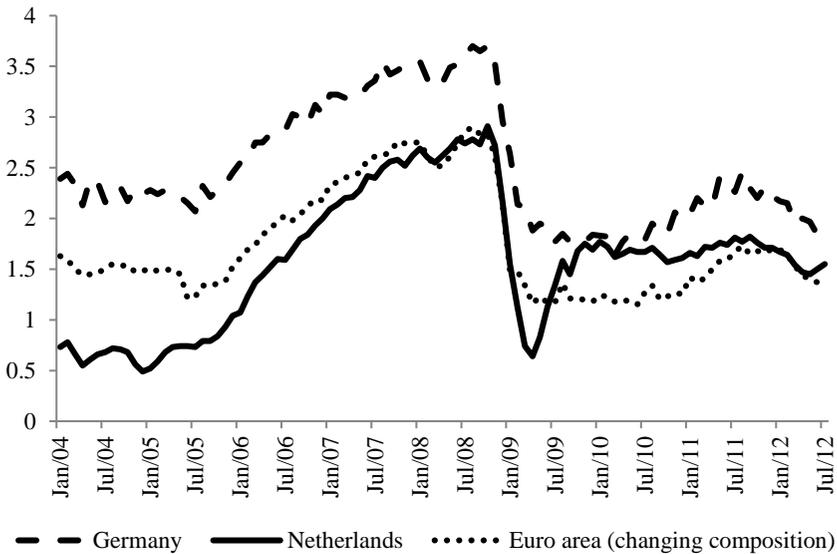
Source: ECB Statistical Data Warehouse

While this difference is bigger in Germany, the Dutch difference has always been well below the European average, yet crosses it in the spring of 2009. There clearly appears to be a structural break at about the same time the mortgages rates in the Netherlands start rising. A similar picture emerges when it is assumed that variable mortgages are funded with longer-term debt, and also when comparing mortgages with a longer fixed interest period to longer fixed deposits. There is no sudden increase in deposit rates in the spring of 2009. Higher interest on savings alone is insufficient explanation for the higher Dutch mortgage rates.

5.2.2 Funding gap risks

Other cost arguments derive from the Dutch funding gap was well. The gap results from a combination of a high national mortgage debt and relatively little free savings. The debt is in large part fiscally inflated, as mortgage interest payments have since long been tax deductible in The Netherlands, basically without limit, to stimulate home-ownership. This policy gave Dutch homeowners an incentive to finance their homes with large debt, even when equity was available. It also encouraged postponing repaying the mortgage. Instead, mortgage providers would bundle life-insured savings accounts with mortgages, which only repay the mortgage at the expiry date. As a result, many Dutch citizens have long-term mortgages for ninety to hundred percent of the execution value of the underlying property. This means that Dutch loan-to-value ratios and loan-to-income ratios are high compared to neighboring countries. At the same time are Dutch savings in large part tied up in pension funds with obligatory participation, which invested these moneys elsewhere. This situation, combined with decreasing house prices during the financial crisis, would have made that Dutch banks are perceived as relatively risky, the argument goes. Dutch mortgage providers would therefore face higher funding costs than other European banks. This argument was forwarded as

an explanation for the high Dutch mortgage rates by DNB, amongst others with the commercial banks (DNB, 2012; Rabobank, 2012).[106]

However, if Dutch banks would indeed have become that much riskier than foreign banks to lend to since the financial crisis, this should be reflected in higher credit default swap spreads (CDS-spreads). The average CDS-spread for the five biggest Dutch mortgage providers did rise, relative to the average CDS-spread of the ten biggest German mortgage providers – see figure 3. However, this difference breaks already in the autumn of 2008, quite some time before the break in mortgage rates, and is largely restored by Mid-2009. Moreover, CDS-spreads for the Dutch systemic banks, and by far the biggest mortgage providers, Rabobank, ING and ABN, for which the willingness of the Dutch State to back them is apparent, remain well below the German average. The higher Dutch average CDS-spreads are thus mainly caused by SNS (eventually also nationalized in February 2013) and AEGON, which have only a small market share in mortgages. An increase in the riskiness of Dutch banks therefore does not seem to fully explain high Dutch mortgage rates either.[107]

It is indeed difficult to believe that the Dutch housing market all of a sudden became one of the riskiest in Europe somewhere in the spring of 2009. In fact, DNB itself stated in its spring 2011 financial stability report that on average Dutch banks obtain cheaper credit than their European counterparts (DNB, 2011). The Dutch funding gap has steadily grown over the past decades; there is no shock in the spring of 2009. And it is a gap that partly exists only on paper, in the sense that many mortgage holders do save money somewhere else with the goal of partly or completely paying off their mortgage when their personal or fiscal circumstances would change – in particular when their mortgage expires, as explained above. To the extent that these funds are accessible, households have an incentive to use them if the alternative is to default, because of very low execution values and full liability for residual debt upon foreclosure. Forced sales percentages in the Netherlands

---

[106] See also Jansen et al. (2013); Boonstra and Treur (2014). Bovenberg and Polman (2013) stress the importance of the funding gap as well and in addition emphasize increases in funding costs resulting from discontinuous matching and bigger liquidity risk.

[107] CPB (2013) comes to a similar conclusion, downplaying the role of the funding gap that DNB (2012) stresses.

historically have been very low, and have largely remained so during and after the financial crisis (Boonstra and Treur, 2014).

Figure 3: CDS spread averages for the biggest banks in the Netherlands and Germany (percentages).
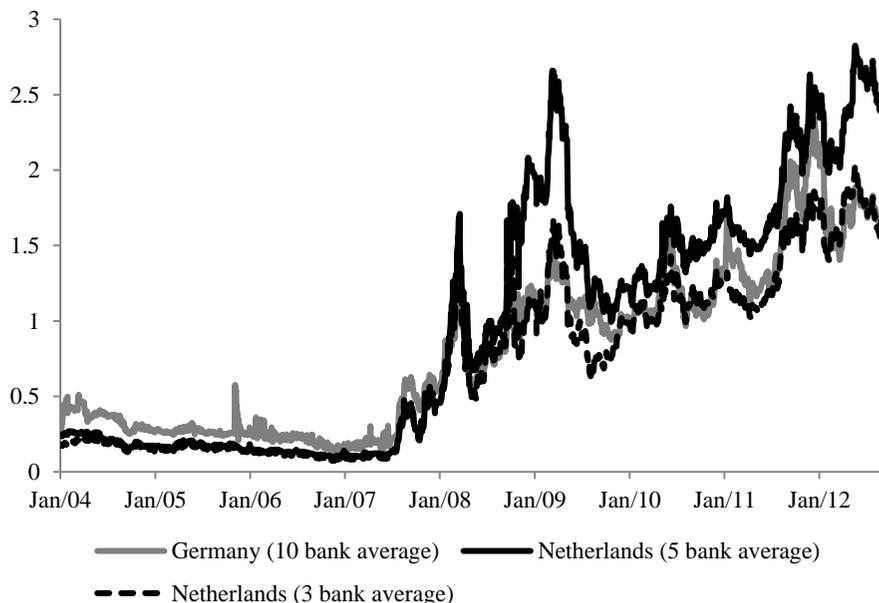
In addition, a large part of the mortgage portfolio, in particular in the higher risk category, falls under the national mortgage guarantee (NHG), which covers mortgages up to a certain amount for qualifying medium-income households.[108] When a mortgage that is covered by this State guarantee would be defaulted upon, any losses that the mortgage provider may incur in the sale of the house are covered. These mortgages therefore are almost risk-free to mortgage providers, which the CDS-spreads seem to reflect. Nevertheless, in the summer of 2013 the Dutch government developed plans to extend the NHG into a National Mortgage Institute (NHI) for securitization, which was supposed to create inexpensive funding

---

[108] The highest this amount has been was in 2009, when the NHG covered mortgages up to 350 000 euros.

opportunities for Dutch mortgage providers. In particular Dutch pension funds would so be encouraged to invest in the Dutch mortgage market. However, even if funding were the problem, given the high price-cost margins, it is quite questionable whether any reduction in funding costs would be passed-on to consumers: hardly any had in the years prior. When the additional risks to the Dutch government turned out substantial, the NHI-plans moved to the backburner politically (KPMG, 2013).[109] Recently, Dutch pension funds have started to invest in Dutch mortgages regardless, also because of the interesting margins.

5.2.3 Basel 3 recapitalization costs

A third explanation offered for the higher Dutch mortgage rates is that tightened Basel 3 regulation in the wake of the financial crisis increased funding costs for banks. Increased capital requirements force banks to increase their equity, which would be costly, the argument goes. Again, it is not obvious why such costs would appear as a break in the spring of 2009 and in the Netherlands only. After all, many Member States had to make changes to meet Basel 3. More fundamentally, it is disputed that higher capital requirements would bring along so much higher financing costs at all. The classic insight of Modigliani and Miller (1958) is that substitution of debt for equity has no effect on financing costs. Even though debt usually has a lower required rate of return than equity, an increase in debt increases the risk borne by equity holders, which in turn require a higher rate of return. While in banking, where debt is (implicitly) subsidized through tax deductibility of interest payments, deposit insurance schemes and too-big-to-fail guarantees, the Modigliani-Miller theorem does not apply perfectly, leading economists have downplayed the concern that tightened capital requirements would increase the costs of banks by much.[110]

---

[109] Financial markets observers were not too impressed by the projected funding benefits for banks either, identifying it largely as a redress of the NHG system. See also Moody's Investor Service (2013).

[110] Admati *et al.* (2013) give an overview of the applicability of the insights of Modigliani and Miller (1958) for financial institutions.

However, even if recapitalization costs are factored in, the main picture does not change. In its revision of the margin calculations in NMa (2011), ACM (2013) included estimated added costs for Dutch mortgage providers to grow into meeting Basel 3 regulation in anticipation. These costs were based on estimates for holding additional equity capital by the IMF, OECD, the Basel Committee on Banking Supervision and the International Institute of Finance (ACM, 2013). While the Dutch margins are somewhat reduced by these costs, they remain high and keep their peculiar pattern. The effects of Basel 3 regulation may have been more indirect, collectively reducing the incentives of the incumbents in the Dutch mortgage market to (re)finance mortgages, in particular those with higher loan-to-value ratios. These effects are discussed below under funding capacity restrictions.

5.2.4 Cost factors combined

The detailed price-cost margin calculations offered by the Dutch competition authority in its studies introduced above can settle the combined role of the various cost factors pointed at.[111] It provides a monthly estimate of the average total funding costs for Dutch mortgages, based on weighted values of base rates, RMBS and CDS spreads, deposit rates and Basel 3 costs. This formula allowed Dijkstra and Schinkel (2012a; 2013) to analyze the extra price-cost margin made on average for Dutch mortgages, over and above the normal average price-cost margin as it was obtained prior to the crisis, continuously.[112] The extra-margin has the great advantage of cutting short discussions on what are proper average overhead cost estimates, and what are reasonable normal profit margins. Figure 4 displays this

---

[111] NMa (2011), updated in ACM (2013). Boonstra and Treur (2014) add nuances to these price-cost margin calculations with a more comprehensive story about liquidity risks and non-continuous funding. However, reasonable alternative specifications with matched and unmatched funding do not alter the pattern of price-cost margins fundamentally, see Dijkstra and Schinkel (2013).

[112] The methodology is explained in detail in Dijkstra and Schinkel (2013). A monthly update of the NMa's margin calculations is produced for academic purposes, and also published monthly by the Association of Homeowners (VEH) as a 'mortgage rate barometer' on their website.

extra-margin development over time from May 2009 for four mortgage seniorities separately, and their weighted average.

The extra-margin on mortgages increases sharply from around zero (by construction) to close to a full percentage point in the spring of 2009. It subsequently was 0.41 percentage points between May 2009 and July 2014 on average, compared to the period between January 2004 and September 2008, peaking at well over a full percentage point at the end of 2012.[113] More remarkably even, the pattern reveals that while the extra-margin went down sharply in the fall of 2010, when the NMa started investigating for suspicion of collusion, it rose steeply again when the NMa concluded in its May 2011 report that there was no longer reason for concern. While admittedly – albeit with the notable exception of the variable mortgage rate – margins had come down (also on average) by the end of the NMa's initial study, the authority's conclusion that the market had returned to normal margins turned out to have been premature. All in all, funding costs on top of the base rates have increased considerably since the crisis, but by far not enough to justify the high level of mortgage rates against the steeply decreased base rates. On average, based on these calculations, mortgage loans were overcharged by more than 10% since May 2009, and almost 20% since the publication of NMa (2011). Clearly, all cost developments combined do not tell the full story.[114]

---

[113] Boonstra and Treur (2014) argue that the Dutch mortgage market is highly contestable, and in the period before the financial crisis, was characterized by high entry and high exit. In fact, according to Boonstra and Treur (2014) competition was abnormally high before the financial crisis, leading to low and even negative margins. Note to explain away the high extra-margins found in Dijkstra and Schinkel (2012a; 2013), mortgages would need to have been sold below cost on average between 2004 and the summer of 2008. This seems hard to believe – or would possibly signal other issues with competition if it were true.

[114] In addition, several banks reported record profits at the time, in particular also on mortgages. See, for example, Financieele Dagblad (2010).

Figure 4. Extra-margins for mortgages since May 2009 of different durations (percentage points).

Legend:
— Weighted average   — Variable
– – 1-5 years   ...... 5-10 years
— · More than 10 years
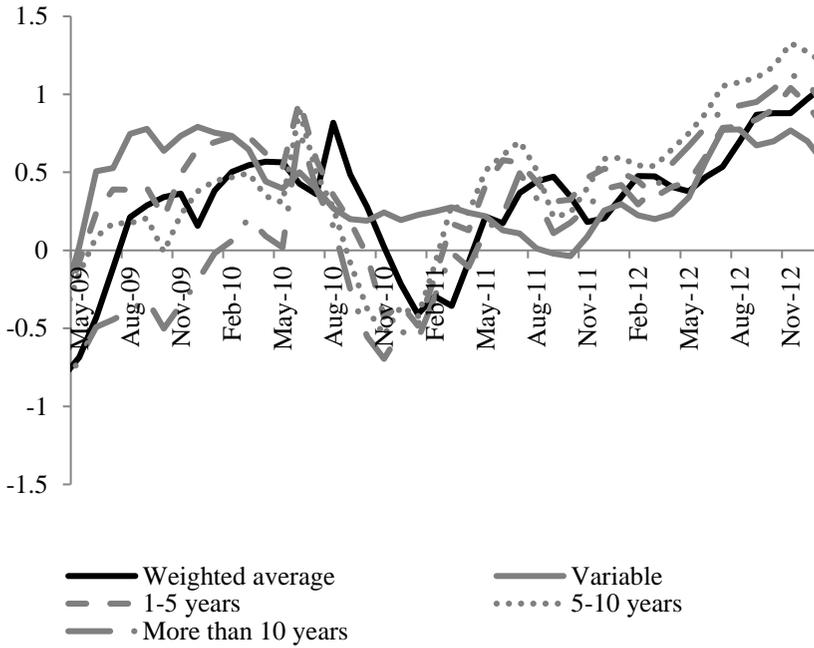
Source: Dijkstra and Schinkel (2013)

5.3 Softer competition explanations

5.3.1 Concentration

Historically, the Dutch mortgage market has been highly concentrated. Three major banks, Rabobank, ING and ABN AMRO, including subsidiaries, serve around a stable 70 percent of the market, followed by SNS and AEGON who each hold a market share of five to ten percent (NMa, 2011). The C4 and the Hirschmann-Herfindahl index (HHI) in the Dutch mortgage market have increased steadily since 2006, albeit with quite some variation. These measures peaked above 80 and 2000 respectively in 2010, reflecting that a number of smaller foreign mortgage providers, which had contested the established players for a share of the Dutch

market, had left.[115] NMa (2011) finds in these foreign challengers leaving its explanation for the high Dutch mortgage rates, as explained in detail in Overvest and Tezel (2014).[116]

While such a low number of large competitors will indeed likely have been conducive to high rates and margins, concentration alone cannot fully explain the increase in margins either. In general, the relationship between concentration and competition in banking is ambiguous (Spierdijk, 2012). To the extent it is negative, the HHI follows a steady upward trend, rather than a sudden jump in the spring of 2009 – in fact, if anything its value decreases substantially in the first half of 2009. Also, the NMa's theory presumes a strong fringe competition effect, whereas whether or not the Dutch mortgage market is contestable remains questionable. While smaller competitors did enter, and quite possibly at lower costs, as Boonstra and Treur (2014) argue, they remained very small relative to the established Dutch household names in mortgages. In addition, while the ACM (2013) finds a positive correlation between the HHI and the margins in the period after the crisis, no such correlation is found before the crisis, where allegedly the foreign challengers had put significant competitive pressure on margins. This finding points rather to a difference in the nature of competition in the Dutch mortgage market, before and after the financial crisis.

5.3.2 Price leadership bans

Competition in the Dutch mortgage market became importantly constrained by regulation from the European Commission, in the following way. At the height of the crisis, in the autumn of 2008, three of the four largest mortgage providers in the

---

[115] Figure 3.2 in NMa (2011). The departing challengers included GMAC, Sparck, ELQ, and DSB Bank.

[116] The authors present a graph in which the margin and the market share of challengers cross end of 2008. While indeed the increase in margins appears to follow on a halving of those challenger's combined markets share, from roughly 16% to 8%, this is really only in the fringe of the market. Moreover, the sudden increase in margins comes later, in spring 2009, when these challengers were long gone – and the margin was actually decreasing in the months before.

Netherlands, ING, ABN AMRO and AEGON, needed State aid to remain operational. Only the largest Dutch bank, Rabobank, had not needed aid. According to article 108 TFEU, State aid is forbidden. The European Commission had allowed the aids temporarily as emergency measures in the midst of the crisis. In 2009, the Commission began formulating comprehensive conditions under which the banks could benefit from the aid, including far-reaching restructuring measures. One of the conditions entertained were so-called price leadership bans, which aimed to prevent that a bank that had received State aid would misuse that aid to undercut healthy banks predatorily. The bans stipulated that the bank in question could not offer more favorable rates than its nearest competitors on standardized products. In the Netherlands, a price leadership ban was imposed on ING, ABN AMRO and AEGON. In the mortgage market, these providers were no longer allowed to offer a lower rate than those of their three best-priced direct competitors (European Commission, 2008). In the highly concentrated Dutch mortgage market, the bans effectively appointed Rabobank as must-follow price leader. If Rabobank raised its mortgage rate, its three closest competitors would have to follow, or they would be in violation of their State aid conditions. And so Rabobank's best-response would have been to increase its, and hence market rates; no further coordination required.

While this argument is straightforward once the price leadership bans are in place, there is an interesting question of timing. After all, the Dutch mortgage rates pattern breaks already in May 2009, while the bans were legally imposed only in late 2009 and early 2010. NMa (2011) and ACM (2013) for this reason dismiss the bans as an explanation out of hand (Overvest and Tezel, 2014). It is important to note, however, that the banks could have foreseen the imposition of price leadership bans well in advance of the publication of the European Commission's formal State aid decisions. The Commission had announced already in its first Communication in 2008, as well as in the preliminary approvals, that it considered requiring such behavioral constraints. Furthermore, there had been months of negotiations going on between the Kingdom of the Netherlands for the banks and the Commission. We know from various sources that Rabobank had specifically asked European Commissioner Kroes during this time to impose the bans on its

rivals (Tweede Kamer, 2012). At least for the first time on 24 April 2009, during talks with ING in Brussels, the Commissioner made it perfectly clear that in its opinion ING should be willing to accept a price leadership ban or the Commission could not approve of the remedy package.[117] Shortly after also, on May 7, the Commission sets a precedent by imposing a price leadership ban on Commerzbank in Germany.[118] This is the month in which, against the European trend, Dutch mortgage rates start to rise sharply, quite possibly in anticipation.

Investigative journalism unearthed in the summer of 2012 that the NMa, Pieter Kalbfleisch personally, had warned the Commission and Commissioner Kroes in October 2009 that with the price leadership bans for ING, and possibly also ABN AMRO, the Dutch market would be "locked" (ZEMBLA, 2012). The NMa did so when it learned about the ban from a press release by ING that month, stating that ING had reached an agreement with the Commission. The Commissioner said, however, that it was too late to modify the bans.[119] Interestingly, NMa (2011) does not refer to its own earlier warning – by then Kalbfleisch had left the NMa. Also, the report discarded findings of the NMa's own European Bureau, published simultaneously on the authority's website as NMa research report Mulder and Lengton (2011a; 2011b), that price leadership of banks that had received State aid had a significant negative effect on mortgage rates, suggesting that price leadership bans therefore would help increase prices. In an extension to this study, Mulder (2014) refines the results. While both market concentration and price leadership bans are found to be significant in the original specification, they become insignificant when costs are estimated individually for each bank, from which Mulder (2014) concludes the effects of the bans are doubtful, while the NMa's concentration-explanation continues to be supported.

---

[117] See Schinkel (2012) who extensively cites from the judgment of the General Court of the European Union of 2 March 2012 in Kingdom of The Netherlands and ING versus the European Commission.

[118] See Genner, Lienemeyer and Walker (2009). It is important to note that while price leadership bans were imposed by the European Commission on other State aided banks in other Member States as well, sufficiently many unconstraint banks remained for competition. Only in the Netherlands were three of the four largest competitors banned from competing with one another.

[119] Four years later, in its revision of the ING decision upon the judgment of the General Court of 2 March 2012, the price leadership bans on ING were lifted for The Netherlands.

Some caution should be exercised in interpreting the results, however, as they may also point to possible econometric issues.[120]

5.3.3 Funding capacity restrictions

In September 2012, ZEMBLA, an influential Dutch investigative journalism television program, paid attention to the remarkably high Dutch mortgage rates, focusing in particular also on the potential role of the European Commission's price leadership bans and the dip in margins during the NMa study. Various actors were interviewed, including the NMa, Rabobank and Commissioner Kroes. The program caused a public debate. As a result of the media attention, the NMa reopened its investigations into the mortgage sector. In April 2013, the competition authority published an update of its sector study, in which it concluded that margins had indeed risen again since May 2011.

ACM (2013) also forwarded a new explanation for why competition in Dutch mortgages may have been softened: funding capacity restrictions. Supported by a review of the literature on Bertrand oligopoly theory with binding capacity constraints, the ACM report explains how when competing firms have insufficient capacity to serve the entire market, prices rise above costs in competitive equilibrium. In the Dutch mortgage market, applicable capacity restrictions could have resulted from banks simply not being able to obtain enough credit to fund the demand for mortgage financing. While interesting, this explanation has not yet convinced. The ACM pointed at reduced dividend payments and balance sheet

---

[120] To estimate bank-specific costs, Mulder (2014) uses a translog cost function, as is standard in the banking literature. However, Mulder only has annual data available for the explanatory variables, while the mortgage rates are monthly observations. This mismatch is solved by interpolation, which has as a consequence that eleven out of every twelve data points are constructed. Furthermore, the results show correlation coefficients higher than 90 percent in combination with an autoregressive term that is close to one, which may point to a unit root in the data series. Mulder also chooses to use the NMa total average funding cost data series to approximate costs, rather than to estimate the effect of the underlying cost factors as individual regressors. This approach has the advantage of returning a coefficient on the cost variable that is more easily interpretable, but the disadvantage that the model is more restricted.

reductions, yet offered no hard empirical evidence of binding funding capacity constraints. And banks have not indicated that funding would be hard to obtain across the board. While the availability of capital free for mortgage financing would be a piece of the puzzle if indeed in short supply, it is not obvious that it is.

In a more sophisticated way, funding constraints may have resulted also from tightened financial markets regulation, which amongst other things required or encouraged banks to restructure their mortgage-portfolio to reduce their exposure to risks by lowering their loan-to-deposit ratios. In effect, such regulation has given many banks incentives to be picky in financing new mortgages, as well as restrictive in re-financing existing ones, in particular towards mortgages with high loan-to-value ratios. Certainly did the DNB mostly follow, rather than push back at, IMF and other international observers in their assessments that the Dutch funding gap was a real debt overhang – whereas arguably the real gap was to a considerably lesser extent, as discussed above.

5.3.4 Barriers to entry

Given the high margins that are apparent in the Dutch mortgage market, one would expect new entry into the market. In the period leading up to the financial crisis, entry into the Dutch mortgage market was quite high, with seven new players entering the market (Boonstra and Treur, 2014). Yet, after many of these new players retreated from the Dutch market to their home countries in the wake of the crisis, entry into the market has been sparse, leaving the Dutch mortgage market again to its incumbents. There are several possible barriers to entry into the Dutch mortgage market, including an information and brand-loyalty advantage for incumbents, typical Dutch loan-to-value-ratio's above one hundred percent, which foreign banks are not used to, or cannot finance, and a home-provider bias in the extensive Dutch system of intermediaries. In addition, the foreign challengers that had entered the Dutch market before the crisis had met there with aggressive pricing strategies by the incumbents – possibly below cost, as argued in Boonstra and Treur (2014). If potential entrants would expect such limit prices again, this could be a deterrent to their entry.

The ACM investigated barriers to entry in the Dutch retail banking sector (ACM, 2014). A central finding, from interviews with foreign parties conducted by KPMG (2014), was that potential entrants note that the mortgage market is risky, because of high loan to value ratios, regulatory uncertainty and DNB having become more strict in its application of market access requirements since the financial crisis. DNB may well have become so after the bankruptcies of Icesave in 2008 and DSB in 2009. After these incidents, DNB and its president Nout Wellink became the subject of criticism as well as Parliamentary debates, on the question whether licenses to operate on the Dutch retail banking market had maybe been given too lightly in the past. It is understandable if DNB has become more careful in granting licenses in light of this, and the possible adverse effects of bankruptcies for financial stability. Indeed is this argument put forward by the Ministry of Finance (2014) in a reaction to ACM (2014). The Ministry states that competition is not the only goal of DNB, and the strict stance of DNB may have positively affected financial stability and protected consumers.

5.4 Intermediate conclusion

This chapter so far has taken stock of the debate on the Dutch mortgage rate puzzle. Importantly, the arguments that have been forwarded in the debate on the Dutch mortgage rate puzzle are not mutually exclusive, and complements rather than substitutes. While increased funding costs and liquidity risks, heightened market concentration, tighter financial regulation and the existence of (regulatory) barriers to entry all will have helped create market conditions rife for price increases through coordination, none of them developed instantaneously, in particular not with a sudden change in the spring of 2009. However, the European Commission's price leadership bans on the three largest competitors of the main Dutch mortgage provider, Rabobank, did. It became clear to the banks involved in talks with the Commission at least in April and May 2009 that the Commission would insist these bans were proposed by the Kingdom of The Netherlands. While fully satisfactory answers remain to be given to questions on how and why exactly they would have

worked by anticipation in the spring of 2009, these price leadership bans appear to have acted in the concentrated Dutch mortgage market as nucleus for the crystallization of high mortgage rates in The Low Countries. In the part that follows, an empirical investigation into the impact of the price leadership bans is performed.

5.5 Empirics: Error correction model

This section empirically estimates how the price leadership bans have impacted competition in the Dutch mortgage market. Specifically, we ask if it can empirically be observed if the price leader, which is identified as Rabobank, is followed more closely after the price leadership bans are put into place. Theoretically, a shift is expected from barometric price leadership to collusive price leadership (Rotemberg and Saloner, 1990). Under barometric price leadership, a price leader still exists that has better information than the price followers, but prices are set competitively, while under collusive price leadership prices are set in a collusive manner. In order to investigate this, a dataset is used of mortgages that are insured under the National Mortgage Guarantee (Nationale Hypotheek Garantie, NHG) between 2004-2012 of approximately one million observations in total. Using an error correction model, it is found that the price leader is followed more closely after the price leadership bans, with coefficients that are close to their theoretical expectations.

The use of error correction models to estimate responses to interest rates of mortgage rates is well established in the literature. For the Dutch market, studies include De Haan and Sterken (2006, 2011), Toolsema and Jacobs (2007) and Francke, Van der Minne and Verbruggen (2014). Valadkhani (2013), Lou and Yin (2014) and Valadkhani and Worthington (2014) test error correction models for the Australian mortgage market, Allen and McVanel (2009) for the Canadian mortgage market and Cecchin (2011) for the Swiss mortgage market.

Outside of the literature on mortgages, error correction models are commonly used in the literature on gasoline pricing, of which Eckert (2013)

provides a survey. The literature on gasoline pricing may be of particular interest to this study as the gasoline market shares several attributes with the mortgage market. Both markets have an oligopolistic structure with products that are slightly differentiated. Data is generally available at a high frequency and approximations of the costs of crude inputs (crude oil price versus the interest rate on savings) are generally available.

In these error correction models, studies on the mortgage rate (and gasoline price) generally single out a single cost factor and establish whether cost increases and decreases are responded to differently. If this is the case and cost increases are immediately translated into a higher price, but cost decreases take a longer time to adjust to, reduced competition may be implied. In the estimation that follows, more than one cost factor is considered, so that we cannot directly approximate a single cost factor. As such we are less interested in how cost increases and decreases are responded to, but rather are interested in the reaction to the price leader. To estimate the presence of a price leader, the literature tends to use Granger causality.[121] Conceptually, to test Granger causality between two variables, it is tested if the lagged values of variable A help to explain the variance in variable B better than the lagged values of B alone explain the variance in B itself. When lagged values of variable A help explain the variance in B over its own lagged values, A is said to Granger cause variable B. De Haan and Sterken (2006) for example follow this approach to determine a price leader in the Dutch mortgage market.[122] We follow the literature in estimating Granger causality to establish a price leader from the data.

Previous studies on the Dutch mortgage market find varying degrees of collusion. For example, De Haan and Sterken (2006) find a clear price leader in the Dutch mortgage market using daily data for 1997-2003, but find that the price

---

[121] Eckert (2013) notes that studies on gasoline markets increasingly fit Edgeworth cycles to the data. Lewis (2012) is an example of a study that employs Edgeworth cycles to test for price leadership. This method has not as of yet found its way into the literature on mortgages by our knowledge, so that we abstain from the use of this method.

[122] Seaton and Waterson (2013) note that price leadership lacks precision as a concept and introduce a new measure. However, their measure relies on prices to remain steady for a given period of time, which our dataset does not display.

leader sets its prices competitively. Toolsema and Jacobs (2007) use monthly data from 1997 to 2000 to find that mortgage rates respond faster to cost increases than to cost decreases, which may imply some degree of market power or tacit collusion. Mulder and Lengton (2011) and Mulder (2014) use monthly data between 2000 and 2010 to find a positive relation between concentration and interest rates in the Dutch mortgage market and find that interest rates are lower when mortgage providers are not constrained by a price leadership ban. Dijkstra and Schinkel (2013) estimate margins based off a cost method set by the Dutch Competition Authority (Overvest and Tezel, 2014) and find that margins did increase after the price leadership bans were set in place, although Francke, Van der Minne and Verbruggen (2014) consider a similar time period (up to 2012) and find that mortgage rates respond to credit conditions which may explain the relatively high mortgage rate in the Netherlands. It should be noted however that Francke, Van der Minne and Verbruggen (2014) do not explicitly test for the effects of competition and concentration in the market.

5.6 Data

Data on mortgage rates was provided by the Homeowners Guarantee Fund (Waarborgfonds Eigen Woning; WEW). This institution provides the National Mortgage Guarantee (Nationale Hypotheekgarantie; NHG). The NHG provides an insurance against residual mortgage debt. If a homeowner that has a NHG guarantee is unable to fulfill his mortgage debt and the house is foreclosed, the NHG settles any remaining debt with the mortgage provider. From the provider's perspective, this means that the addition of an NHG guarantee to a mortgage eliminates default risk and thus requires a lower interest rate. The insurance ensures that NHG mortgages have a similar risk profile from the mortgage provider's perspective and as such can be treated as homogeneous products across providers. The data was supplied anonymously, so that it is not possible with exact certainty to state which bank is which. However, the Homeowners Guarantee Fund does provide an annual report in which it shows the largest suppliers of guaranteed mortgages over each year. For every year in the sample, the largest supplier is the

Rabobank, which corresponds to bank A, which is the largest mortgage provider for each year in our sample.[123] The number of mortgages in the annual reports differed sufficiently little between bank A and Rabobank that we are confident bank A is in fact Rabobank. As a second indication, we find that bank A is the market leader in almost every category of mortgage durations, except for mortgages with a variable duration, of which it sells almost no mortgages.[124] From interviews with bankers, we confirm that Rabobank tends not to supply NHG mortgages with a variable mortgage rate, strengthening our conviction that bank A is in fact Rabobank.

As for the price followers, identification is less crucial, because each of the largest mortgage providers outside of the Rabobank was either operating under a price leadership ban or could expect to operate under a price leadership ban because they received state aid. From combining annual report data with our sample we find that bank B is ING, but also find that bank B aggressively starts supplying variable mortgages from 2009 on, while backing out of the maturities that had been most popular before, especially mortgages with a 10 year maturity. This makes comparison of interest rates before and after 2009 difficult, and may itself be seen as an indication that the price leadership bans affected competitive behavior: Because bank A supplies no variable maturities, bank B might have had some freedom in interest setting in this category of mortgages.

Bank C is identified as AEGON, which operated under a price leadership ban from November 2010 officially, although it had received State Aid in 2009 already, so that it could have anticipated a price leadership ban similar to ING. Bank D and E are likely both ABN AMRO, because it is clear from the annual reports that ABN AMRO and ABN AMRO Hypotheken are listed as independent entities in the dataset. For the smaller banks it becomes difficult to pinpoint the exact identities, although SNS (nationalized bank), Obvion (subsidiary of Rabobank), BNP Paribas and Argenta (French and Belgian mortgage providers,

---

[123] A figure comparing data from the annual reports to our sample is provided in Appendix 5A.

[124] Less than 100 mortgages out of 178 000 mortgages supplied by Bank A had a variable mortgage rate.

both retreated from the Dutch market during the financial crisis) all had a considerable presence in the market.

The dataset covers all mortgages with a NHG guarantee that were signed between January 1st 2004 and December 12th 2012. It provides effective rates as included in the mortgage contract – almost one million observations total. Each observation contains information on the contract date, the (anonymized) mortgage provider, the loan duration, the loan amount, loan type and the effective annual interest rate. To ensure that the data are as homogeneous as possible, we start by focusing on 10-year mortgages, which are the most numerous types of maturity in the sample.[125]

Data on cost factors are also collected. Daily cost factors are CDS spreads on 10 year senior debt for the biggest five Dutch mortgage providers (Rabobank, ING, ABN AMRO, AEGON and SNS) and Dutch RMBS spreads on securities with a maturity between 8 and 12 years. These data were obtained from Thomson Datastream and Markit respectively. Monthly cost factors were obtained from DNB and these include the 6-month Euribor rate, the 10-year interbank swap rate, the deposit rate, the average amount of tier 1 capital over risk-weighted assets of Dutch banks and the Herfindahl Index. Descriptive statistics of the variables are included in Table 2. Note that the cost factors in the model are highly correlated (Appendix 5B), which may give rise to concerns of multicollinearity. However, we are mostly concerned with the interpretation of the coefficient on the interest rate set by the price leader, so that multicollinearity between cost factors is not an issue in this regard. This interest rate of the price leader is correlated around 0.6 with the RMBS spread, which may point towards some amount of multicollinearity. To avoid misinterpreting the coefficients, the relationship is also estimated without this cost factor, leading to similar results.

Figure 5 shows a graph of interest rates of banks A, B and C and compares it to the deposit rate. Note that the deposit rate is graphed on the right-hand axis which has a different scale, so that the interest rates on mortgages are not equal to the deposit rate. However, it can be seen from the graph that the relationship

---

[125] Approximately 40% of all mortgages in the sample had a maturity of 10 years.

between deposit rates and interest rates becomes different somewhere in the beginning of 2009. The graph also provides some insight into the dispersion of the interest rates over providers. At a glance, the mortgage rates seem to move closer together after 2009, which is confirmed when daily standard deviations over providers are calculated.[126] This is in accordance with the theory, from which we would expect less dispersion after the price leadership bans are put into place.

Figure 5: Mortgage rates (10 year NHG) for Bank A, B and C (left hand axis) and the   deposit   rate   (right   hand   axis)
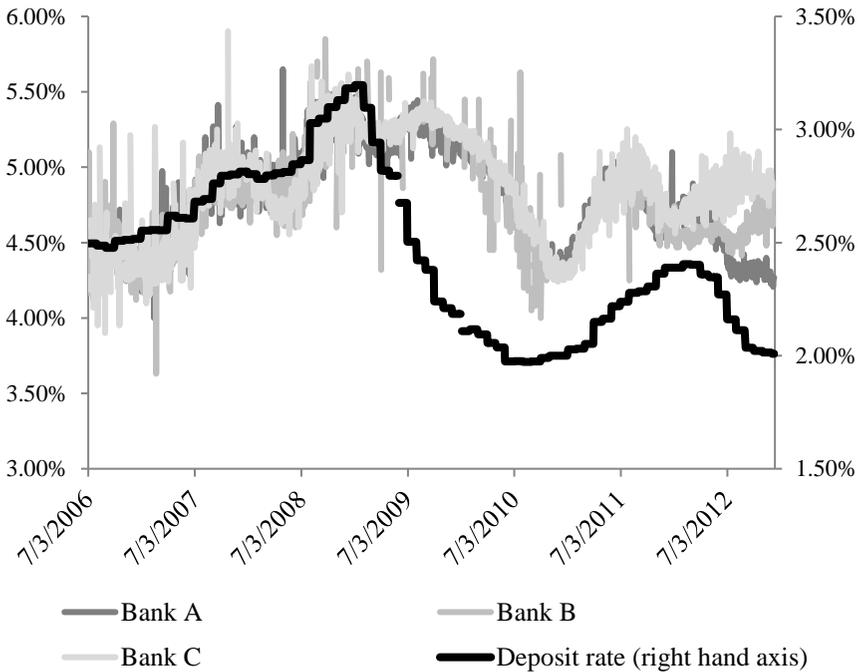
Source: NHG and DNB

---

[126] For 10 year mortgages, daily standard deviation over the six largest providers went down from 0.171% to 0.160%. For the average of all mortgages with the exception of variable mortgages, daily standard deviation went down from 0.258% to 0.236%.

5.7 Method

Although we expect bank A, which we identify as the Rabobank, to be the price leader based off the volume of mortgages, we would like to confirm this suspicion by checking if the data tells a similar story. In order to test for price leadership, we estimate which bank is most likely to Granger cause the interest rate of the other banks. Conceptually, Granger causality tests if lagged values of variable A help to explain the variance in variable B above the inclusion of lagged values of B alone. In this case, we estimate two types of VAR models to infer Granger causality, a six-way VAR between the average daily interest rates of the biggest six banks in which each bank is assumed to set its interest rate simultaneously, and pairwise VAR models. The results can be found in Appendix 5C and both methods show that indeed bank A is the most likely price leader as its interest rate is most likely to Granger cause the interest rates of the other banks without being Granger caused by the interest rates of other banks. Since bank A has been established as the price leader, the interest setting behavior between bank A and the price following banks can be formalized. Specifically, we are interested in the effect of the interest rate of bank A on the interest rates of the price following banks. Theoretically, we expect the interest rate of bank A to have a moderate effect before the price leadership bans, and a large effect after the price leadership bans are in effect. However, costs need to be accounted for, because the exclusion of cost factors may lead to an overestimate of the coefficient on the interest rate set by the price leader (a detailed explanation is provided in Appendix 5D). The series display unit roots,[127] so that we start by testing for pairwise cointegration between bank A and the interest rates set by the price following banks. Using daily averages of interest rates set by the biggest six mortgage providers we find that the series display cointegration.[128] We estimate the following cointegrating relationship for each of the price following banks:

---

[127] Note that a unit root is found for all interest rates in levels, but not in first differences. Appendix 5E shows Dickey Fuller test results.

[128] Johansen test statistics can be found in Appendix 5E.

$$r_{i,t} = \beta_0 + \beta_{i,1} r_{A,t-T} + \beta_{i,2} PLB_t + \beta_{i,3} r_{A,t-T} PLB_t + XControls_t$$
$$+ XControls_t PLB_t + \eta_{i,t}$$

Where $r_{i,t}$ is the interest rate set by price-following bank i at day t, and $r_{A,t-T}$ is the interest rate set by the price leader at day t-T, so that T represents the number of days that it takes the price-following bank to respond. This number was estimated from pairwise VAR models. In order to determine how long it takes the price following banks to respond to the price set by bank A, we check which of the lags in the pairwise VAR models is most significant. This leads to the following response times: Bank B,C, and F respond after 1 day, bank D after 3 days and bank E after 5 days.

PLB_t is a dummy that equals one when the price leadership bans are in place. This dummy was determined endogenously by performing a Quandt-Andrews test for the most likely breaks in the data, which were found to be most likely in the first half of 2009 for each of the price following banks.[129]

The coefficient of interest is $\beta_{i,3}$, as it measures the difference in response of the price follower to the interest set by the price leader before and after the price leadership bans. As such, we expect this coefficient to be positive and significantly different from zero. Specifically, from the theoretical model, we expect $\beta_{i,1}$ to be smaller than 1/2, while we expect $\beta_{i,1} + \beta_{i,3}$ to be close to 1.[130]

$Controls_t$ is a matrix of cost control variables. Note that we do not have specific cost factors for each of the mortgage providers in the dataset. However because we estimate the relationship for each mortgage provider individually, coefficients on the different cost factors may differ between mortgage providers. We follow the cost factors identified by the ACM (2013). These cost factors include CDS spreads for the biggest five mortgage providers in the Netherlands, Dutch RMBS spreads, the six-month Euribor rate, the Dutch deposit rate and the 10 year interbank swap rate. These cost factors are in accordance with the ACM (2013) report, a report that banks generally agreed upon and as such is seen as a

---

[129] The exact procedure is described in more detail in Appendix 5F.
[130] Appendix 5D provides a detailed explanation.

reasonable approximation for the cost factors that are of importance in the mortgage market. CDS spreads are a measure of bank risk and as such proxy for the costs of obtaining funding in the money and capital markets. RMBS spreads proxy for the costs of securitizing mortgages and housing market risk. The Euribor rate and interbank swap rate both provide proxies for a base interest rate, while the deposit rate is a measure for the costs of deposit funding. To control for possible costs of regulatory compliance from Basel 3's capital requirements, the amount of Tier 1 equity capital to risk-weighted assets was included and the Herfindahl Index was included to control for concentration. Table 1 provides an overview of the variables that are used. All cost factors are interacted with the price leadership dummy, because prices may respond differently to costs in the collusive and the competitive situation. Specifically, we expect that cost factors have a smaller effect on the interest rate of the price-following banks in the collusive situation. Although in Dijkstra and Schinkel (2013) we obtain a single estimate for the total costs of providing a mortgage, based off ACM (2013), here we remain agnostic about the exact cost structure. This has the advantage of giving the model more freedom in selecting parameters, but the disadvantage of having less readily interpretable coefficients on the cost factors.

So far, the Granger causality tests and unit root tests above were estimated using daily average interest rates from the data set. Although daily averages are needed to complete these tests, a large amount of variation is lost by taking daily averages. For example, if a bank closes 20 mortgages in a day on average, 19 of those data points are lost when daily averages are used. In order to use the full dataset, the model is estimated on both a daily average basis as well as on a mortgage basis.

Table 1: Variable descriptions

Variable	Description	Frequency	Source
$r_{i,t}$	Interest rate on 10 year mortgages set by following banks (B to F)	Daily	NHG
$r_{A,t-T}$	Interest rate on 10 year mortgages set by bank A	Daily	NHG
$rmbs_t$	Spread on Dutch RMBS (AAA, 8-12 years)	Daily	Markit
$r_{euribor,t}$	Six-month Euribor rate	Daily	DNB
$cds_{j,t}$,	CDS spread on 10 year senior debt for the biggest five mortgage providers (Rabobank, ABN AMRO, ING, AEGON and SNS)	Daily	Thomson
$r_{deposit,t}$	Interest rate on demand deposits (duration less than 3 months)	Monthly	DNB
$r_{base,t}$	Interbank swap rate (10 year)	Monthly	DNB
$tier1_t$	Tier 1 capital / Risk Weighted Assets for the Netherlands	Quarterly	DNB
HHI_t	Herfindahl Index of mortgages per month	Monthly	NHG

From the cointegrating equation, the error term, $\eta_{i,t}$, is obtained to estimate the following short run equation:

$$\Delta r_{i,t} = \gamma_{i,1}\Delta r_{A,t-T} + \gamma_{i,2}PLB_t + \gamma_{i,3}\Delta r_{A,t-T}PLB_t + \theta_i\eta_{i,t-5} + X\Delta Controls_t + X\Delta Controls_t PLB_t + \varepsilon_{i,t}$$

So that the short term equation focusses on the effect of changes in bank A's interest rate on changes in the interest rate of the price following banks. Note that the equation is in terms of five day differences, so that $\Delta r_{i,t} = r_{i,t} - r_{i,t-5}$. Five day differences were taken rather than first differences because banks tend to set their

interest rates on a weekly basis. As such, we would expect five day differences to have a more meaningful interpretation, because one day differences are expected to have large spikes on the weekday that the interest rate is set, with small variations in the days after. For example, suppose a bank changes its interest on a Tuesday and keeps it constant until the Tuesday afterwards. Daily first differences would then show a large jump on Tuesday compared to Monday and no changes after that. Five day differences would compare Tuesdays to Tuesdays in the week before, so that an increase in the interest rate is found over the entire week. Five day differences of cost control variables are included here as well and are also interacted with PLB_t to allow for differences in reactions to costs in the short run as well. The error term from the cointegrating equation $\eta_{i,t-5}$ is included so that the short term deviation model reverts to the long term cointegrating model, in which the coefficient θ_i is expected to have a value between 0 and −1. The coefficient of interest for the short-run is $\gamma_{i,3}$ which we expect to be positive because price following banks are expected to more closely follow the interest rate of the price leader. Although we expect the coefficient $\gamma_{i,3}$ to be positive, we do not have a theoretical prediction of the exact value as we do with the cointegrating relationship.

A cointegrating model was chosen for this chapter because the data displays cointegration and because it is a common method to estimate price leadership in the literature. We do deviate from the literature, because we are mostly interested in the cointegrating relationship, while most other studies focus on the short-run dynamics. Although we agree that short-run dynamics matter, the cointegrating relationship can be more closely interpreted as the response function of the price follower in equilibrium which is what we are interested in.

5.8 Results

This section presents the results from the empirical tests and compares them to the theoretical model. The cointegrating model described in the method section is tested in two ways, both by testing at the mortgage level and at the daily average

interest rate level. The results of the estimations in which daily averages of mortgage rates with a maturity of 10 years are used are presented first. Different estimations are performed because of large differences in the amount of data that was available for each day. For example, bank B, which we identify as ING, had few observations for 10 year mortgages in 2009 and 2010, while it had a lot of observations in 2011 and 2012. Using daily data gives each day the same weight and as such does not give a large weight to days with a lot of observations. At the same time, daily averages assign a lot of weight to days with relatively few observations. Both methods therefore emphasize the data in a different manner, possibly leading to different results. To prevent misinterpretation of the data in our results, we therefore present both the results on the basis of daily averages as well as on the basis of individual mortgages.

The results for the daily mortgage rates are presented in tables 2 and 3. Table 2 shows the results of the cointegrating equation and it can be seen that the effect of the interest rate set by bank A is significantly positive for four out of five price following banks in the period before the price leadership bans. The coefficient on $r_{A,t-T}$ lies between 0.03 and 0.08, suggesting that an increase in the interest rate of bank A has a significantly positive but economically small effect on the interest rates set by the price followers. After the price leadership bans are in place, the coefficient becomes much larger, with a coefficient on the interaction term $r_{A,t-T}PLB_t$ between 0.65 and 1.11. This implies that for the price following banks, the interest rate of Bank A became more important after the price leadership bans. The coefficients on $r_{A,t-T}$ and $r_{A,t-T}PLB_t$ together are close to 1 as well, which is in accordance with the theory that suggests a coefficient of 1 in a situation of collusive price leadership. The coefficient on the interaction term on the interest rate of bank B is positive and significant, but lower than the coefficient for the other price followers, which may be the result of having few observations on 10 year mortgages for bank B. Note that all cost control variables are included in these estimations even though the coefficients are not presented.[131]

---

[131] The coefficients on cost factors are omitted for the sake of brevity and because the coefficients themselves are not very meaningful because of the large degree of multicollinearity between the different cost factors.

Table 2: Results cointegrating equation, 10 year maturity using daily averages (robust standard errors in parentheses).

	$r_{B,t}$	$r_{C,t}$	$r_{D,t}$	$r_{E,t}$	$r_{F,t}$
Time between responses	1 Day	1 Day	3 Days	5 Days	1 Day
Estimated break	19-6-2009	2-3-2009	4-3-2009	14-5-2009	24-2-2009
$r_{A,t-T}$	.08*** (.033)	.03* (.019)	.04*** (.015)	.02 (.017)	.07*** (.019)
$r_{A,t-T}PLB_t$	.65*** (.085)	1.07*** (.043)	1.11*** (.038)	1.05*** (.043)	1.04*** (.041)
Cost Controls	All	All	All	All	All
n	1046	1498	1592	1603	1567
R^2	.697	.814	.849	.816	.846

*, **, ***: Significant at the 10, 5 and 1% level respectively.

The short run deviation estimations for the daily averages are presented in table 3. As before, the coefficient on the interest rate of Bank A becomes larger after the price leadership bans for all price following banks. The interpretation of the short run equations is less straightforward than that of the cointegrating model, although we would expect that the reaction to the interest set by bank A is larger after the price leadership bans are implemented, which seems to be the case from the results. Note that the coefficient on $\eta_{i,t-5}$ lies between negative 0.55 and negative 0.84, suggesting that the adjustment to the long run cointegrating equation takes on average a week or two.

Table 3: Results short run deviations, 10 year maturity using daily averages (robust standard errors in parentheses).

	$\Delta r_{B,t}$	$\Delta r_{C,t}$	$\Delta r_{D,t}$	$\Delta r_{E,t}$	$\Delta r_{F,t}$
Time between responses	1 Day	1 Day	3 Days	5 Days	1 Day
Estimated break	19-6-2009	2-3-2009	4-3-2009	14-5-2009	24-2-2009
$\Delta r_{A,t-T}$	.02 (.020)	.03*** (.012)	.03*** (.010)	.01 (.014)	.02* (.013)
$\Delta r_{A,t-T}PLB_t$	.25** (.107)	.28*** (.063)	.46*** (.060)	.59*** (.074)	.43*** (.059)
$\eta_{i,t-5}$	−.84** (.034)	−.68*** (.025)	−.71*** (.025)	−.76*** (.025)	−.55*** (.024)
Cost Controls	All	All	All	All	All
n	866	1359	1511	1554	1477
R^2	.455	.361	.378	.382	.288

*, **, ***: Significant at the 10, 5 and 1% level respectively.

The estimation is repeated on the mortgage level, for which tables 4 and 5 present the results. Table 4 shows the results for the cointegrating equation and shows the coefficient on the interaction term of the interest rate of bank A and the PLB dummy is significantly different from zero for all banks except bank B. The interest rate set by bank A has an effect on the interest rates of the price following banks before the financial crisis with a coefficient that lies between .09 and .28. After the imposition of the price leadership bans, the coefficient on the interest rate of the price leader lies between approximately .85 and .98 for all price following banks with the exception of bank B. This is in accordance to the results from the daily averages estimation and indicates that competitive behavior has changed in the Dutch mortgage market in 2009. Weaker results for bank B may stem from the fact that bank B supplies almost no mortgages with a 10 year maturity in 2009 and

2010 and instead focuses on variable mortgages, in which bank A has almost no presence.[132]

Table 4: Results cointegrating equation, 10 year maturity using data on the mortgage level (robust standard errors in parentheses).

	$r_{B,t}$	$r_{C,t}$	$r_{D,t}$	$r_{E,t}$	$r_{F,t}$
Time between responses	1 Day	1 Day	3 Days	5 Days	1 Day
Estimated break	19-6-2009	2-3-2009	4-3-2009	14-5-2009	24-2-2009
$r_{A,t-T}$	.28*** (.032)	.24*** (.049)	.24*** (.030)	.09** (.020)	.18*** (.018)
$r_{A,t-T}PLB_t$	.02 (.045)	.74*** (.051)	.72*** (.033)	.76*** (.034)	.68*** (.023)
Cost Controls	All	All	All	All	All
n	18201	23417	37653	27063	33093
R^2	.277	.627	.551	.427	.631

*, **, ***: Significant at the 10, 5 and 1% level respectively.

Table 5 presents the results for the short run deviations from the long term equilibrium. It can be seen that the coefficient on the interest of bank A becomes larger after the imposition of the price leadership bans, except for bank B, even though the effect is insignificant for bank B. Furthermore, the coefficient on the error term is negative for all banks and lies between −0.41 and −0.82, showing that the reversion to the long run equilibrium occurs within a week or two. The results overall confirm the suspicion that the Dutch mortgage market became less competitive after May 2009, specifically because the interest rate of the price leader is followed more closely after talks about the price leadership bans began.

---

[132] Below, we analyze the effect when mortgages are not differentiated by maturity specifically to address the lack of observations of bank B. Similar results are found for banks C,D,E and F, and the results become stronger for bank B.

Table 5: Results short run deviations, 10 year maturity using data on the mortgage level (robust standard errors in parentheses).

	$\Delta r_{B,t}$	$\Delta r_{C,t}$	$\Delta r_{D,t}$	$\Delta r_{E,t}$	$\Delta r_{F,t}$
Time between responses	1 Day	1 Day	3 Days	5 Days	1 Day
Estimated break	19-6-2009	2-3-2009	4-3-2009	14-5-2009	24-2-2009
$\Delta r_{A,t-T}$	.14*** (.025)	.16*** (.040)	.06*** (.022)	−.00 (.017)	.07*** (.013)
$\Delta r_{A,t-T}PLB_t$	−.04 (.039)	.04 (.043)	.16*** (.033)	.38*** (.059)	.13*** (.029)
$\eta_{i,t-5}$	−.78** (.026)	−.52*** (.018)	−.48*** (.017)	−.66*** (.022)	−.42*** (.018)
Cost Controls	All	All	All	All	All
n	17092	22185	35542	26215	31068
R^2	.073	.066	.038	.054	.040

*, **, ***: Significant at the 10, 5 and 1% level respectively.

5.9 Robustness tests

This section presents robustness tests to include more maturities and to estimate the results using the offer date rather than the contract date. So far, we have estimated using only data on mortgages with a 10 year maturity. Using the same maturity ensures that the mortgages are comparable and coefficients are more easily interpreted. However some data is lost, which is especially concerning for bank B, as that bank supplies very few mortgages with a 10 year maturity in the years 2009 and 2010. As a robustness check, we therefore also estimate with the full dataset in which we include mortgages of all maturities. The regressions to be estimated are thus:

$$r_{i,j,t} = \beta_0 + \beta_{i,1}r_{A,j,t-T} + \beta_{i,2}PLB_t + \beta_{i,3}r_{A,j,t-T}PLB_t + XControls_t$$
$$+ XControls_t PLB_t + \eta_{i,t}$$

$$\Delta r_{i,j,t} = \gamma_{i,1}\Delta r_{A,j,t-T} + \gamma_{i,2}PLB_t + \gamma_{i,3}\Delta r_{A,j,t-T}PLB_t + \theta_i\eta_{i,t-5}$$
$$+ X\Delta Controls_t + X\Delta Controls_t PLB_t + \varepsilon_{i,j,t}$$

Here $r_{i,j,t}$ is the interest rate of mortgage i with maturity j set at time t and $r_{A,j,t-T}$ is the average mortgage rate with matuirty j set by bank A at time t-T. As such, interest rates are matched by maturities. This ensures that we have more data on the mortgage rates set by bank B, because we can focus on all mortgages rather than only the mortgages with a maturity of 10 years. Furthermore, the database featured observations with maturities with unrealistically long maturities,[133] so that we exclude observations over a maximum maturity, in this case 30 years and observations with a negative maturity. The excluded observations together totaled to approximately 3400 observations. After removing these observations, the total database consisted of approximately 800 000 observations of non-bank A interest rates.[134]

We again perform Granger causality tests for the full dataset using daily averages of the interest rates, so that the daily averages reflect daily averages over all maturities. These Granger causality tests again show bank A as the most likely price leader. From these daily averages we again obtain response times by estimating pairwise VAR models between daily interest rates set by bank A and each of the price following banks. In this estimation, we use May 1st 2009 as the break date for all banks.[135] Table 6 presents the results for the cointegrating equation.[136]

As before, the results show that the interest rate of bank A is significant in determining the interest rates set by the price following banks and becomes larger after the imposition of the price leadership bans. This is now also true for bank B, which shows the same effect as the other banks.

---

[133] For example, the dataset features over 800 observations with maturities longer than 100 years.

[134] Bank A supplied approximately 180 000 mortgages in our database.

[135] May 1st 2009 was chosen because talks between the European Commission started near the beginning of May and the break in mortgage rates can also be observed at this time.

[136] The short run deviations are excluded as we are mostly interested in the cointegrating equation, as that captures the reaction function best. Furthermore, the results on the short run deviations were qualitatively similar as before, but less pronounced.

Table 6: Results cointegrating equation, all maturities using data on the mortgage level (robust standard errors in parentheses).

	$r_{B,j,t}$	$r_{C,j,t}$	$r_{D,j,t}$	$r_{E,j,t}$	$r_{F,j,t}$
Time between responses	3 Days	5 Days	1 Day	5 Days	2 Days
Estimated break	1-5-2009	1-5-2009	1-5-2009	1-5-2009	1-5-2009
$r_{A,j,t-T}$	.06*** (.022)	.33*** (.013)	.36*** (.026)	.26** (.017)	.30*** (.016)
$r_{A,j,t-T}PLB_t$	.50*** (.042)	.21*** (.014)	.52*** (.027)	.63*** (.021)	.52*** (.017)
Cost Controls	All	All	All	All	All
n	29484	52382	47552	36959	42989
R^2	.595	.608	.583	.408	.611

*, **, ***: Significant at the 10, 5 and 1% level respectively.

We also run a single regression in which we use all data for all suppliers rather than run regressions for each supplier separately. The results for this regression are presented in table 7. The results are qualitatively similar in that the coefficient on $r_{A,j,t-T}$ becomes larger after the price leadership bans are in place and is robust for the inclusion of both supplier and maturity fixed effects.

The robustness checks confirm the main results in that the price leader is followed more closely after the price leadership bans are put into place, and now that observations for bank B for 2009 and 2010 are also included, it is found that bank B responds in a similar manner to the other price following banks.

Table 7: Results cointegrating equation, all maturities and all suppliers using data on the mortgage level (robust standard errors in parentheses).

	$r_{i,j,t}$	$r_{i,j,t}$	$r_{i,j,t}$	$r_{i,j,t}$
Time between responses	0 Days	0 Days	0 Days	0 Days
Estimated break	1-5-2009	1-5-2009	1-5-2009	1-5-2009
$r_{A,j,t-T}$	.34*** (.006)	.28*** (.005)	.11*** (.026)	.11** (.005)
$r_{A,j,t-T}PLB_t$	.43*** (.007)	.43*** (.006)	.37*** (.006)	.37*** (.006)
Cost Controls	All	All	All	All
Supplier Fixed Effects	No	Yes	No	Yes
Maturity Fixed Effects	No	No	Yes	Yes
n	425559	425559	425559	425559
R^2	.476	.599	.544	.621

*, **, ***: Significant at the 10, 5 and 1% level respectively.

In addition to the contract dates, the WEW provided us with an additional document that contained the offer date in combination with the household ID. By matching the two documents, we were able to obtain a measure of the mortgage rate at the offer date. In matching the data, we ran into a large number of observations that seemed off, with offer dates that were set on a later date the contract dates and offer dates and contract dates with multiple years between them. To avoid erroneous offer dates, we excluded observations where the offer date was later than the contract date, and excluded observations where more than 100 days had passed between offer and contract date. 100 days were chosen because mortgage offers are generally valid for three months in the Netherlands. For mortgages with a maturity of 10 years, this led to 146 455 observations for the price following banks, or approximately 9 loans that were made per bank per day. Table 8 shows similar results to the main regressions in that the coefficient on bank A's interest rate becomes close to 1 for all banks except bank B.

Table 8: Results cointegrating equation, 10 year maturity using data on the mortgage level, offer dates (robust standard errors in parentheses).

	$r_{B,t}$	$r_{C,t}$	$r_{D,t}$	$r_{E,t}$	$r_{F,t}$
Time between responses	1 Day	1 Day	3 Days	5 Days	1 Day
Estimated break	1-5-2009	1-5-2009	1-5-2009	1-5-2009	1-5-2009
$r_{A,t-T}$	.39*** (.028)	.56*** (.029)	.44*** (.028)	.26** (.028)	.40*** (.020)
$r_{A,t-T}PLB_t$	−.08** (.039)	.45*** (.033)	.38*** (.031)	.64*** (.037)	.54*** (.025)
Cost Controls	All	All	All	All	All
n	14276	15931	31087	21142	25843
R^2	.341	.756	.623	.559	.721

*, **, ***: Significant at the 10, 5 and 1% level respectively.

5.10 Conclusion

Dutch mortgage rates became structurally different from mortgage rates in other European countries in the spring of 2009. In this chapter, we have shown that this may partly but not fully be explained by increases in costs and concentration. While increased costs together with heightened market concentration and tighter regulation helped create market conditions rife for price increases through coordination, none of them developed instantaneously. However, the European Commission's price leadership bans on the three largest competitors of the main Dutch mortgage provider, Rabobank, did. Talks on the price leadership bans began in the spring of 2009, thus creating a plausible reason to expect a change in competitive behavior around that time.

To estimate the impact of the price leadership bans directly, we conduct an empirical investigation into the Dutch mortgage market using data on mortgages under the National Mortgage Guarantee (NHG) in the period 2004-2012. Data was available on a mortgage level, allowing us to estimate an error correction model

that estimates responses on a daily basis. After controlling for costs and concentration, it is found that the interest rate of the price leading bank becomes more important in determining the interest rates set by price following banks after the price leadership bans were set in place. Specifically, while the coefficient on the interest rate of the price leading bank was under ½ before the spring of 2009, it became close to 1 after the price leadership bans were put into place. This leads to the conclusion that indeed the price leadership bans acted as a nucleus for the crystallization of high mortgage rates in Netherlands.

Appendix 5A: Identification key players

Figure A1 gives an overview of the number of mortgages supplied between 2006-2012 in our dataset versus the numbers reported in the annual reports. For the biggest four players, these numbers overlap sufficiently that we are confident in their identification.

Figure A1: Number of mortgages in dataset versus the number of mortgages supplied according to the annual reports.
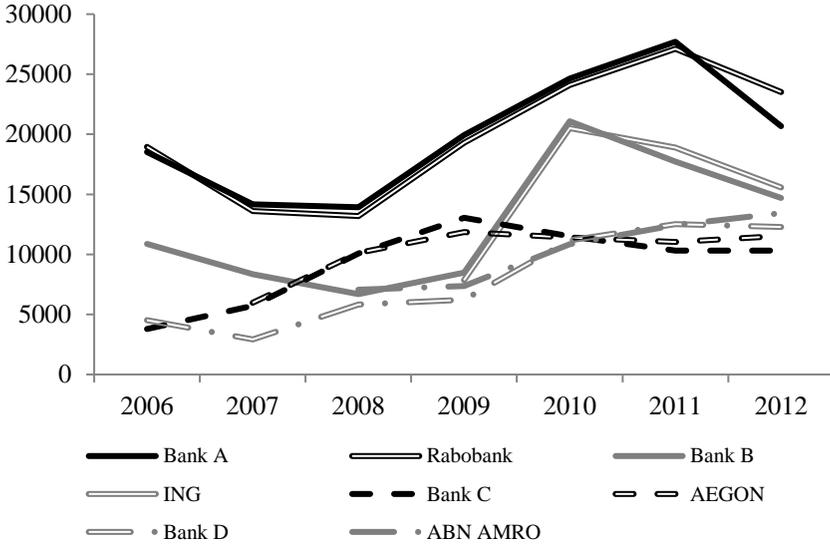
Appendix 5B: Correlation table

Table B1 shows the correlation matrix. It can be seen that the RMBS variable correlates most with the interest rate set by bank A.

Table B1: Correlation matrix.

	$r_{A,t}$	cds_{abn}	cds_{ral}	cds_{ing}	cds_{ae}	cds_{sns}	$rmbs_t$	$r_{base,t}$	r_{depos}	r_{euribo}	$tier1$
$r_{A,t}$	1										
$cds_{abn,t}$	-.11	1									
$cds_{rabo,t}$	-.08	.71	1								
$cds_{ing,t}$	-.35	.69	.90	1							
$cds_{aegon,t}$	.06	.58	.89	.77	1						
$cds_{sns,t}$	-.15	.60	.93	.85	.89	1					
$rmbs_t$	.61	.15	.24	-.13	.37	.29	1				
$r_{base,t}$	.49	-.60	-.75	-.81	-.57	-.78	.05	1			
$r_{deposit,t}$	.53	-.58	-.14	-.27	.04	-.14	.17	.60	1		
$r_{euribor,t}$	.28	-.70	-.58	-.53	-.39	-.61	-.25	.82	.78	1	
$tier1_t$	-.27	.79	.60	.63	.42	.60	.08	-.79	-.74	-.89	1
HHI_t	.02	.45	.19	.11	.13	.17	.21	-.32	-.51	-.54	.49

Appendix 5C: Granger causality tests

For the six-way Granger causality test, we estimate a VAR model of the following form:

$$r_t = c + A_1 r_{t-1} + \cdots + A_p r_{t-p} + \varepsilon_t$$

Where r_t is a vector of the interest rates set by the six biggest mortgage providers at time t. As such, the VAR model simultaneously estimates the effect of a number of lagged values of the interest rates of the biggest six banks on each of the interest rates set by the biggest six banks. The number of lags in each of the VAR models is endogenously determined by the Schwartz Criterion. In the case of the six-way VAR, this means that the model was estimated with 3 lags.[137]

The Granger causality results for the six-way VAR model are presented in table C1. The table shows Chi-squared values of the null hypothesis that the interest rate in a certain row does not Granger cause the interest rate in the column. So, for example, $r_{A,t}$ Granger causes $r_{D,t}$ (the null hypothesis of no Granger causality is rejected because 10.12 is above the critical Chi-squared value), but $r_{D,t}$ does not Granger cause $r_{A,t}$ (the null hypothesis of no Granger causality is accepted because 2.36 is below the critical Chi-squared value). From the table, it follows that the interest rate set by bank A is only Granger caused by bank B at the 10% significance level and by none of the interest rates set by other banks, while it Granger causes two out of five interest rates. Specifically, it Granger causes the interest set by bank B, which is the only bank which interest rate Granger causes the interest rate set by bank A. The null hypothesis that the interest rate of Bank A is not Granger caused by any other bank (bottom row of table B1) is rejected, but is least likely to be rejected compared to the other banks. As such, we take bank A as the most likely price leader.[138]

---

[137] Different lag structures were tested, as well as models in which cost factors were included as exogenous variables. These mostly led to the same result where bank A was generally found to be the price leader in the market.

[138] Note that bank D Granger causes three out of five interest rates, which is more than bank A. However, $r_{D,t}$ is Granger caused by $r_{B,t}$, which in turn is Granger caused by $r_{A,t}$, and the

Table C1: Granger causality test 6-way VAR model, 3 autoregressive terms (Chi-squared values). [139]

	$r_{A,t}$	$r_{B,t}$	$r_{C,t}$	$r_{D,t}$	$r_{E,t}$	$r_{F,t}$
$r_{A,t}$		15.28***	.89	10.12**	.75	2.51
$r_{B,t}$	7.26*		16.27***	18.32***	17.57***	2.89
$r_{C,t}$	1.54	5.68		.75	37.36***	1.69
$r_{D,t}$	2.36	9.50**	5.37		1.60	8.08**
$r_{E,t}$	2.25	6.60*	34.95***	10.56**		12.82***
$r_{F,t}$	5.86	8.56**	1.06	12.22***	6.84*	
All	26.32**	71.19***	105.77***	110.57***	61.31***	70.59***

Table C2 shows the results from estimating pairwise VAR models. Again, Chi-squared values from Granger causality tests are presented, but now they are from pairwise models rather than from a six-way model. As before, lags were determined endogenously from the Schwartz criterion, which led to the inclusion of 5 to 9 autoregressive terms, depending on the pair. Table C2 show that generally, interest pairs tend to Granger cause one another, which is to say that it is generally not possible to say one interest rate is not Granger caused by any other interest rate. However, it can still be determined which bank is most likely to be the price leader, even if that bank's interest rate may still be affected by some of the interest rates of other banks.

For each interest rate pair, bank A is more likely to Granger cause the other bank's interest rate than the other way around, which can only be said for bank A. For example, the Chi-square value for $r_{A,t}$ to $r_{B,t}$ is 24.60 compared to a chi-square value of 6.00 for $r_{B,t}$ to $r_{A,t}$, implying that $r_{A,t}$ Granger causes $r_{B,t}$ and not the other way around. Furthermore, bank A's interest rate is Granger caused by two other

---

null hypothesis that $r_{D,t}$ is not Granger caused by any other interest rate is rejected. As such, bank A seems more likely as a price leader than bank D from the six-way VAR model.

[139] Note that numerous observations are excluded because Bank B is included in the model, because Bank B has very few observations in the years 2008-2010. When the model is re-estimated without Bank B, the results still hold in that Bank A remains the most likely price leader in the market.

interest rates, while the other interest rates are Granger caused by four or five of the other interest rates. From the combination of both the six-way and pairwise VAR models, we conclude that bank A is indeed the price leader in the market.

Table C2: Granger causality test pairwise VAR models, autoregressive terms selected by Schwartz criterion (Chi-squared values).

	$r_{A,t}$	$r_{B,t}$	$r_{C,t}$	$r_{D,t}$	$r_{E,t}$	$r_{F,t}$
$r_{A,t}$		24.60***	22.05***	39.59***	20.32***	31.22***
$r_{B,t}$	6.00		17.54***	15.26***	18.89**	8.55
$r_{C,t}$	17.25**	18.90***		29.31***	10.58	18.82***
$r_{D,t}$	9.14	48.89***	37.14***		24.84***	43.02***
$r_{E,t}$	5.31	11.62	22.02***	17.20**		18.92**
$r_{F,t}$	17.36**	18.74***	33.89***	42.62***	30.76***	

Appendix 5D: Theoretical model

This appendix presents a simple model of competition to obtain empirical predictions. Assume a demand for somewhat differentiated goods:

$$Q_i = a - br_i + \frac{d}{n}\sum_{j=1}^{n}(r_j - r_i)$$

So that demand for mortgages of supplier i depends negatively on its own interest rate and positively on the interest rates of other suppliers. Here d is a product differentiation parameter that reflects some brand loyalty – the larger d, the more homogenous mortgage providers are.

Suppose bank l is the price leader and operates at a cost per unit of c_l. All other banks are followers that operate at $c_{i \neq l}$ and move simultaneously after bank l. Consider the subgame perfect equilibrium between the followers for any value of r_l first. The equilibrium best-response of follower i to r_l is

$$r_{i \neq l}^* = \frac{a + \frac{d}{n}r_l^*}{2b + d}$$
$$+ \frac{(b+d)n - d}{n(2b+d)(2n(b+d)-d)}\left[((2b+d)n + d)c_{i \neq l} + d\sum_{j \neq i \neq l}^{n} c_j \right]$$

Which is linear in r_l and all individual costs. Note that the slope of the followers' response functions is:

$$\frac{dr_{i \neq l}^*}{dr_l^*} = \frac{d}{(2b+d)n}$$

Which has a value under ½ because b and n have positive values. Note that this has an asymptotic value of:

$$\lim_{d \to \infty} \frac{dr^*_{i \neq l}}{dr^*_l} = \frac{1}{n}$$

Which is 0.5 for $n=2$ and 0.2 for $n=5$. Under the price leadership bans, $r^*_{i \neq l} = r^*_l$ so that:

$$\frac{dr^*_{i \neq l}}{dr^*_l} = 1$$

As such, we expect the coefficient on the interest rate of the price leader to lie below ½ before the price leadership bans, and around 1 after the price leadership bans are in effect. However, obtaining reaction functions from empirical estimates is not straightforward. Figure D1 shows the reaction functions of the price leader and price followers and illustrates this point. Note that we estimate a series of equilibrium values between the interest rate set by the price leader and price followers. As such, assume we start in point A. Now suppose something changes, for example an increase in the costs of the follower. This shifts the reaction curve of the price follower upwards and moves the new equilibrium interest rate upwards as well to end up in point B. If the relationship between r_l and $r_{i \neq l}$ is empirically measured, points A and B would be observed and the empirical estimation overestimates the actual response function of the price follower. How much the response is overestimated can't be easily determined without additional assumptions on the exact parameters of the theoretical model.

Figure D1: Illustration estimation reaction function when costs are not accounted for.

$r_{i \neq l}$

B

$\Delta c_{i \neq l}$

A

$\dfrac{dr_{i \neq l}^*}{dr_l^*}$

r_l
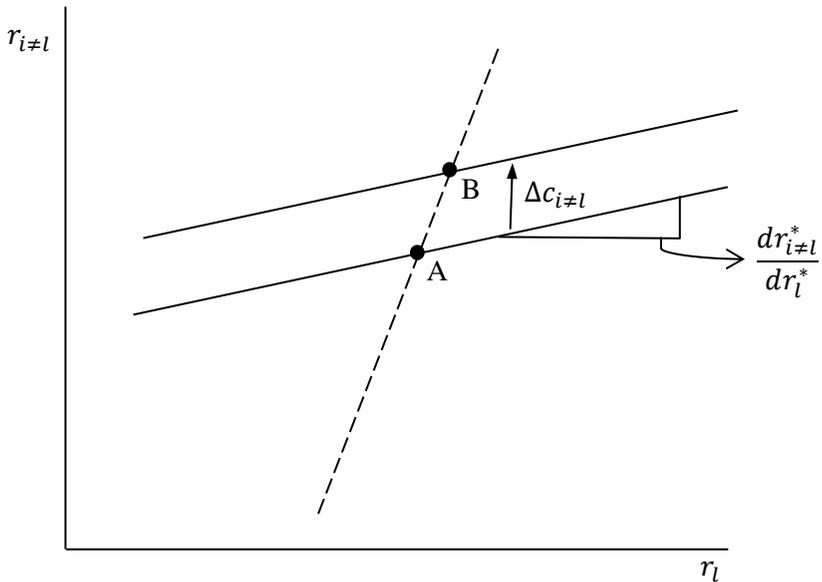
Note that the empirical estimation might overestimate the response curve by such a degree that the response seems more steeply sloped than the response curve in the collusive equilibrium. In the collusive equilibrium, the followers interest rate is only determined by the price of the price leader and not by its costs. As such, the line is 45 degrees, and if costs are not controlled for, this means that the slope in the competitive situation might wrongly be estimated to be larger than the collusive situation. In order to obtain correct estimates in the competitive situation, it is therefore crucial we correct for costs. When costs are corrected for, the slope of the response curve can be obtained from the estimates.

Appendix 5E: Unit roots and cointegration

This section shows the unit root tests and tests for cointegration. Table E1 presents the Dickey-Fuller test statistics for the interest rates. All series display unit roots in levels, but not in first differences.

Table E1: Dickey-Fuller test statistics for daily average interest rates, 10 year maturity (no trend or constant included, lags based off Schwarz Information Criterion).

	Levels t-value	Levels p-value	1st difference t-value	1st difference p-value
$r_{A,t}$	−1.28	.184	−29.99	.000
$r_{B,t}$	−.86	.345	−22.72	.000
$r_{C,t}$	−.60	.456	−20.96	.000
$r_{D,t}$	−.54	.483	−25.90	.000
$r_{E,t}$	−.13	.638	−24.02	.000
$r_{F,t}$	−.75	.393	−27.14	.000

Table E2 presents the Johansen trace statistic for cointegration between the interest rate of bank A and the price following banks. It follows that one cointegrating relationship exists between each of the interest rates of banks B to F and the interest rate set by bank A.

Table E2: Johansen trace test testing for pairwise cointegration with $r_{A,t}$ (no trend or constant assumed, five autoregressive terms).

	No cointegrating equation		At most one cointegrating equation	
	Trace statistic	P-value	Trace statistic	P-value
$r_{B,t}$	72.12	.000	.49	.549
$r_{C,t}$	17.57	.001	.60	.500
$r_{D,t}$	57.45	.000	.74	.449
$r_{E,t}$	39.27	.000	.04	.870
$r_{F,t}$	49.72	.000	.99	.372

Appendix 5F: Quandt-Andrews test

We estimate the most likely date for the break in competitive behavior endogenously. Although the policy discussion has focused on the spring of 2009, the break should also be seen in the data. In this section we endogenously establish a structural break through the Quandt-Andrews statistical test. For this test, we again focus on daily averages, because the test requires a time series estimation. The regression that is used to perform the Quandt-Andrews test is the following:

$$r_{i,t} = \beta_0 + \beta_{i,1} r_{A,t-T} + XControls_t + \eta_{i,t}$$

Which is the exact regression estimated in the main text, only not interacted with the price leadership ban dummy. From this regression, all variables are allowed to change at the break point. The results are presented in table F1. The most likely break points for all banks take place in the first half of 2009. This strengthens the intuition that the break in competitive behavior is explained by the anticipation of price leadership bans rather than the actual implementation that came later or the financial crisis that erupted in 2008.

Table F1: Quandt-Andrews break test results.[140]

Dependent variable	Most likely date	F-statistic (Likelihood ratio)
$r_{B,t}$	June 19th 2009	19.47
$r_{C,t}$	March 2nd 2009	88.74
$r_{D,t}$	March 4th 2009	124.51
$r_{E,t}$	April 2nd 2009	112.68
$r_{F,t}$	February 24th 2009	102.08

Although the dates in table F1 are the dates where the most likely break date took place, there is a range of dates in which a significant break takes place. This

---

[140] Bank B has very few observations in the period 2009-2010 so that we scrap a large amount of data when estimating the break in the data.

range is very wide and for most of the dates that leave a big enough sample before and after the break date, a significant break is found.[141] This result is not surprising for at least two reasons. First of all the dataset spans a tumultuous period for financial markets and the housing market in particular. The data spans (parts of) both the financial crisis and the European debt crisis in addition to the imposition of the price leadership bans already mentioned. This means that any break point that splits data in such a way that one subsample lies before one of these events and one subsample after is likely to be found significant. Secondly, the dataset includes many observations with low day-to-day variation, leading to low standard errors in estimation and as such a high chance of finding a significant difference in coefficient values before and after the estimated break. Given the wide range of possible break dates, some caution should be advised in taking the break dates in table F1 as the only break date that is possible. However, the most likely break date is found in the spring of 2009 and not at, for example, around the fall of Lehman Brothers in September of 2008. This strengthens the suggestion that the imposition of price leadership bans may have had a larger impact on competitive behavior than other events.

---

[141] Specifically, a significant break can be found anywhere between at least 2007 and 2011.

References

Literature

Acharya, V. (2011), Measuring systemic risk and the dismal failure of Basel risk weights, *VOXEU.org*.

Acharya, V., R. Engle, and D. Pierreta (2014), Testing macroprudential stress tests: The risk of regulatory risk weights, *Journal of Monetary Economics*, Vol. 65(1), p. 36-53.

ACM (2013), *Concurrentie op de hypotheekmarkt: Een update van de margeontwikkelingen sinds begin 2011*, The Hague: Autoriteit Consument en Markt.

ACM (2014), *Barrières voor toetreding tot de Nederlandse bancaire retailsector*, The Hague: Autoriteit Consument en Markt.

Adams, R.M., P.W. Bauer, and R.C. Sickles (2004), Scale Economies, Scope Economies, and Technical Change in Federal Reserve Payment. *Journal of Money, Credit and Banking*, Vol. 36(5), p. 943-958.

Admati, A.R., and M.F. Hellwig (2011), Comments to the UK Independent Commission on Banking, *Stanford University Working Paper*.

Admati, A.R., and P. Pfleiderer (2012), Comments on the Implementation of the Volcker Rule, S*tanford University Working Paper*.

Admati, A.R., P.M. DeMarzo, M.F. Hellwig and P.C. Pfleiderer (2013) Fallacies, irrelevant facts, and myths in the discussion of capital regulation: why bank equity is not expensive. *Rock Center for Corporate Governance at Stanford University Working Paper*, 86.

Allen, J., and Y. Liu (2007), Efficiency and economies of scale of large Canadian banks, *Canadian Journal of Economics*, Vol. 40(1), p. 225-244.

Allen, J., and D. McVanel (2009), Price Movements in the Canadian Residential Mortgage Market, *Bank of Canada Staff Working Paper*, no. 2009-13.

Arcand, J.-L., E. Berkes, en U. Panizza (2015), Too Much Finance?, *Journal of Economic Growth*, Vol. 20(2), p. 105-148.

Asaftei, G. (2008), The contribution of product mix versus efficiency and technical change in US banking, *Journal of Banking & Finance*, Vol. 32(11), p. 2336–2345.

Baele, L., O. De Jonghe, and R. Vander Vennet (2007), Does the stock market value bank diversification? *Journal of Banking & Finance*, Vol. 31(7), 1999–2023.

Bagehot, W. (1873), *Lombard Street*, H.S. King, London.

Baker, D., and T. McArthur (2009) The Value of the "Too Big to Fail" Big Bank Subsidy, *CEPR Issue Brief*, September 2009.

Barrell, R., E.P. Davis, D. Karim, and I. Liadze (2010), Evaluating Off-Balance Sheet Exposures in Banking Crisis Determination Models. *Brunel University Working Paper*.

Barth, J.R., C. Lin, Y. Ma, J. Seade, and F.M. Song (2013) Do Bank Regulation, Supervision and Monitoring Enhance or Impede Bank Efficiency? *Journal of Banking & Finance*, Vol. 37(8), p. 2879-2892.

Basu, S., R. Inklaar, and J.C. Wang (2011), The Value of Risk: Measuring the Service Output of U.S. Commercial Banks, *Economic Inquiry*, Vol. 49(1), 226-245.

Battes, P., and P. Elshout (2008), *De val van ABN Amro: Een reconstructie in zes aktes*. Amsterdam: Business Contact.

BCBS (2010), An assessment of the long-term economic impact of stronger capital and liquidity requirements, *BIS working paper*, August 2010.

BCBS (2014), Supervisory framework for measuring and controlling large exposures, *BIS working paper*, April 2014.

Beccalli, E. (2007), Does IT investment improve bank performance? Evidence from Europe, *Journal of Banking & Finance*, Vol. 31(7), p. 2205-2230.

Beccalli, E., M. Anolli, and G. Borello (2015) Are European banks too big? Evidence on economies of scale, *Journal of Banking & Finance*, Vol. 58(9), p. 232-246.

Beck, T.H.L. (2007), Efficiency in financial intermediation: Theory and empirical measurement, In: B. Balkenhol (Ed.), *Microfinance and public policy: Outreach, performance and efficiency*. Basingstoke: Palgrave Macmillan.

Beck, T.H.L. (2009), The Econometrics of Finance and Growth. In: T. Mills en K. Patterson (Eds.), *Palgrave Handbook of Econometrics*. Vol. 2. Hampshire, U.K.: Palgrave Macmillan.

Beck, T., H. Degryse, and C. Kneer (2014), Is more finance better? Disentangling intermediation and size effects of financial systems, *Journal of Financial Stability*, Vol. 10(1), p. 50-64.

Bennett, A., A. Barth, and K. Rutherford (2003), Do we preach what we practice? A survey of methods in political science journals and curricula, *Political Science and Politics*, Vol. 36(3), p. 373-378.

Berendsen, C. (1999), Global Ambitions, In: De Vries, J., W. Vroom, and T. de Graaf (eds.), *Worldwide banking: ABN AMRO Bank 1824-1999*. Amsterdam: ABN AMRO Bank N.V.

Berger, A.N. (2003), The economic effects of technological progress: Evidence from the banking industry, *Journal of Money, Credit and Banking*, Vol. 35(2), p. 141-176.

Berger, A.N. (2007), International Comparisons of Banking Efficiency, *Financial Markets, Institutions & Instruments*, Vol. 16(3), p. 119-144.

Berger, A.N., I. Hasan, and L.F. Klapper (2004), Further Evidence on the Link between Finance and Growth: An International Analysis of Community Banking and Economic Performance, *Journal of Financial Services Research*, Vol. 25(2-3), p. 169-202.

Berger, A.N., I. Hasan, and M. Zhou (2010) The effects of focus versus diversification on bank performance: Evidence from Chinese banks. *Journal of Banking & Finance*, Vol. 34(7), p. 1417–1435.

Berger, A.N., and D.B. Humphrey (1997), Efficiency of Financial Institutions: International Survey and Directions for Future Research, *European Journal of Operational Research*, Vol. 98(2), p. 175-212.

Berger, A.N., L.F. Klapper, and R. Turk-Ariss (2009), Bank Competition and Financial Stability, *Journal of Financial Services Research*, Vol. 35(2), p. 99-118.

Berger, A.N., and L.J. Mester (1997), Inside the black box: What explains differences in the efficiencies of financial institutions?, *Journal of Banking & Finance*, Vol. 21(7), p. 895-947.

Berger, A.N., N.H. Miller, M.A. Petersen, R.G. Rajan, and J.C. Stein (2005), Does function follow organizational form? Evidence from the lending practices of large and small banks, *Journal of Financial Economics*, Vol. 76(2), p. 237-269.

Berger, A.N., and G.F. Udell (2002), Small Business Credit Availability and Relationship Lending: The Importance of Bank Organisational Structure, *The Economic Journal*, Vol. 112(477), p. F32-F53.

Bhattacharya, S., A.W.A. Boot, and A.V. Thakor (2004), *Credit, Intermediation, and the Macroeconomy: Readings and Perspectives in Modern Financial Theory*, Oxford: Oxford University Press.

Bhattacharya, S., and A.V. Thakor (1993), Contemporary Banking Theory, *Journal of Financial Intermediation*, Vol. 3(1), p. 2-50.

Bijlsma, M.J., and R.J.M. Mocking (2013), The private value of too-big-to-fail guarantees, *CPB Discussion Paper*, No. 240.

Bolt, W., and D. Humphrey (2010), Bank competition efficiency in Europe: A frontier approach, *Journal of Banking & Finance*, Vol. 34(8), p. 1808–1817.

Bonin, J.P., I. Hasan, and P. Wachtel (2005), Bank Performance, Efficiency and Ownership in Transition Countries, *Journal of Banking & Finance*, Vol. 29(1), p. 31-53.

Boonstra, W. and L. Treur (2012), Reactie op: Hollands hoge hypotheekrentes, *ESB*, Vol. 97(4645), p. 598-599.

Boonstra, W. and L. Treur (2014), Competition in the Dutch mortgage market: Notes on concentration, entry, funding, and margins, *Journal of Competition Law & Economics*, Vol. 10(4), p. 819-841.

Boot, A.W.A. (1998), Universal banking als overgangsfase, *Bank- en Effectenbedrijf*, Vol. 47(December), p. 29-30.

Boot, A.W.A. (2003), Consolidation and Strategic Positioning in Banking with Implications for Europe, *Brookings-Wharton, Papers on Financial Services*, Vol. 2003, p. 37-83.

Boot, A.W.A. (2010), *De ontwortelde onderneming: Ondernemingen overgeleverd aan financiers?* Assen: Van Gorcum.

Boot, A.W.A. (2011), Banking at the crossroads: How to deal with marketability and complexity?, *Review of Development Finance*, Vol. 1(3–4), p. 167-183.

Boot, A.W.A., and M.A. Dijkstra (2011), Financiële sector in crisis, In: J.H. Garretsen, R.M. Jong-A-Pin, and E. Sterken (eds.), *De economische toekomst van Nederland*, Chapter 4, p. 105-142.

Boot, A.W.A., and L. Ratnovski (2016), Banking and Trading, *Review of Finance*, published online 27 January.

Boot, A.W.A., and A. Schmeits (1998), Challenges to competitive banking: a theoretical perspective, *Research in Economics*, Vol. 52(3), p. 255-270.

Boot, A.W.A., and A.V. Thakor (1997), Banking Scope and Financial Innovation, *Review of Financial Studies*, Vol. 10(4), p. 1099-1131.

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

Bos, J.W.B., M. Koetter, J.W. Kolari, and C.J.M. Kool (2009), Effects of Heterogeneity on Bank Efficiency Scores, *European Journal of Operational Research*, Vol. 195(1), p. 251-261.

Bos, J.W.B., and J.W. Kolari (2005), Large Bank Efficiency in Europe and the United States: Are There Economic Motivations for Geographic Expansion in Financial Services? *Journal of Business*, Vol. 78(4), p. 1555-1592.

Bos, J.W.B. and C.J.M. Kool (2006), Bank efficiency: The role of bank strategy and local market conditions, *Journal of Banking & Finance*, Vol. 30(7), p. 1953–1974.

Bos, J.W.B., and H. Schmiedel (2007), Is there a single frontier in a single European banking market? *Journal of Banking & Finance*, Vol. 31(7), p. 2081–2102.

Bossone, B., and J.-K. Lee (2004), In Finance, Size Matters: The "Systemic Scale Economies" Hypothesis, *IMF Staff Papers*, Vol. 51(1), p. 19-46.

Bovenberg, A.L., and R. Polman (2013), Splitsing activiteiten banken verbetert dynamiek woningmarkt, *ESB*, Vol. 98(4654), p. 116-119.

Brewer, E., and J. Jagtiani (2013), How Much Did Banks Pay to Become Too-Big-To-Fail and to Become Systemically Important?, *Journal of Financial Services Research*, Vol. 43(1), p. 1-35.

Brissimis, S.N., M.D. Delis, and E.G. Tsionas (2010), Technical and allocative efficiency in European banking, *European Journal of Operational Research*, Vol. 204, p. 153–163.

Broersen, E.N., and A.W.T.J. Verdonk (2002), Value based management en management control bij ABN AMRO, *Handboek Management Accounting*, April 2002.

Brouwer, H.J. (1997), Jaarcijfers Nederlandse banken 1996: Uitzonderlijk goed jaar, *Bank- en Effectenbedrijf*, Vol. 46(June), p. 12-18.

Buch, C.M., C.T. Koch, and M. Koetter (2011), Size, Productivity, and International Banking, *Journal of International Economics*, Vol 85(2), p. 329-334.

Buiter, W.H. (2009), Lessons from the global financial crisis for regulators and supervisors, *Paper presented at the 25th anniversary Workshop The Global Financial Crisis: Lessons and Outlook of the Advanced Studies Program of the IFW*, Kiel, May 8/9.

Carbó Valverde, S.C., D.B. Humphrey, and F. Rodríguez Fernández (2003), Deregulation, Bank Competition and Regional Growth, *Regional Studies*, Vol. 37(3), p. 227-237.

Carbó Valverde, S.C., and F. Rodríguez Fernández (2005) New evidence of scope economies among lending, deposit-taking, loan commitments and mutual fund activities, *Journal of Economics and Business*, Vol. 57(3), p. 187-207.

Carvallo, O., and A. Kasman (2005) Cost efficiency in the Latin American and Caribbean banking systems, *International Financial Markets, Institutions and Money*, Vol. 15(1), p. 55-72.

Casu, B. and C. Girardone (2010), Integration and efficiency convergence in EU banking markets, *Omega*, Vol. 38(5), p. 260–267.

Cecchin, I. (2011), Mortgage Rate Pass-Through in Switzerland, *Swiss National Bank Working Papers* no. 2008-11.

Chaplinsky, S. and G.R. Erwin (2009), Great expectations: Banks as equity underwriters. *Journal of Banking & Finance*, Vol. 33(2), p. 380–389.

Chen, X., M. Skully, and K. Brown (2005), Banking efficiency in China: Application of DEA to pre- and post-deregulation eras: 1993–2000, *China Economic Review*, Vol. 16(3), p. 229–245.

Chortareas, G.E., C. Girardone, and A. Ventouri (2012), Bank supervision, regulation, and efficiency: Evidence from the European Union, *Journal of Financial Stability*, Vol. 8(4), p. 292-302.

Claes, P.C.M. (2008), ABN AMRO Holding N.V., In: P.C.M. Claes, *Value-based Management Control Systems: An Analysis of Design and Use*. Dissertation, VU University Amsterdam, p. 87-110.

Claessens, S., A. Demirgüç-Kunt, and H. Huizinga (2001), How does foreign entry affect domestic banking markets? *Journal of Banking & Finance*, Vol. 25(5), p. 891-911.

Claessens, S., and N. van Horen (2012), Being a foreigner among domestic banks: Asset or liability?, *Journal of Banking and Finance*, Vol. 36(5), p. 1276-1290.

Claessens, S., and N. van Horen (2013), Impact of Foreign Banks, *Journal of Financial Perspectives*, Vol. 1(1), p. 1-18.

Clark, J.A., and T.F. Siems (2002), X-Efficiency in Banking: Looking beyond the Balance Sheet, *Journal of Money, Credit and Banking*, Vol. 34(4), p. 987-1013.

Cochrane, J. (2014), Toward a run-free financial system, In: M.N. Baily and J. Taylor (Eds.), *Across the Great Divide: New Perspectives on the Financial Crisis*, Stanford: Hoover Institution.

Colangelo, A., and R. Inklaar (2012), Bank output measurement in the Euro area: a modified approach, *Review of Income and Wealth*, Vol. 58(1), p. 142-165.

Cordeiro, J., and D. Kent (2001), Do EVA adopters outperform their industry peers? Evidence from security analyst earnings forecasts, *American Business Review*, Vol. 19(2), p. 57-63.

CPB (2013), De Nederlandse woningmarkt - hypotheekrente, huizenprijzen en consumptie, *CPB Notitie*, The Hague: Centraal Planbureau.

Cummins, J.D., M.A. Weiss, X. Xie, and H. Zi (2010), Economies of scope in financial services: A DEA efficiency analysis of the US insurance industry. *Journal of Banking & Finance*, Vol. 34(7), p. 1525–1539.

Czíria, C., M. Koning, and C. Mulders (2002), Jaarcijfers Nederlandse Banken: Tegenzittende beurzen geven druk op bankresultaten, *Bank- en effectenbedrijf*, Vol. 51(June), p. 12-15.

Dailami, M., and R. Hauswald (2007), Credit-spread determinants and interlocking contracts: A study of the Ras Gas project, *Journal of Financial Economics*, Vol. 86(1), p. 248-278.

Davies, R., and B. Tracey (2012), Too big to be efficient? The impact of implicit funding subsidies on scale economies in banking, *Journal of Money, Credit and Banking*, Vol. 46(s1), 219-253.

De Graaf, F. (2005), De bestuursstructuur en de maatschappelijke verantwoordelijkheid van ondernemingen: de invloed van stakeholders en de deregulering van de Nederlandse financiële sector, *Dissertation*, University of Amsterdam.

De Haan, J., and T. Poghosyan (2012), Bank size, market concentration, and bank earnings volatility in the US, *Journal of International Financial Markets, Institutions and Money*, Vol. 22(1), p. 35-54.

De Haan, L., and E. Sterken (2006), Price Leadership in the Dutch Mortgage Market, *DNB Working Paper No. 102*, Amsterdam: De Nederlandsche Bank.

De Haan, L. and E. Sterken (2011), Bank-Specific Daily Interest Rate Adjustment in the Dutch Mortgage Market, *Journal of Financial Services Research*, Vol. 39(3), p 145-159.

De Jong, A., D.V. DeJong, G. Mertens, and P. Roosenboom (2007), Investor relations, reputational bonding, and corporate governance: The case of Royal Ahold, *Journal of Accounting and Public Policy*, Vol. 26(3), p. 328-375.

De Jong, A., D.M. Higgins, and H. van Driel (2015), Towards a new business history?, *Business History*, Vol. 57(1), p. 5-29.

De Jonghe, O., and R. Vander Vennet (2008), Competition versus Efficiency: What Drives Franchise Values in European Banking?, *Journal of Banking & Finance*, Vol. 32(9), p. 1820-1835.

De Nicolo, G., P. Bartholomew, J. Zaman, and M. Zephirin (2004), Bank Consolidation, Internationalization and Conglomeration: Trends and Implications for Financial Risk, *Financial Markets, Institutions & Instruments*, Vol. 13(4), p. 173-217.

DeAngelo, H., and L. DeAngelo (2000), Controlling stockholders and the disciplinary role of corporate payout policy: a study of the Times Mirror Company, *Journal of Financial Economics*, Vol. 56(2), p. 153-207.

Decker, S., M. Kipping, and R.D. Wadhwani (2015), New business histories! Plurality in business history research methods, *Business History*, Vol. 57(1), p. 30-40.

Deaton, A. and J. Muellbauer (1980), An Almost Ideal Demand System, *American Economic Review*, Vol. 70(3), p. 312-326.

Degryse, H., and S. Ongena (2005), Distance, Lending Relationships, and Competition, *Journal of Finance*, Vol. 60(1), p. 231-266.

Degryse, H., and S. Ongena (2008), Competition and Regulation in the Banking Sector, In: A.V. Thakor and A.W.A. Boot (Eds.), *Handbook of Financial Intermediation and Banking*, Chapter 15.

Delis, M.D., P. Molyneux, and F. Pasiouras (2011), Regulations and Productivity Growth in Banking: Evidence from Transition Economies, *Journal of Money, Credit and Banking*, Vol. 43(4), p. 735-764.

Delis, M.D., and N.I. Papanikolaou (2009), Determinants of bank efficiency: evidence from a semi-parametric methodology, *Managerial Finance*, Vol. 35(3), p. 260-275.

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

Demirgüç-Kunt, A., and E. Detragiache (2002), Does deposit insurance increase banking system stability? An empirical investigation, *Journal of Monetary Economics*, Vol. 49(7), p. 1373-1406.

Demirgüç-Kunt, A., L. Laeven, and R. Levine (2004) Regulations, Market Structure, Institutions, and the Cost of Financial Intermediation. *Journal of Money, Credit and Banking*, 36(3), p. 593-622.

Deng, S., and E. Elyasiani (2008), Geographic diversification, bank holding company value and risk, *Journal of Money, Credit and Banking*, Vol. 40(6), p. 1217–38.

Deng, S., E. Elyasiani, and C.X. Mao (2007), Diversification and the cost of debt of bank holding companies, *Journal of Banking and Finance*, 31(8), p. 2453–73.

DeYoung, R. (1997), A diagnostic test for the distribution-free efficiency estimator: An example using U.S. commercial bank data, *European Journal of Operational Research*, Vol. 98(2), p. 243-249.

DeYoung, R. (2010), Scale economies are a distraction. *The Region*, Vol. 24(3), p. 14-16.

DeYoung, R., and K.P. Roland (2001), Product Mix and Earnings Volatility at Commercial Banks: Evidence from a Degree of Total Leverage Model, *Journal of Financial Intermediation*, Vol. 10(1), p. 54-84.

Diamond, D.W. (1984), Financial Intermediation and Delegated Monitoring, *Review of Economic Studies*, Vol. 51(3), p. 393-414.

Diamond, D.W., and P.H. Dybvig (1983), Bank Runs, Deposit Insurance and Liquidity, *Journal of Political Economy*, Vol. 91(3), p. 401-419.

Dijkstra, M.A., F. Randag, and M.P. Schinkel (2014), High mortgage rates in the low countries: what happened in the spring of 2009? *Journal of Competition Law & Economics*, Vol. 10(4), p. 843-859.

Dijkstra, M.A., and M.P. Schinkel (2012a), NMa's Mortgage-Rate-Calculation-Method: Actualization and Reinterpretation, *Amsterdam Law School Research Paper*, No. 2012-84, *Amsterdam Center for Law & Economics Working Paper*, No. 2012-07.

242

Dijkstra, M.A., and M.P. Schinkel (2012b), Hollands hoge hypotheekrentes, *ESB*, Vol. 97(4645), p. 594-597.

Dijkstra, M.A., and M.P. Schinkel (2013), Extra-Margins in ACM's Adjusted NMa 'Mortgage-Rate-Calculation Method', *Amsterdam Law School Research Paper*, No. 2013-40, *Amsterdam Center for Law & Economics Working Paper*, No. 2013-10.

DNB (2011), *Financial stability report, Spring 2011*, Amsterdam: De Nederlandsche Bank.

DNB (2012), *Financial stability report, Spring 2012*, Amsterdam: De Nederlandsche Bank.

Drucker, S., and M. Puri (2005), On the benefits of concurrent lending and underwriting, *Journal of Finance*, Vol. 60(6), p. 2763-2799.

Eckert, A. (2013), Empirical Studies of Gasoline Retailing: A Guide to the Literature, *Journal of Economic Surveys*, Vol. 27(1), p. 140-166.

Elliott, D.J., and C. Rauch (2014), Lessons from the implementation of the Volcker Rule for Banking Structural Reform in the European Union, *SAFE Sustainable Architecture for Finance in Europe white paper series* no. 13.

Elsas, R., A. Hackethal and M. Holzhäuser (2010), The Anatomy of Bank Diversification, *Journal of Banking & Finance*, Vol. 34(6), 1274-1287.

Erber, G., and R. Madlener (2009) Impact of ICT and Human Skills on the European Financial Intermediation Sector, In: M. Balling, E. Gnan, F. Lierman and J.-P. Schoder (Eds.), *Productivity in the Financial Services Sector*, Chapter 10, p. 183-200.

European Commission (2008), *C(2009)9000 final corr.: "Commission decision on the State aid implemented by the Netherlands for ING's illiquid Assets Back-Up Facility and Restructuring Plan*, Brussels, November 18.

European Commission (2009), *3708 final: 'State aid N 244/2009, Commerzbank, Germany*,' Brussels, May 7, no. 71.

European Commission (2011) *Directive of the European Parliament and of the Council on credit agreements relating to residential property*. Brussels: European Commission.

Fang, Y., I. Hasan, and K. Marton (2011), Bank Efficiency in South-Eastern Europe, the Role of Ownership, Market Power and Institutional Development, *Economics of Transition*, Vol. 91(3), p. 495-520.

Feng, G., and A. Serlitis (2010), Efficiency, technical change, and returns to scale in large US banks: Panel data evidence from an output distance function satisfying theoretical regularity. *Journal of Banking & Finance*, Vol. 34(1), 127-138.

Ferguson, R., J. Rentzler, and S. Yu (2005) Does Economic Value Added (EVA) Improve Stock Performance Profitability?, *Journal of Applied Finance*, Vol. 15(2), p. 101-113.

Financieel Stabiliteitscomité (2013), *Verslag Financieel Stabiliteitscomité 12 november 2013*, Amsterdam: DNB.

Fisher, R.W. (2013) Ending 'Too Big to Fail': A Proposal for Reform Before It's Too Late, *Speech by the president of the Federal Reserve Bank of Dallas*, January 16th.

Fiordelisi, F., and P. Molyneux (2010), Total Factor Productivity and Shareholder Returns in Banking, *Omega*, Vol. 38(5), 241-253.

Fixler, D., and K. Zieschang (2010), Deconstructing FISIM: Should Financial Risk Affect GDP? *US Bureau of Economic Analysis working paper*.

Ford, R.C., and W.A. Randolph (1992), Cross-functional structures: A review and integration of matrix organization and project management, *Journal of Management*, Vol. 18(2), p. 267-294.

Francke, M., A. van der Minne, and J. Verbruggen (2014), The effect of credit conditions on the Dutch housing market, *DNB Working Paper*, no. 447

Gambacorta, L., and A. van Rixtel (2013), Structural bank regulation initiatives: approaches and implications, *BIS Working Paper*, No. 412.

Gandhi, P, and H. Lustig (2015), Size Anomalies in U.S. Bank Stock Returns, *Journal of Finance*, Vol. 70(2), p. 733-768.

Genner, J., M. Lienemeyer, and C. Walker(2009), The Commerzbank Recapitalisation Decision: Providing Legal Certainty in Times of Crisis and Guidance for Future Restructuring, *Competition Policy Newsletter*, 2.

George, A.L., and A. Bennett (2004), *Case studies and theory development in the social sciences*, Cambridge: MIT Press.

Ginniken, M.J. (2010), Vijandige overnames: de rol van de vennootschapsleiding in Nederland en de Verenigde Staten, *Dissertation*, University of Amsterdam.

Gippel, J. (2013), A Revolution in Finance?, *Australian Journal of Management*, Vol. 38(1), p. 125-146.

Goetz, M.R., L. Laeven, and R. Levine (2013), Identifying the Valuation Effects and Agency Costs of Corporate Diversification: Evidence from the Geographic Diversification of U.S. Banks, *Review of Financial Studies*, Vol. 26(7), p. 1787-1823.

Goetz, M.R., L. Laeven, and R. Levine (2016), Does the geographic expansion of banks reduce risk? *Journal of Financial Economics*, Vol. 120(2), p. 346-362.

Goldsmith, R.W. (1969), *Financial Structure and Development*. Yale University Press.

Goldstein, M., and N. Véron (2011) Too Big To Fail: The Transatlantic Debate, *Peterson Institute for International Economics Working Paper*, 11-2.

Goodhart, C.A.E. (2012), The Vickers Report: An Assessment, *Law and Financial Markets Review*, Vol. 6(1), p. 32-38.

Greenbaum, S.I., A.V. Thakor, and A.W.A. Boot (2016), *Contemporary Financial Intermediation*, Elsevier Academic Press.

Gulamhussen, M.A., C. Pinheiro, and A.F. Pozzolo (2010), Do multinational banks create or destroy economic value?, *University of Lisboa working paper*.

Haldane, A.G. (2010), The $100 billion question, *Speech given at the Institute of Regulation & Risk,* Hong Kong, 30 March.

Haldane, A., S. Brennan, and V. Madouros (2010), What is the contribution of the financial sector: Miracle or mirage?, In: LSE (2010) *The Future of Finance: The LSE Report*, London School of Economics and Political Science

Hasan, I., M. Koetter, and M. Wedow (2009), Regional Growth and Finance in Europe: Is there a Quality Effect of Bank Efficiency? *Journal of Banking & Finance*, Vol. 33(8), p. 1446-1453.

Haynes, S.N., G.H. Mumma, C. Pinson (2009), Idiographic assessment: Conceptual and psychometric foundations of individualized behavioral assessment, *Clinical Psychology Review*, Vol. 29(2), p. 179-191.

Henderson, B.J., and N.D. Pearson (2011), The dark side of financial innovation: A case study of the pricing of a retail financial product, *Journal of Financial Economics*, Vol. 100(2), p. 227-247.

Ho, S.J., and S.K. Mallick (2010) The impact of information technology on the banking industry, *Journal of the Operational Research Society*, Vol. 61(2), p. 211-221.

Holmström, B., and J. Tirole (1997), Financial Intermediation, Loanable Funds, and the Real Sector, *Quarterly Journal of Economics*, Vol. 112(3), p. 663-692.

Huang, Y., J. Tang, and X. Zhou (2012), The Efficiency of Internal Capital Markets: Evidence from Conglomerate Firms around Financial Crises, *University of Hong Kong Working Paper*.

Huang, T.-H., and M.H. Wang (2004), Estimation of scale and scope economies in multiproduct banking: evidence from the Fourier flexible functional form with panel data. *Applied Economics*, Vol. 36(11), p. 1245 — 1253.

Hughes, J.P., W. Lang, L.J. Mester, and C.-G. Moon (1996), Efficient Banking under Interstate Branching, *Journal of Money, Credit and Banking*, Vol. 28(4), p. 1045-1071.

Hughes, J.P., W. Lang, L.J. Mester, and C.-G. Moon (2000), Recovering Risky Technologies Using the Almost Ideal Demand System: An Application to U.S. Banking, *Journal of Financial Services Research*, Vol. 18(1), p. 5-27.

Hughes, J.P., and L.J. Mester (2010), Efficiency in Banking: Theory, Practice, and Evidence, In: A.N. Berger, P. Molyneux., and J. Wilson (Eds.), *The Oxford Handbook on Banking*, Chapter 18.

Hughes, J.P., and L.J. Mester (2015), Who said large banks don't experience scale economies? Evidence from a risk-return driven cost function, *Journal of Financial Intermediation*, Vol. 22(4), p. 559-585.

Hughes, J. P., L.J. Mester, and C.G. Moon (2001), Are scale economies in banking ellusive or illusive? Evidence obtained by incorporating capital structure and risk-taking into models of bank production, *Journal of Banking & Finance*, Vol. 25(12), p. 2169–2208.

Humphrey, D.B., and B. Vale (2004), Scale economies, bank mergers, and electronic payments: A spline function approach. *Journal of Banking & Finance*, Vol. 28(7), p. 1671–1696.

Iimi, A. (2004), Banking sector reforms in Pakistan: economies of scale and scope, and cost complementarities. *Journal of Asian Economics*, Vol. 15(3), p. 507–528.

Independent Commission on Banking (2011), *Final report recommendations*, London: Independent Commission on Banking.

Inklaar, R., and J.C. Wang (2013), Real Output of Bank Services: What Counts is What Banks Do, Not What They Own, *Economica*, Vol. 80(317), p. 96-117.

James, C. (1996), RAROC at Bank of America: From Theory to Practice, *Journal of Applied Corporate Finance*, Vol. 9(2), p. 83-93.

Jansen, J., M. Bijlsma, M. Kruidhof, and C. Pattipeilohy (2013),Funding problems in the mortgage market, *DNB Occasional Studies*, Vol. 11(1), Amsterdam: De Nederlandsche Bank.

Jensen, M.C., E.F. Fama, J.B. Long Jr., R.S. Ruback, G.W. Schwert, C.W. Smith Jr., and J. Warner (1989), Clinical papers and their role in the development of financial economics, *Journal of Financial Economics*, Vol. 24(1), p. 3-6.

Jonker, J. (2008), Scale at any price. The rise and predictable fall of ABN AMRO, 1960-2006, *Utrecht University working paper*.

Klein, P.G., and M.C. Saidenberg (2010), Organisational structure and the diversification discount: Evidence from commercial banking, *Journal of Industrial Economics*, 58(1), p. 127–55.

Kluis, C.E., and J.E.B. van der Veen de Lille (1999), Jaarcijfers 1998: Ups en downs bij Nederlandse banken, *Bank- en effectenbedrijf*, Vol. 48(June), p. 12-16.

Koelewijn, J. (2000), Nederlandse financials: Ambities en resultaten, *Bank- en effectenbedrijf*, Vol. 49(September), p. 2-3.

Koelewijn, J. (2008), De overname van ABN AMRO: de belangen van de stakeholders in diverse scenario's geanalyseerd, In: *Geld en Bankwezen*, chapter 23.

Koetter, M., J.W. Kolari, and L. Spierdijk (2012), Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for U.S. Banks, *The Review of Economics and Statistics*, Vol. 94(2), p. 462–480.

Koetter, M., and F. Noth (2013), IT use, productivity, and market power in banking, *Journal of Financial Stability*, Vol. 9(4), p. 695-704 .

Koetter, M., and M. Wedow (2010), Finance and Growth in a Bank-Based Economy: Is It Quantity or Quality That Matters?, *Journal of International Money and Finance*, Vol. 29, p. 1529-1545.

Košak, M., and J. Zorić (2011), Accounting for Heterogeneity in Cross-Country Bank Efficiency Comparisons: The Case of New EU Member States, *Economics of Transition*, Vol. 19(3), p. 473-494.

Koutsomanoli-Filippaki, A. and E.C. Mamatzakis (2010), Estimating the speed of adjustment of European banking efficiency under a quadratic loss function, *Economic Modelling*, Vol. 27(1), p. 1-11.

KPMG (2013), *Nederlandse Hypotheek Instelling: Analyse van specifieke risico's voor de Nederlandse Staat*, Amsterdam, 17 september.

KPMG (2014), *Barriers to entry, growth and exit in the retail banking market in the Netherlands*, Amsterdam: KPMG.

Krüger, P., A. Landier, and D. Thesmar (2015), The WACC Fallacy: The Real Effects of Using a Unique Discount Rate, *Journal of Finance*, Vol.70(3), p. 1253-1285.

Laeven, L., and R. Levine (2007), Is there a diversification discount in financial conglomerates?, *Journal of Financial Economics*, Vol. 85(2), p. 331–367.

Langfield, S., and M. Pagano (2016), Bank bias in Europe: effects on systemic risk and growth, *Economic Policy*, Vol. 31(85), p. 51-106.

Larson, M.J., G. Schnyder, G. Westerhuis, and J. Wilson (2011), Strategic responses to global challenges: The case of European banking, 1973-2000, *Business History*, Vol. 53(1), p. 40-62.

Le Leslé, V., and S. Avramova (2012), Revisiting Risk-Weighted Assets: Why Do RWAs Differ Across Countries and What Can Be Done About It? *IMF discussion paper*, WP 12/90.

Leland, H.E., and D.H. Pyle (1977), Informational Asymmetries, Financial Structure, and Financial Intermediation, *Journal of Finance*, Vol. 32(2), p. 371-387.

Lensink, R., A. Meesters, and I. Naaborg (2008), Bank Efficiency and Foreign Ownership: Do Good Institutions Matter?, *Journal of Banking & Finance*, Vol. 32(5), p. 834-844.

Lewis, M.S. (2012), Price Leadership and Coordination in Retail Gasoline Markets with Price Cycles, *International Journal of Industrial Organization*, Vol. 30(4), p. 342-351.

Liikanen, E., H. Bänziger, J.M. Campa, L. Gallois, M. Goyens, J.P. Krahnen, M. Mazzucchelli, C. Sergeant, Z. Tuma, J. Vanhevel, and H. Wijffels (2012), *High-level Expert Group on Reforming the Structure of the EU Banking Sector, Final Report to the European Commission,* Brussels.

Lin, X., and Y. Zhang (2009), Bank ownership reform and bank performance in China, *Journal of Banking & Finance*, Vol. 33(1), p. 20-29.

Lou, W., and X. Yin (2014), The impact of the global financial crisis on mortgage pricing and credit supply, *Journal of International Financial Markets, Institutions and Money*, Vol. 29(1), p. 336-363.

Lozano-Vivas, A. and F. Pasiouras (2010), The impact of non-traditional activities on the estimation of bank efficiency: International evidence, *Journal of Banking & Finance*, Vol. 34(7), 1436–1449.

Lozano-Vivas, A., J.T. Pastor, and I. Hasan (2001), European Bank Performance Beyond Country Borders: What Really Matters? *European Finance Review*, Vol. 5(1-2), p. 141–165.

MacKinnon, J.G. (2010), Critical values for cointegration tests, *Queen's Economics Department Working Paper*, No. 1227.

Marinč, M. (2013), Banks and Information Technology: Marketability vs. Relationships, *Electronic Commerce Research*, Vol. 13(1), p.71-101.

Mariathasan, M., and O. Merrouche (2014), The manipulation of basel risk-weights, *Journal of Financial Intermediation*, Vol. 23(3), p. 300-321.

Martín-Oliver, A., and V. Salas-Fumás (2008), The output and profit contribution of information technology and advertising investments in banks, *Journal of Financial Intermediation*, Vol. 17(2), p. 229-255.

Maudos, J., and J. Fernández de Guevara (2007) The cost of market power in banking: Social welfare loss vs. cost inefficiency, *Journal of Banking & Finance*, Vol. 31(7), p. 2103–2125.

Mayer, T., and S. Zignago (2011), Notes on CEPII's distances measures: The GeoDist database, *CEPII working paper*, no. 2011 – 25 December.

McAllister, P.H., and D. McManus (1993), Resolving the Scale Efficiency Puzzle in Banking, *Journal of Banking & Finance*, Vol. 17(2-3), p. 389-405.

McKinsey (2008), Enduring Ideas: The GE–McKinsey nine-box matrix, *McKinsey Quarterly*, September.

Mester, L.J. (1991), Agency Costs Among Savings and Loans, *Journal of Financial Intermediation*, Vol. 1(3), p. 257-278.

Mester, L.J. (1996) A study of bank efficiency taking into account risk-preferences, *Journal of Banking & Finance*, Vol. 20(6), p. 1025-1045.

Mester, L.J. (2008) Optimal Industrial Structure in Banking. In: A.W.A. Boot, and A.V. Thakor (Eds.) *Handbook of Financial Intermediation and Banking*. Chapter 5, p. 133-162.

Mester, L.J. (2010) Scale Economies in Banking and Financial Regulatory Reform. *The Region*, September 2010, p. 10-13.

Ministry of Finance (2013), Kabinetsvisie Nederlandse bankensector, *Letter to the Lower House*, August 23.

Ministry of Finance (2014), Brief minister met de kabinetsreactie op rapport 'Barrières voor toetreding tot de Nederlandse bancaire retailsector' van de Autoriteit Consument en Markt (ACM), *Letter to the Lower House 32013, no. 83*.

Modigliani, F., and M.H. Miller (1958), The Cost of Capital, Corporation Finance and the Theory of Investment, *American Economic Review*, Vol. 48(3), p. 261-297.

Moody's Investors Service (2013), *Dutch Banks: Government's Proposal to Transfer Dutch Mortgages is Credit Positive*, September 26.

Mulder, A., and G. Westerhuis (2015), The determinants of bank internationalisation in times of financial globalisation: evidence from the world's largest banks, 1980–2007, *Business History*, Vol. 57(1), p. 122-155.

Mulder, M. (2014), The impact of concentration and regulation on competition in the Dutch mortgage market, *Journal of Competition Law & Economics,* Vol. 10(4), p. 795-817.

Mulder, M., and M. Lengton (2011a), Competition and interest rates in the Dutch mortgage market, *NMa Working Papers No. 5*, The Hague: Nederlandse Mededingingsautoriteit.

Mulder, M. and M. Lengton (2011b), Invloed concurrentie op hypotheekrente, *ESB*, Vol. 96(4618), p. 558-561.

NMa (2010), *Quick Scan Hypotheekrente: Een onderzoek naar de marges op hypotheken*, The Hague: Nederlandse Mededingingsautoriteit.

NMa (2011), *Sectorstudie Hypotheekmarkt: Een onderzoek naar de concurrentieomstandigheden op de Nederlandse hypotheekmarkt*, The Hague: Nederlandse Mededingingsautoriteit.

Norbart, J. (2000), Jaarcijfers Nederlandse banken 1999: Spectaculair herstel van Nederlandse banken, *Bank- en effectenbedrijf*, Vol. 49(June), p. 23-27.

Noss, J., and R. Sowerbutts (2012), The implicit subsidy of banks, *Bank of England Financial Stability Paper*, no. 15.

Neuhann, D., and F. Saidi (2012), The rise of the universal bank: Financial architecture and firm volatility in the United States, *New York University Working Paper*.

OECD (2011), *OECD StatExtracts*, 17 November 2011.

Orhangazi, Ö (2008), Financialisation and capital accumulation in the non-financial corporate sector: A theoretical and empirical investigation on the US economy: 1973–2003, *Cambridge Journal of Economics*, Vol. 32(6), p. 863-886.

Overvest, B., and G. Tezel (2014), Notes on the margin: The Dutch mortgage market, *Journal of Competition Law & Economics,* Vol. 10(4), p. 779-794.

Palepu, K. (1985), Diversification strategy, profit performance and the entropy measure*, Strategic Management Journal*, Vol. 6(3), p. 239-255.

Pasiouras, F., S. Tanna, and C. Zopounidis (2009), The impact of banking regulations on banks' cost and profit efficiency: Cross-country evidence, *International Review of Financial Analysis*, Vol. 18(5), p. 294–302.

Pennacchi, G. (2012), Narrow banking, *Annual Review of Financial Economics*, Vol. 4(1), p. 1-36.

Petersen, M.A. (2004), Information: Hard and soft, *Kellogg School of Management Working Paper*.

Philippon, T. (2008), The Evolution of the US Financial Industry from 1860 to 2007: Theory and Evidence, *NBER working paper*.

Philippon, T., and A. Reshef (2012), Wages and Human Capital in the U.S. Financial Industry: 1909-2006, *Quarterly Journal of Economics*, Vol. 127(4), p. 1551-1609.

Prahalad, C.K., and G. Hamel (1990), The Core Competence of the Corporation, *Harvard Business Review*, Vol. 68(3), p. 79-91.

Rajan, R.G., and L. Zingales (1998), Financial Dependance and Growth, *American Economic Review*, Vol. 88(3), p. 559-586.

Rapp, M.S., D. Schellong, M. Schmidt, and M. Wolff (2011), Considering the shareholder perspective: value-based management systems and stock market performance, *Review of Managerial Science*, Vol. 5(2), p. 171-194.

Richardson, M., R.C. Smith, and I. Walter (2010), Large Banks and the Volcker Rule, In: V.V. Acharya, T.F. Cooley, M.P. Richardson, and I. Walter

(Eds.), *Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance*, Wiley, p. 181-212.

Rime, B. (2005), Do "too big to fail" expectations boost large bank issuer ratings? *Swiss National Banks, Systemic Stability Section: Working Paper*.

Ross, S.A. (1976), The arbitrage theory of capital asset pricing, *Journal of Economic Theory*, Vol. 13(3), p. 341-360.

Rotemberg, J.J., and G. Saloner (1990), Collusive Price Leadership, *Journal of Industrial Economics*, Vol. 39(1), p. 93-111.

Santos, A.O., and D. Elliott (2012), Estimating the Costs of Financial Regulation, *IMF staff discussion note*, SDN/12/11.

Sanyal, P., and R. Shankar (2011), Ownership, competition, and bank productivity: An analysis of Indian banking in the post-reform period, *International Review of Economics & Finance*, Vol. 20(2), p. 225–247.

Saracogu, N. (2009), Changing power balance in matrix organizations, *Dissertation*, The University of Technology, Sydney.

Schinkel, M.P. (2012), Hoe de Banken hun PLV's Kregen, *Markt & Mededinging*, Vol. 15(5), 190-196.

Schipper, I. (2005), *ABN AMRO company profile*, Amsterdam: SOMO.

Schmid, M.M., and I. Walter (2009), Do financial conglomerates create or destroy economic value?, *Journal of Financial Intermediation*, Vol. 18(2), p. 193-216.

Schmid, M.M., and I. Walter (2014), Firm structure in banking and finance: is broader better?, *Journal of Financial Perspectives*, Vol. 2(2), p. 65-75.

Seaton, J.S., and M. Waterson (2013), Identifying and characterising price leadership in British supermarkets, *International Journal of Industrial Organization*, Vol. 31(5), p. 392-403.

Sharma, A.K., and S. Kumar (2010), Economic Value Added (EVA) – Literature Review and Relevant Issues, *International Journal of Economics and Finance*, Vol. 2(2), p. 200-220.

Slovik, P., and B. Cournède (2011), Macroeconomic impact of Basel III, *OECD Economics Department working papers*, no. 844.28.

Smit, J. (2008), *De Prooi*, Amsterdam: Prometheus.

Solow, R.M. (1957), Technical Change and the Aggregate Production Function, *Review of Economics and Statistics*, Vol. 39(3), p. 312-320.

Spierdijk, L. (2012), De invloed van bankenconcurrentie op de economie, *ESB*, 97(4643), 545–547.

Stiroh, K.J. (2004a), Diversification in banking: Is noninterest income the answer? *Journal of Money, Credit and Banking*, Vol. 36(5), p. 853-882.

Stiroh, K.J. (2004b), Do Community Banks Benefit from Diversification? *Journal of Financial Services Research*, Vol. 25(2), p. 135-160.

Stiroh, K.J., and A. Rumble (2006), The dark side of diversification: The case of US financial holding companies, *Journal of Banking & Finance*, Vol. 30(8), p. 2131-2161.

System of National Accounts (1993), *System of National Accounts 1993*, Washington D.C.: United Nations.

Tadesse, S. (2006), Consolidation, scale economies and technological change in Japanese banking, *International Financial Markets, Institutions and Money*, Vol. 16(5), p. 425-445.

Thakor, A.V. (2012), The Economic Consequences of the Volcker Rule, *Paper for the U.S. Chamber's Center for Capital Markets Competitiveness*.

Thomae, H. (1999), The nomothetic-idiographic issue: Some roots and recent trends, *International Journal of Group Tensions*, Vol. 28(1-2), p. 187-215.

Toolsema, L.A., and J.P.A.M. Jacobs (2007), Why Do Prices Rise Faster than They Fall? With an Application to Mortgage Rates, *Managerial and Decision Economics*, Vol. 28(7), p. 701-712.

Tufano, P. (2001), Complementary Research Methods, *Journal of Financial Economics*, Vol. 60(2-3), p. 179-185.

Tweede Kamer (2012), Parlementaire enquête financieel stelsel, *Tweede Kamer stukken*, no. 31980, nr. 62, p. 1451-1452.

Ueda, K., and B. Weder di Maurer (2013), Quantifying structural subsidy values for systemically important financial institutions , *Journal of Banking & Finance*, Vol. 37(10), p. 3830-3842.

Uhde, A., and U. Heimeshoff (2009) Consolidation in banking and financial stability in Europe: Empirical evidence. *Journal of Banking & Finance*, Vol. 33(7), p. 1299-1311.

Valadkhani, A. (2013), The pricing behavior of Australian banks and building societies in the residential mortgage market, *Journal of International Financial Markets, Institutions & Money*, Vol. 26, p. 133-151.

Valadkhani, A., and A. Worthington (2014), Asymmetric behavior of Australia's Big-4 banks in the mortgage market, *Economic Modelling*, Vol. 43(C), p. 59-66.

Valickova, P., T. Havranek, and R. Horvath (2015), Financial development and economic growth: A meta-analysis, *Journal of Economic Surveys*, Vol. 29(3), p. 506-526.

Van Beek, T., and R. Gunther (2004), Interview Marcel Schürman. Opleiden met business-impact! *Bank- en Effectenbedrijf*, Vol. 53(October), p.24-27.

Van den Brink, R.G.C. (2003), Bankstrategie en bankcultuur, *Speech at the acceptance of professorship*, May 20, University of Amsterdam.

Van den Brink, R.G.C. (2007), Bankstrategie en bankcultuur, *Bank- en effectenbedrijf*, Vol. 56(December), p. 27.

Van den Brink, R.G.C. (2008), ABN Amro en de kredietcrisis, *Bank- en effectenbedrijf*, Vol. 57(December), p. 35.

Van der Feen de Lille, J.E.B. (1998), 1997: Recordjaar Nederlandse banken, *Bank- en effectenbedrijf*, Vol. 47(June), p. 4-12.

Van der Feen de Lille, J.E.B., and C. Czíria (2001), Het jaar van de nieuwe voorzitters, *Bank- en effectenbedrijf*, Vol. 50(June), p. 16-21.

Vries, J. de, W. Vroom, and T. de Graaf (1999), *Worldwide banking: ABN AMRO Bank 1824-1999*. Amsterdam: ABN AMRO Bank N.V.

Walter, I. (2003), Strategies in Financial Services, the Shareholders, and the System: Is Bigger and Broader Better?, *Brookings-Wharton Papers on Financial Services*, Vol. 2003, p. 1-36.

Weill, L. (2009), Convergence in banking efficiency across European countries, *Journal of International Financial Markets, Institutions & Money*, Vol. 19(5), p. 818-833.

Westerhuis, G. (2008), Conquering the American market: ABN AMRO, Rabobank and Nationale-Nederlanden working in a different business environment, 1965-2005, *Dissertation*, Utrecht University.

Westerhuis, G. (2011), Multinationals en het managen van buitenlandse dochterondernemingen: Een historisch onderzoek naar de relatie tussen ABN AMRO en LaSalle, *Tijdschrift voor Sociale en Economische Geschiedenis*, Vol. 8(1), p. 83-107.

Wheelock, D.C., and P.W. Wilson (2012), Do Large Banks Have Lower Costs? New Estimates of Returns to Scale for U.S. Banks, *Journal of Money, Credit and Banking*, Vol. 44(1), p. 171-199. February 2012

Yildirim, H.S., and G.C. Philippatos (2011), Efficiency of Banks: Recent Evidence from the Transition Economies of Europe, 1993-2000, *The European Journal of Finance*, Vol. 13(2), p. 123-143.

ABN AMRO sources

ABN AMRO (2000a), Strategische heroriëntatie: Sterkere nadruk op cliënten en aandeelhouderswaarde, *Press release*, May 30.

ABN AMRO (2000b), Annual report 1999. Amsterdam: ABN AMRO.

ABN AMRO (2001), Managing Board Agenda: Potential refinement of Group strategy, *ABN AMRO Internal Document*, June 21.

ABN AMRO (2002), Spaghetti 2: Contribution of WCS to the Group's asset gathering end-game, *ABN AMRO Internal Document*, February 12.

ABN AMRO (2003a), Annual report 2002. Amsterdam: ABN AMRO.

ABN AMRO (2003b), Group strategy update: Managing board offsite, *ABN AMRO Internal Document*, June 25-26.

ABN AMRO (2004a), Annual report 2003. Amsterdam: ABN AMRO.

ABN AMRO (2004b), Group strategy update: Managing board offsite, *ABN AMRO Internal Document*, May 25.

ABN AMRO (2005a), Playing to our strengths: An update on the implementation of our strategy, *Presentation*, London, February 7.

ABN AMRO (2005b), Annual report 2004. Amsterdam: ABN AMRO.

ABN AMRO (2005c), ABN AMRO launches cash offer for Banca Antonveneta: Fully aligned with mid-market strategy, *Presentation,* Amsterdam: ABN AMRO.

ABN AMRO (2006), Annual report 2005. Amsterdam: ABN AMRO.

ABN AMRO (2007), Annual report 2006. Amsterdam: ABN AMRO.

Groenink, R. (2010), Interview commissie de Wit, *Interview Tweede Kamer*, February 3.

International media
Business Week (1996), Slow and steady at ABN AMRO, *Business Week*, October 27.

Daily Deal (2001), Citigroup snatches up EAB for $1.95B, *Daily Deal*, October 30.

Economist, the (2002), Strategies for corporate and institutional banking. Big, bigger, biggest, *The Economist*, April 4.

Financial News (2006), Not all plain sailing for ABN AMRO, *Financial News*, August 14.

Financial Times (1997), ABN Amro, the Lex Column, *Financial Times*, August 22.

Financial Times (1998), ABN Amro, the Lex Column, *Financial Times*, July 9.

Financial Times (1999a),Taking confidence in the Real deal: ABN Amro believes its $2.1bn purchase of Brazil's Banco Real was a sound investment, *Financial Times*, March 31.

Financial Times (1999b), Dutch institution to scale back commercial lending to focus on more lucrative activities, *Financial Times*, August 20.

Financial Times (2000a), 'Tougher' look at Dutch bank: Chairman bids to impose new culture at 'bureaucratic' bank with foreign faces at top, *Financial Times*, May 31.

Financial Times (2000b), ABN Amro of the Netherlands is undergoing a fundamental reorganization to change both its structure and culture, *Financial Times*, July 27.

Financial Times (2000c), ABN Amro, the Lex column, *Financial Times*, August 18.

Financial Times (2001), ABN Amro, the Lex column, *Financial Times*, August 17.

Financial Times (2006), Making education make money, ABN Amro regards teaching as a focal point, *Financial Times*, June 19.

Forbes (1999), Dutch colonizers, *Forbes*, June 14.

Fortune (2012), Banco Santander's Emilio Botín takes on the world, *Fortune*, March 23.

The Children's Investment Fund (2007), Agenda items for the AGM of ABN AMRO Holding N.V. on 26 April 2007, February 20.

Dutch media

Beleggersbelangen (2001), Goede vooruitzichten ABN AMRO, *Beleggersbelangen*, May 11.

Beleggersbelangen (2002a), ABN AMRO moet strategie kiezen, *Beleggersbelangen*, January 25.

Beleggersbelangen (2002b), ABN AMRO op de goede weg, *Beleggersbelangen*, February 22.

Beleggersbelangen (2002c), Beren op ABN's weg, *Beleggersbelangen*, August 2.

Beleggersbelangen (2003), ABN AMRO op zoek naar groei, *Beleggersbelangen*, Februari 21.

Beleggersbelangen (2004), ABN AMRO stelt teleur, *Beleggersbelangen*, November 5.

Beleggersbelangen (2006a), ABN AMRO overtuigt niet, *Beleggersbelangen*, April 28.

Beleggersbelangen (2006b), Nieuwe indeling ABN AMRO, *Beleggersbelangen*, April 14.

Beleggersbelangen (2006c), ABN's vruchteloze snijden, *Beleggersbelangen*, October 20

Consumentenbond (2011), Hypotheekrente, *Letter to the Minister of Finance*, February 9.

Elsevier (2000), Rijkman Groenink: 'Het wordt bij de bank nooit meer zoals het was', *Elsevier*, Vol. 56(December 16).

Elsevier (2005), Nederlander van het jaar: Lefgozer die Italië veroverde, *Elsevier*, Vol. 61(December 31), p. 70-76.

Elsevier (2015), De bank die ooit zo groot was, *Elsevier*, Vol. 71(15), p. 16-23.

Financieele Dagblad (2000a), Wachten op cultuuromslag, *Het Financieele Dagblad*, December 2.

Financieele Dagblad (2000b), Groenink stuurt ABN AMRO de bancaire snelweg op, *Het Financieele Dagblad*, June 2.

Financieele Dagblad (2001), De achttien maanden van Groenink, *Het Financieele Dagblad*, February 15.

Financieele Dagblad (2002), ABN AMRO verlies 6673 werknemers, January 16.

Financieele Dagblad (2005), ABN bekeert zich tot het midden, February 8.

Financieele Dagblad (2010), Rente helpt Rabo aan Record, 26 August.

FEM Business (2002), Jiskoot's probleem, *FEM Business*, June 15.

FEM Business (2004), Rijkman rekent zichzelf af, *FEM Business*, Vol. 7(50).

FEM Business (2005a), ABN AMRO: Zakenbank in glijvlucht, *FEM Business*, Vol. 8(44), p. 14-16.

FEM Business (2005b), ABN AMRO: Onbegrepen, ongeliefd, *FEM Business*, Vol. 8(50), p. 40-42.

FEM Business (2005c), Groenink moet voorspelbaar worden, *FEM Business*, Vol. 8(50), p. 7.

NRC Handelsblad (2003), ABN Amro beperkt rechten van ondernemingsraad, February 18.

Rabobank (2012), *Uitleg opbouw hypotheektarief*, www.rabobank.nl, consulted September 14.

VEB (2004), *Letter to the shareholders of ABN AMRO*, The Hague: Vereniging van Effectenbezitters.

VEB (2005), *Letter to the shareholders of ABN AMRO*, The Hague: Vereniging van Effectenbezitters.

Volkskrant (2007), Profiel Rijkman Groenink, *Volkskrant*, March 24.

VEH (2011), Klacht Vereniging Eigen Huis tegen hypothecaire geldverstrekkers, *Letter to the Dutch Competition Authority (NMa),* March 24.

ZEMBLA (2012) *Uw hypotheek als melkkoe,* TV-documentary, available at www.zembla.nl, September 14.

Samenvatting (Summary in Dutch)

Sinds de recente financiële crisis zijn schaal- en scopevoordelen van banken actueler dan ooit. Zowel individuele banken als de financiële sector als geheel zijn steeds groter geworden, zelfs na de financiële crisis. Academici en beleidsmakers vragen zich af of deze toename in grootte van financiële instellingen efficiënt is. Het antwoord, zoals vaak binnen de economische wetenschap, is dat het er van afhangt. Schaal- en scopevoordelen lijken te bestaan voor individuele financiële instellingen, maar er zitten limieten op, en ze kunnen ook negatief worden. Dit proefschrift gaat dieper in op de vraag of schaal- en scopevoordelen bestaan, waardoor deze veroorzaakt worden en wanneer deze wel en juist niet ontstaan.

Breder gaat dit proefschift over de rol van de financiële sector in de maatschappij. Hoe de financiële sector toevoegt aan de welvaart is van belang voor de effectiviteit van beleidsvoorstellen. Huidige voorstellen op het gebied van financiële regelgeving zijn gericht op kapitaaleisen, verbieden van bepaalde activiteiten en het opsplitsen van banken. De effectiviteit van deze voorstellen zal afhangen van de structuur van de financiële sector. Als bijvoorbeeld schaal- en scopevoordelen geheel verklaard worden door impliciete overheidssubsidies, dan is het opsplitsen van banken mogelijk heel zinvol. Als daarentegen schaal- en scopevoordelen bestaan zodat grotere banken een kostenvoordeel hebben, dan leidt het opsplitsen van banken ook tot hogere kosten die deels worden doorgegeven aan consumenten. Het netto effect hangt dan af van de grootte van beide.

De centrale onderzoeksvraag van dit proefschrift wordt op verschillende manieren benaderd. Hoofdstuk 2 beschrijft de literatuur op het gebied van schaal- en scopevoordelen en hoe de financiële sector aan welvaart bijdraagt. De literatuur constateert ruwweg dat de financiële sector toevoegt aan de welvaart totdat zij een bepaalde omvang bereikt, en dat er onvoldoende voor risico gecorrigeerd wordt in het meten van de toegevoegde waarde van de financiële sector. Daarnaast worden veelal positieve schaalvoordelen geconstateerd tegenover een negatieve waarde

van meerdere activiteiten (scopenadelen). Onderzoeken gebaseerd op data van voor de eeuwwisseling vinden meestal schaalvoordelen tot een bepaalde grootte, waarna deze omslaan in schaalnadelen. Onderzoeken op basis van meer recente data (na 2000) constateren veelal schaalvoordelen voor elk niveau van de activa. Voor wat betreft de bronnen van schaal- en scopevoordelen wordt gedacht dat de agentschapskosten bij meerdere activiteiten te groot zijn voor de mogelijke voordelen van het hebben van meerdere activiteiten. Schaalvoordelen kunnen efficiënt of inefficiënt zijn. Efficiënte schaalvoordelen ontstaan doordat vaste kosten worden uitgesmeerd over een grote hoeveelheid output, terwijl inefficiënte schaalvoordelen kunnen ontstaan door monopoliemacht of impliciete overheidsgaranties wanneer grote banken niet failliet kunnen gaan.

Hoofdstuk 3 schat schaal- en scopevoordelen op basis van een dataset van Europese banken over meerdere jaren en meerdere landen. Hier wordt met name dieper ingegaan op de vraag of schaal- en scopevoordelen efficiënt zijn, of met name het product van impliciete overheidssubsidies doordat grote banken niet failliet kunnen gaan. Om dit te onderzoeken worden ongeveer 18000 bankobservaties tussen 2002 en 2011 gebruikt. Om de effecten van impliciete overheidssubsidies te schatten wordt een proxy geïntroduceerd: ratings uplifts. Ratings uplifts worden gemeten door het verschil tussen twee ratings van Moody's, namelijk het verschil tussen de zogenaamde Bank Financial Strength Rating, de rating die de bank beoordeelt zonder de mogelijkheid van externe steun, en de rating wanneer deze steun wel mogelijk is. Door het verschil tussen deze twee ratings te nemen kan een inschatting gemaakt worden van de hoogte van de impliciete subsidies. Schaalvoordelen worden op alle activa-niveaus gevonden, zelfs wanneer er voor uplifts wordt gecorrigeerd. Wel blijkt dat banken met een uplift lagere schaalvoordelen kennen dan banken zonder uplift, ze zijn dus minder efficient in het creëren van schaalvoordelen. Hetzelfde model wordt gebruikt om scopevoordelen te schatten en constateert dat scopevoordelen ook positief zijn, maar deze resultaten zijn gevoelig voor modelselectie en moeten dus met enige voorzichtigheid worden geïnterpreteerd.

Hoofdstuk 4 is een case study over ABN AMRO in de periode 1997-2007. Voordat ABN AMRO verkocht en opgesplitst werd in 2007 was het één van de

grootste banken ter wereld met activa van meer dan een biljoen euro. Op basis van de resultaten van hoofdstuk 3 zouden dan schaal- en scopevoordelen worden verwacht, maar deze bleken in de praktijk voornamelijk afwezig. De case study constateert dat de bank weinig synergieën wist te creëren tussen verschillende landen en divisies, en dat de Wholesale Clients divisie structureel slechter presteerde dan de andere divisies. Maar hoewel Wholesale Clients slechter presteerde, groeide deze wel sneller dan de andere divisies. Een verklaring hiervoor kan gevonden worden in het managing for value systeem dat gebruikt werd om te meten waar in de organisatie winst werd gecreëerd. Dit systeem bevoordeelde transactiegerichte activiteiten ten opzichte van relatiegerichte activiteiten, omdat transactiegerichte activiteiten winsten op kortere termijn genereerden en een beter meetbaar resultaat opleverden. Tegelijkertijd bracht ABN AMRO over de tijd steeds meer focus aan door branches te verkopen in landen waar het slechts marginaal aanwezig was. Maar hoewel de focus over de tijd toenam, bleef ABN AMRO één van de meest diffuse banken in de wereld. De bank leek niet in staat om voldoende synergieën te creëren tussen thuismarkten en divisies om te compenseren voor de kosten van het managen van een uitgespreide organisatie.

Het laatste hoofdstuk beschrijft de concurrentie op de Nederlandse hypotheekmarkt na het voorjaar van 2009 en is samen met Maarten Pieter Schinkel geschreven. Specifiek gaat dit hoofdstuk in op de vraag waarom de Nederlandse hypotheekrente hoger ligt dan die in omringende landen, terwijl deze daarvoor ongeveer in de Europese middenmoot lag. Toenames van zowel kosten als concentratie spelen een rol, maar de belangrijkste verklaring wordt gezocht in prijsleiderschapsverboden. Omdat een aantal hypotheekaanbieders staatssteun had ontvangen (ING, ABN AMRO, AEGON en SNS), legde de Europese Commissie prijsleiderschapsverboden op zodat ze deze staatssteun niet konden gebruiken om hun concurrenten de markt uit te prijzen. Deze prijsleiderschapsverboden hadden juist in Nederland een effect doordat de Nederlandse hypotheekmarkt gedomineerd werd door enkele hele grote banken. Op basis van een empirische studie van ongeveer een miljoen observaties wordt gevonden dat er sterker op de prijsleidende bank wordt gereageerd na het voorjaar van 2009 dan ervoor, zoals verwacht zou worden na een prijsleiderschapsverbod.

Voor de beleidsdiscussie impliceert dit proefschrift dat het opsplitsen van banken mogelijk leidt tot welvaartsverbeteringen wanneer hierdoor impliciete overheidssubsidies verminderen. Maar tegelijkertijd is er een negatief welvaartseffect omdat schaalvoordelen geconstateerd worden. Het opsplitsen van banken met als doel ze te verkleinen zorgt dan voor hogere kosten bij banken die mogelijk doorgegeven worden aan de consument. Omdat dit proefschrift gemengd bewijs vindt voor scopevoordelen, is het juridisch opsplitsen van banken langs activiteitslijnen mogelijk minder kostbaar. Hier is enige voorzichtigheid genoodzaakt, juist omdat er gemengd bewijs wordt gevonden. Vanuit welvaartsperspectief is het waarschijnlijk aan te moedigen beleid te voeren dat impliciete overheidssubsidies en marktmacht vermindert zonder de schaal en scope van financiële instellingen te verkleinen, zoals kapitaaleisen, bail-in en het versterken van concurrentie door toetredingsbarrieres te slechten.

De case study van ABN AMRO laat daarnaast zien dat grootte niet het enige is dat er toe doet in financiële instellingen. Allereerst hangt de creatie van schaal- en scopevoordelen af van de organisatie van die activiteiten, er is geen universele wet die dicteert dat een toename van schaal of scope altijd kosten zal verlagen of winsten zal verhogen. En ten tweede is het belangrijk om een balans te vinden tussen het creëren van schaal- en scopevoordelen, omdat de creatie van schaalvoordelen scopevoordelen teniet kan doen. Systemen die tot doel hadden de kosten onder controle te houden bij ABN AMRO hebben mogelijk averechtse effecten gehad op de creatie van synergieën, aangezien het managing for value systeem weinig prikkels gaf tot het creëren van synergieën buiten de eigen divisie.

Tot slot is het altijd belangrijk om marktcondities mee te nemen wanneer beleid gemaakt wordt, en niet alleen te kijken naar het mogelijke bestaan van schaal- en scopevoordelen. Prijsleiderschapsverboden werken wellicht goed in diffuse markten zoals de Duitse hypotheekmarkt, maar kunnen sterke anticomptitieve effecten hebben in geconcentreerde markten zoals de Nederlandse hypotheekmarkt. Op eenzelfde wijze kan een managing for value systeem goed werken voor een gefocuste of gespecialiseerde bank, maar kan het teveel averechtse prikkels creëren in banken die difuus zijn en daarom sterk vertrouwen op het creëren van synergieën.