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The Linkages Between Banks and Realtors in the Norwegian Realtor Industry

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Summary

In this thesis, we investigate whether a bank-realtor cross-ownership in Norway affects the final selling price of a house or the probability of obtaining a mortgage in the bank that owns the realtor conveying the sale. The objective is to discover whether such cross-ownership has any anticompetitive effects in the Norwegian realtor industry and the market for mortgages, and how it affects consumers. Such effects could indicate realized efficiency gains through the ownership, or it could imply that the bank-realtor is pushing mortgages on the consumer. Our findings show that when using a bank-owned realtor, the selling price decreases by about 1 %. When it comes to the probability of obtaining a mortgage in the bank which owns the realtor conveying the sale, the result differs depending on the bank-realtor combinations. When DNB Eiendom is the realtor, we find that the probability of having a mortgage in DNB Bank increases with six percentage points, compared to when using other realtors. For the other bank-realtor linkages, the change in probability is quite low, or not significant. Although our results show statistically significant effects, the effects are rather small. Therefore, it is difficult to determine whether cross-ownership has anticompetitive effects or if it harms the consumers.

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Introduction

In this thesis, we study the cross-ownership between Norwegian banks and real estate agencies. The largest real estate agencies in Norway are owned by Norwegian banks. The banks do, therefore, have access to potential mortgage clients through their real estate agencies, as well as through other channels. The realtors owned by banks are DNB Eiendom, Privatmegleren, Krogsveen, Eiendomsmegler1, and Aktiv Eiendomsmegling. We investigate whether a bank realtor cross-ownership affects the selling price and the probability of having a mortgage in the bank that owns the realtor that conveyed the sale. The main questions we will answer is:

1. *Is the housing price higher when the buyer has financing through the bank that owns the real estate agency conveying the housing sale?*

2. *Is it more likely that the buyer has a mortgage in the bank which owns the agency conveying the housing sale?*

The objective is to provide insight into whether a cross-ownership has any anticompetitive effects. If the final price is not affected, bank-realtor ownership is less likely to be problematic for competitive or efficiency reasons. If the probability of having a mortgage in the bank that owns the realtor that conveyed the sale is high, this could indicate that the bank-realtor has efficiently utilized its cooperative ownership structure, which could be related to economics of scope. On the other hand, it may also imply that the realtors are "pushing" mortgages on the customers. Nevertheless, if this probability is high, it may provide anticompetitive effects as it will be more difficult for independent agents (banks or realtors) to attract customers.

To our knowledge, no studies on the effects of cross-ownership of banks and realtors have been made. We discuss the cross-ownership in light of economic theory. We

consider bundling and tying to be the relevant economic theories, and present two different models that shed light on the implications of tying and bundling. Tying and bundling is the practice of selling two products as a package (Economides, 2014). Bundling is a general term for the practice of selling a package of products, and tying implies that the purchase of one product is conditioned upon the purchase (or other requirements) of another product (Economides, 2014). Lastly, we discuss the relevancy of these theories to the Norwegian realtor industry.

We hypothesize that a bank-realtor cross-ownership may have implications for the buyers. More specifically, we believe that buyers may be affected by the final price or through the probability of having a mortgage in the bank that owns the real estate agency that conveyed the sale. Concerning the final price, we expect that the real estate agencies' incentives when conveying the sale may depend on whether or not a bank owns them. For instance, if the real estate agency is bank owned, they might be more concerned with conveying mortgages than obtaining a high price. Furthermore, we investigate whether or not specific banks can sell more mortgages through their realtor, by checking if the probability of having a mortgage in the same bank increases when using the bank's realtor. Commonly, real estate agents offer to provide proof of financing in "their" bank at open house viewings. If one bank/realtor has a substantially larger share of the market than its competitors, this may affect the competition in the market for mortgages and realtor services.

To test our hypotheses, we have used data on transactions and property collateralization, which includes information on the time of purchase, price, buyers' age group, localization of property, and hedonics. The data contains information on transactions in Oslo, Bærum, Bergen, and Stavanger, and is collected from January 1993 to February 2018. The data includes information on which real estate agency was used and the bank responsible for the financing. The data allows us to identify the instances where a bank-owned real estate agency was used, and when a bank that owns a real estate agency is responsible for the financing.

We study our hypotheses empirically using hedonic regression models, particularly, a multiple linear regression model and a linear probability model. For the former, we use the dummy variables *bankowned* and *samebank*, which indicates whether a bank owns the real estate agency or if the buyer has used the same bank and realtor. We find that whether a bank owns the realtor has no statistically significant effect on the price. On the other hand, we find that when using the same bank and realtor, the final price is about 1% lower. This finding might indicate that the realtor is less interested in approaching potential buyers that are not already customers within the bank or are more interested in selling mortgages than obtaining a higher price. Although this effect is significant, it is rather low, and one cannot tell whether this reduction may have implications for competition in the two markets.

Next, we use a linear probability model to study if the probability of having a mortgage in a particular bank is dependent on using the bank's realtor. When using DNB Eiendom, we find that obtaining a mortgage in DNB Bank increases by six percentage points. However, this substantial number could indicate realized efficiency effects from the cross-ownership. On the other hand, if DNB manages to increase its already high market share in the banking sector through its realtor, it may affect other banks' ability to compete. For the other bank-owned realtors, the probability of having a mortgage in the associated banks are either low or not significant. Furthermore, we use *samebank* as the dependent variable to investigate if the probability of using the same bank and realtor is affected by characteristics with the transaction, such as when the transaction took place, the age of the buyers, and the housing type. Among others, the findings show that younger buyers are less likely to use the same bank and realtor than older buyers, and the probability of using the same bank and realtor is higher after the year 2000.

Although our findings are significant, the effects are rather small. Thus, it is uncertain whether a bank-realtor linkage could provide any anticompetitive effects in the markets or impact the consumers negatively.

We will first provide an overview of the Norwegian realtor industry, including characteristics, developments, ownership structure, and regulations. Next, we present some theories on the efficiency effects of bank-realtor cross-ownership. The literature review covers the theories of tie-in sales and bundling, and we also discuss the relevancy of these theories in the scope of our thesis. The empirical part of the thesis includes information about the data, research method, and results. Finally, we will discuss the main findings and implications and provide some concluding remarks.

Overview of the Norwegian Realtor Industry

Development and Characteristics

The Norwegian realtor industry is dominated by large real estate chains, where the major part is owned or controlled by Norwegian banks (NOU, 2006:1). When the Real estate law (Lov om eiendomsmegling)[1] of 1989 was passed, the realtor industry consisted of mostly independent realtors, where one person was responsible for the business (NOU, 2006:1). The current market structure started developing in the late 1990s (Stamsø, 2011), and by 2003, the realtors owned by banks constituted a share of more than 40% of the total marked (Stamsø, 2011). The realtors owned by banks are DNB Eiendom (Owned by DNB Bank), Privatmegleren (owned by Nordea), Eiendomsmegler1 (owned by Sparebank1), Aktiv Eiendomsmegling (owned by Eika Gruppen), and Krogsveen[2] (owned by Pareto Bank) (Eie, 2017; Dagens Næringsliv,

[1] Lov om eiendomsmegling: Norges Eiendomsmeglingsforbund. (2018). Engelsk ordliste for bolighandelen.

[2] From 2005-2018 Krogsveen was owned by Danske Bank. In 2018, Krogsveen was purchased by Pareto Bank, Danske Bank has continued its cooperation with the real estate agency (Dagens Næringsliv, 2018). Pareto Bank does not operate in the market for mortgages.

2018). In 2016, these agencies accounted for 64% of all housing sales (Huseiernes Landsforbund, 2018).

In the last decades, the supply of realtor services has increased, and the agencies have grown in size and number (Stamsø, 2011; NOU, 2006:1). This development has resulted in higher competition among the agencies and put downward pressure on the prices of real estate services, at least in some areas of the industry (NOU, 2006:1). After 1990, requirements concerning marketing and licensing of agents have become stricter. In addition, consumers have gotten higher expectations of the standard of the property, and new technological tools have entered the industry. As a result, the way real estate agencies practice their profession has changed throughout the last decades (NOU, 2006:1).

In 1990, the Financial Supervisory Authority of Norway registered around 28,000 real estate transactions through realtors and lawyers, while in 2004, this number had increased to almost 125,000 (NOU, 2006:1). In 2002, SSB registered 30,432 transactions, of which detached houses, small houses[3] and apartments constituted 14,235, 5,407 and 10,790 respectively. In 2019, the number of transactions had increased to 54,030, and the respective numbers for detached houses, small houses and apartments were 26,339, 3,179, and 24,512 (SSB, 2020). Several factors could explain the growing number of transactions and the increasing demand for real estate services, such as the high "self-ownership share", population growth, increased mobilization, growth in the number of divorces, and centralization (Stamsø, 2011; NOU, 2006:1).

[3] "Small houses" (småhus) is defined by The Norwegian Tax Administration as residential property that are physically connected by at least one common wall. This will typically include terraced houses and semi-detached houses.

The banks view the realtors as important distribution channels for the sale of mortgages (NOU, 2006:1). In 2017, Ipsos Public Affairs, on behalf of Huserienes Landsforbund, surveyed people who recently had purchased residential property, and whether they had been offered mortgages through the realtor. 18% of the respondents said the agent had offered a mortgage in the bank connected to the agency. Out of these, 36% had chosen to accept the offer (Ipsos Public Affairs, 2017). Huseiernes Landsforbund (2018) infer that the main reasons for linking products in the realtor industry are complementarity and exploitation of information asymmetry to receive other players' value creation. When two products are complementary, they depend on each other and may have low value without its complement. As many people need financing to purchase a house, a mortgage and a realtor may function as two complementary products/services. Offering complimentary products at the same place reduces transaction costs and enhances efficiency.

Market Shares

The following tables show the market shares for mortgages from the banks that own a realtor, and the realtors' market shares, in our sample. The data is collected from 01.01.1993 to 09.02.2018, and there are 71,358[4] observations. As the first table shows, the bank-owned realtors have a smaller aggregate market share in our sample than the market shares described above. This may be related to the fact that the market composition has changed throughout the sample period. Additionally, our sample only includes Oslo, Bergen, Stavanger, and Bærum, so differences in market shares nationwide are not captured.

[4] There are fewer observations after 2008 compared to the years before. This is because a large numbers of transactions were dropped due to the collateral practice of the real estate agent, which was more prevalent in the years before 2008.

Realtors

DNB Eiendom has a market share of 18.4% nationwide (DNB Group, 2020) and a 16.6% share in our sample. Nationwide, Eiendomsmegler1 and DNB Eiendom are considered to be the largest realtor chains (DNB-Konsernet, 2016; Sparebank1 SR-Bank, 2018), Pareto reports that Krogsveen has a market share of about 7.5% (Pareto Group, 2019). According to Eika's annual report, Aktiv is considered the fourth largest realtor in Norway (Eika Gruppen, 2020). Nationwide, DNB Eiendom increased its market share from 14.9% in 2011 to 18.5% in 2012 and has remained around 18-19% since then (DNB-Konsernet, 2016). This substantiates the point that the numbers in our sample do not reflect the actual distribution.

Realtor	Nr. of transactions	Percent
dnb_eiendom	11,884	16.60
eiendomsmegler1	4,030	5.65
aktiv	1,256	1.76
terra	636	0.89
krogsveen	6,618	9.27
privatmegleren	141	0.20
non bank-owned	46,795	65.63
Total	71,358	100.00

Mortgages

In our sample, DNB has a substantially larger market share than the other firms, particularly in the market for mortgages, where their market share is almost 43%. An overview from Norges Bank (2018) of the market shares in the retail banking industry shows that, as of 06.30.2018, DNB had a market share of 28%, Sparebank1 had a market share of 20% and Nordea and Eika both had a market share of 10%. Danske Bank was not included in the chart, but foreign banks with branches in Norway had an aggregate market share of 9% (Norges Bank, 2018).

Bank	Nr. of transactions	Percent
DNB	30,633	42.93
sparebank1	4,265	5.98
eika	129	0.18
danskebank	1,976	2.77
nordea	6,636	9.30
other	27,719	39.84
Total	71,358	100.00

The Bidding Process: an English Ascending Auction

The Real Estate Law (Lov om eiendomsmegling) and the Alienation Act (Avhendighetsloven)[5] regulates the transaction process (Stamsø, 2011), and residential property is mainly sold through English auctions, which is an ascending auction where bidders provide increasing bids until one bidder remains (Pepall, Richards, & Norman, 2014). In the sales process, the seller puts the property on the market, and potential buyers place bids through the agent. The final price depends on the final bid and seller's acceptance. The winning bid is binding, and the bidder is not able to withdrawal.

Transactions and Costs

A residential property transaction comprises several costs, such as search cost, realtor services, mortgages, taxes, and other fees. The knowledge and experience of the agent could reduce some of the transaction costs. In general, the size of the transaction costs depends on location, taxes, and fees. Furthermore, the final price is highly affected by supply and demand in the real estate market. High demand generally increases the price and vice versa. Demand for real estate depends on the total cost, which implies that high transaction costs will contribute to keeping the

[5] Lov om eiendomsmegling: Norges Eiendomsmeglingsforbund. (2018). Engelsk ordliste for bolighandelen.

prices at a lower level (Stamsø, 2011). Compared to other countries, the transaction cost in Norway are quite low (Stamsø, 2011).

Laws and Regulations

As a main rule, the banks' real estate agency operations should be separated into independent firms and not interrelate with other bank operations (NOU, 2006:1). Norwegian law prohibits real estate agencies from exercising operations outside the scope of real estate, and realtors cannot sell bank-related services to customers (Bråthen, 2014). However, the realtor can encourage buyers to apply for a mortgage in their bank. If the buyer enters into a mortgage agreement based on this encouragement, the agency is nevertheless only able to receive a reward if the buyer and seller are informed about it before the end of the operation. It is only the agency that can receive the reward, and not the agent personally (Bråthen, 2014).

Bank employees cannot receive any rewards for marketing or recommendation, as this is prohibited by the Financial Institution Act (Finansforetaksloven) (Finanstilsynet, 2016). Nevertheless, it is not unusual that the banks' case handlers receive a reward for every loan-customer that enters into a house selling agreement with the real estate agency owned by the bank (Finanstilsynet, 2016). Huseiernes Landsforbund (2017) argue that there have been cases where case handlers have been rewarded when conducting such recommendation and when a loan client uses the bank's real estate agency.

The principle of free realtor choice[6] gives the seller the right to choose which realtor they want to use, regardless of recommendation or linkages between banks and realtors. This principle is supposed to protect the seller from unreasonable agreements. Also, the principle may mitigate the risk of large credit institutions exploiting their dominant market position to attract customers to their real estate operations (Finanstilsynet, 2016). Both the bank and the realtor have to show good

[6] "Prinsippet om fritt meglervalg", own translation

business practice, and the bank is prohibited from including terms that require a specific real estate agency in a mortgage agreement (Bråthen, 2014). If the bank recommends their real estate agency, it has to inform that one is not required to follow this recommendation and that it will not impact the loan terms (Finanstilsynet, 2016).

Bråthen (2014) points out that whether cooperation between banks and agencies happens within the scope of the law has to be seen in the light of the general requirement of the independence of the real estate agent. In a transaction, the real estate agent is a middle-man, independent of other parts and stakeholders. Based on this independency, the agent has to balance the interest of both the buyer and the seller of a property, and cannot act in favor of one of the parties, or according to own interest (Bråthen, 2014). However, the laws protecting the middle-man role of the real estate agent does not hinder banks from owning or controlling real estate agencies. Thus, as long as such linkages do not threaten the independence of the real estate agent, give the agent an unacceptable self-interest, or negatively affect his work or other stakeholders, it is allowed (Bråthen, 2014).

Practical Implications from a Bank-Realtor Cross-Ownership in the Product Offer.

Cross-selling of bank and realtor products can result in a bundle or tie-in arrangement of products. Tying occurs when the purchase of one product is conditioned upon the purchase (or other requirements) of another product. Bundling is a general term for selling a package of products, typically at a discount (Economides, 2014). This can play out in the following ways:

1. The client receives proof of financing or mortgage from a bank but is only allowed to buy a house sold by the bank's real estate agency.

2. The bank offers the client a mortgage if the bank's realtor gets the selling assignment of their current home.

3. A real estate agent approaches a potential buyer at an open house event and offers to contact its bank to provide proof of financing if this is not already obtained. Alternatively, the agent may offer to provide a higher valued proof of financing or a better-termed mortgage. The latter scenario may also happen after the sale is completed.

Scenario 1 is a case of tying because the client is required to buy a house sold by bank's realtor to obtain proof of financing. This is prohibited by law, and the mortgage agreement cannot be conditioned on such requirements (Bråthen, 2014). However, an informal tying arrangement might occur if the bank indirectly offers a higher mortgage or better terms if the client buys a house sold by the bank's realtor, without including this condition in the contract. It is worth noting that if the client approaches the bank to obtain a mortgage for buying a property sold by the bank's realtor, the bank can grant this client a loan (Bråthen, 2014). In this case, there are no requirements from the bank.

The banks may promote and recommend a house from their realtor to the client. If the client is interested, this can reduce transaction costs ("one-stop shopping"). On the other hand, if the client perceives the recommendation as a condition for obtaining the mortgage, the reduced transaction costs might be offset by the limited pool of options. From the seller's perspective, a tie-in arrangement between banks and potential buyers can be beneficial in the sense that it lowers the supply of houses for the buyer. Consequently, the bidding process may intensify, which can result in a higher price.

It is not apparent whether scenario 2 represents a case of tying or mixed bundling. If the contract formally states that the possibility to obtain a mortgage is conditioned on

also using the bank's realtor, this represents a case of tying and is prohibited (Bråthen, 2014). If the bank encourages the client to use their realtor for a sale by offering better prices on realtor services or better terms on the mortgage, the scenario resembles a case of mixed bundling, rather than tying. The client is offered a bundle of products at a discount, but not obliged to take advantage of it. However, if the terms of the mortgage depend on choosing the bundle, this scenario resembles a tying arrangement, rather than a bundle, even though there are no formal requirements. This scenario, therefore, lies in a gray area between what is prohibited and what is allowed. Asymmetric information might induce the realtor to promote a suboptimal offer, and the client could have obtained a better offer elsewhere (Huseiernes Landsforbund, 2018). Case handlers in banks are known to receive a reward for clients that enters into an arrangement with the bank's realtor (Finanstilsynet, 2016). On the other hand, realtors are not allowed to accept rewards from the bank if the realtor recruits a new client for the bank.

For banks and realtors, a tie-in could be beneficial in terms of efficiency and profits. For scenarios 1 and 2, offering financing and real estate services together may induce cost synergy effects, due to decreased operational costs. The duration of the transaction process may be reduced, allowing for more selling assignments. The tie-in arrangement may reduce competition in the real estate market, as non-bank-owned realtors cannot attract potential customers. Banks with a high degree of market power could leverage their market power to the real estate market, which could negatively affect competition in the realtor market. Scenarios 1 and 2 raise doubt about whether the law realistically prevents banks and real estate agencies from exploiting the cross-ownership. Particularly, this is because a cross-ownership between banks and real estate agencies creates an ability to tie financing to the sales transaction, even in the absence of a formal tying agreement, as discussed above (Zumpano, 2002). For instance, Norwegian non-bank-owned realtors claim that the bank-owned realtors are still practicing illegal tying arrangements by requiring their clients to use the bank's realtor to obtain a bridge loan (Løtveit, 2020).

In scenario 3, the interaction may happen before or after a transaction. Because the products are offered at a "discount", and the buyer can choose between different offers, this scenario resembles a case of mixed bundling. Therefore, this scenario seems to be the least problematic when it comes to conflicts with the law. If the offer is better than current offers and reduces search costs, the buyer may be tempted to use the bank of the realtor if he or she receives better terms on the mortgage, or because it reduces search costs. If the buyer is offered a higher or better-termed mortgage, this could increase the possibility of them joining the auction. More bidders may result in a higher price, which benefits the seller.

Theory and Practice

Efficiency Effects of Bank-Realtor Cross-Ownership

Realtor services and mortgages can function as complementary products, as most people need a mortgage to finance the purchase of a house. Bank-realtor cross-ownership may contribute to lower prices for realtor services and better terms on the mortgage as a result of lower operational costs for both banks and realtors. Furthermore, bank-realtor cross-ownership could lead to lower search costs for consumers. Banks' ownership of realtors can provide higher earnings and have synergy effects as a result of lower operational costs, better utilization of common administrative systems, and collocation (Huseiernes Landsforbund, 2018; Bråthen 2014). For other stakeholders, cooperation between banks and real estate agencies can be beneficial as it contributes to safer financing, more efficient settlements, and fewer independent players to deal with (Bråthen, 2014).

Lewis and Webb (2007) argue that synergies between activities are essential for successful bank-realtor cross-ownership. In their paper, they look into the cost synergies from banks acquiring realtors and argue that such synergies exist when the joint cost of producing complementary services is less than the combined costs of producing the services separately. Also, the Financial Roundtable in Lewis and Webb

(2007, p 2350) argues that it will benefit the consumers if banks enter into the real estate market because the house-buying process will become more convenient. This view is indeed in line with the argument of Bråthen (2014), as mentioned above. Furthermore, Lewis and Webb (2007) argue that bank and real estate services are complementary in that several aspects of a real estate transaction can be considered financial. Realtor services include listing and selling properties, and most people require a mortgage to finance the purchase of a house. Combining the banking and real estate industries can create cost synergies between the product lines and alter the scale economies in the joint industries.

Although bank-realtor cross-ownership can generate efficiency gains, it can also affect competition between the real estate agencies. According to Zumpano (2002), if the bank enters the real estate market by acquiring a realtor, this could lead to more concentration in the market because it might lead to fewer and larger participants. If the market concentrates, competition can decrease. This can threaten non-bank-owned realtors, as consumers may systematically choose a realtor connected to the bank. This is also an entry barrier for new firms. Additionally, if bank entry results in new firms in the market, cross ownerships generate an opportunity to market both realtor services and mortgages, even in the absence of a formal trying agreement. This could give the banks a competitive advantage over independent realtors. The ability to tie financing to the sales transaction could drive out independent real estate agencies, which again could result in increased concentration in the industry, fewer firms, and monopoly power (Zumpano, 2002).

Huseiernes Landsforbund (2018) points to the possibility of loyal clients choosing realtor services from the bank where they are clients without comparing terms from other banks. The client might feel coerced into using the bank's realtor, even if the quality of the services is inferior to that of other independent agencies (Zumpano, 2002). This will make it difficult for non-bank owned realtors to attract clients. It can also lead to real estate agents overselling mortgages from their banks, although the client might receive better offers elsewhere (Huseiernes Landsforbund, 2018).

Furthermore, because information asymmetry exists in that the real estate agent possesses more information than the buyer and seller, the real estate agent may be able to derive additional profits from buyers by increasing the transaction costs (Huseiernes Landsforbund, 2018). Although such a case of "one-stop shopping" can reduce transaction costs, and particularly search costs, it could also increase the transaction costs and blind consumers to alternative sources of finance, which could impose a severe cost (Zumpano, 2002).

Because the bank and realtor possess more information than the buyer on the development in the residential real estate market and the buyers' ability to service debt, information asymmetry exists. If the bank and realtor use the information to their advantage, it could have negative consequences for the buyer. Particularly, the information asymmetry may have implications for the mortgage a potential buyer can obtain from the bank. In 2012, Forbrukerrådet conducted an experiment in order to analyse first-time buyers' process in choosing a mortgage. They found that the bank's sales agent's competency is crucial for the buyers' decision and that the buyers could easily be persuaded to choose a mortgage with a higher level of unpredictability than initially preferred (Forbrukerrådet, 2012). These findings could imply that a bank-realtor could be able to push a buyer into obtaining a mortgage that is too high. This is another possible effect of bank-realtor cross-ownership, that goes beyond competitive consequences. Because the realtor's profits will ultimately return to the holding company (the bank), the bank may have an incentive to issue higher mortgages to earn more on each client. This will allow more clients to participate in an auction held by their realtor and can lead to a faster sales process, or a higher price. In turn, faster sale processes facilitate more selling assignments for the realtor. On this basis, the problem of banks' persuading clients to obtain higher mortgages may be larger if the bank owns a relator as such practice seems to benefit the bank-realtor company.

Offering a mortgage with a higher level of unpredictability could be in the self-interest of the bank-realtor if it leads to a faster sale or a higher selling price. As a

consequence, the buyer could end up with a house that is more expensive than he or she ideally can afford. Even though the buyer may be able to service the mortgage at the time, there are other costs, such as overheads that could be overlooked and the fact that the interest rate cost could increase.

Furthermore, the banks are obliged to discourage the client from accepting a loan if they infer that it can lead to economic problems (Hveem & Nyhus, 2013). However, if the consumers are offered a loan, but at the same time discouraged from accepting it, this could be confusing for the customers, and the effect of the discouragement could be reduced (Hveem & Nyhus, 2013).

If consumers are exploited in the sense that they are sold a too high mortgage in the bank owning the realtor, this could call for consumer protection and an argument against bank-realtor cross-ownership. However, government regulations on banks' lending practices and banks' ability to offer mortgages through a realtor might mitigate these potential consequences.

Moreover, bank-owned realtors may have an incentive to lower the price on their realtor services in order to increase the number of selling assignments and potential loan customers. This could leave the buyer better off due to lower prices. However, because independent agencies' competitiveness is affected, it may simultaneously inhibit market efficiency (Huseiernes Landsforbund, 2018). On the other hand, Zumpano (2002) states that the competitive advantage of the bank-owned realtor could allow them to operate beyond the range of achievable scale economies and extract monopoly profit. Because of their size, it will be even more difficult for new and competing firms to enter the market, and as a large firm, they will face higher operating costs. Due to these costs, they will have little incentive to lower commission rates, so that consumers' commission costs will increase (Zumpano, 2002).

As discussed above, there are different views on the effects of bank-realtor cross-ownership. There are proven complementarities in operations of banks and real estate agencies, and thus, a bank entry into the realtor industry can provide efficiency gains. It can also benefit consumers as it may reduce transaction costs and facilitate "one-stop shopping". However, it may also increase the concentration in the realtor industry, and thus, lower competition. If this leads to the exit of other competitive firms, some infer that the prices may increase. An alternative view is that realtor services' prices decrease if the bank-owned realtor is seeking more selling assignments. Nevertheless, the outcome is likely to depend on the competitive situation in the market, but it may not be both individually beneficial and socially beneficial at the same time.

Literature Review

Tying and Bundling in an Antitrust Perspective

We consider tying and bundling to be the main relevant economic theories. With mixed bundling, both products are available on a standalone basis, but the bundle is typically offered at a discount. In a pure bundle, the individual products are not available on a standalone basis and could, therefore, be considered equivalent to tying (Economides, 2014). However, with tying, one of the products may or may not be available on its own. The literature on tying and bundling does, in many cases, not distinguish between the two practices. In this chapter, we will describe the two theories before we discuss their relevance for bank-realtor cross-ownership in Norway.

Theory

The assumed implications from tying do, in many cases, depend on two theories: 1) the leverage theory of tying, and 2) the single monopoly profit theory. The leverage theory of tying was first informally stated in law literature as the notion that a firm with monopoly power in one market has the incentive to monopolize complementary

markets (Choi and Stefanadis, 2001). The main concern has been the fear that the integrated firm can foreclose the competitive market, thereby extending their monopoly. Foreclosure occurs if an integrated firm is able to deny a rival access to the market for the competitive product (Pepall et al., 2014). Although informally formulated, the leverage theory has been the basis of several court decisions (Whinston, 1990; Choi and Stefanadis, 2001), and courts have harshly treated the practice of tying. In the single monopoly profit theory, on the other hand, the monopolist is not able to extract additional monopoly profits by monopolizing an adjacent market. This theory was presented by Chicago School economists, and did, in contrast to the leverage theory of tying, formally illustrate the implications of tying and bundling.

The Chicago School Argument

The leverage theory was based on informal arguments, and there were no models used to investigate the effects of tying. Chicago School economists were the first to develop models to describe the mechanisms of how tying affects competition and consumers. In this section, we use a model based on Tirole (2005) and Whinston (1990) to summarize the main points. In the model, there is one integrated firm with a monopoly product *M* and a complementary product *C* in an adjacent, competitive market. In the competitive market, some independent producers offer the product *C'*, which is complementary to M and competes with *C*. The consumers have valuation v_M of the monopoly product, which costs c_M to produce. The complementary product is produced at cost c_C, and is valued at v_C..

Assumptions

There are strict assumptions in the Chicago School models that affect the results. The first assumption is that the complementary product market is perfectly competitive and characterized by constant returns to scale (Whinston, 1990). In addition, it is often assumed that the complementary product is valueless in the absence of the monopoly product (Whinston, 1990). In this case, tying the sale of *M* to *C* resembles the case of pure bundling. Lastly, it is often assumed that the products are used in fixed proportions (Whinston, 1990). A well-known example that fulfills these

assumptions is an integrated firm that has a monopoly in the market for nuts and competes in the market for bolts.

Results

The integrated firm can offer *M* and *C* independently, it can tie the sale of *M* to *C*, or it can offer a bundle *of M–C* at a discounted price. The latter resembles mixed bundling, whereas the second case is akin to a pure bundle. *C* and *C'* compete in a perfectly competitive market, and are available at marginal cost. The consumers evaluate the bundle *M–C* by whether or not v_M is worth more than the bundle's incremental cost over c_C alone. Therefore, the only way the integrated firm will benefit is if the bundle's price is no larger than $v_M + c_C$. Otherwise, the consumers will not buy the bundle.

A central argument in the single monopoly profit theory is that tying *C* to *M* imposes a restriction on the consumers, similar to an increase in price on *M*, and that this restriction reduces the demand for *M* (Bowman, 1957). For the integrated firm, when products are used in fixed proportions, the only way that tying can be profitable is if the decrease in demand for *M* is offset by the increase in demand for *C* to maintain demand. Every increase in price for one part has to be offset by a reduction in price by a compensating amount for the other part. Otherwise, the total monopoly return would fall (Bowman, 1957).

When consuming two products in fixed proportions, such as nuts and bolts, the monopolist can extract as much monopoly revenue from the sale of products independently as from the sale of the bundle. This can be shown using the simple model below.

Under a tie-in, the integrated firm has the following profit, where p_M is the price of the monopoly product, and p_c is the price of the competitive product. π^T is the profit

for the integrated firm under a tie-in, π_M^I is the profit for the monopoly product with independent pricing, and π_C^I is the profit for the complementary product with independent pricing:

$$p_M + p_c \leq v_M + c_c$$

$$\pi^T = q(p_M - c_M) + q(p_C - c_C)$$

When *M* and *C* are sold independently, the firm has the following profit:

$$\pi_M^I = q(p_M - c_M)$$

$$\pi_C^I = q(p_C - c_C)$$

This implies that the integrated firm is not able to derive additional profits from tying *M* to *C*:

$$\pi_M^I + \pi_C^I = q(p_M - c_M) + q(p_C - c_C) = \pi^T$$

This indicates that, under the assumptions of a perfectly competitive market for the complementary product, tying the two products will never increase monopoly profits.

Alternative Motives

Because tying will not lead to increased monopoly profits, the Chicago School theorists argue that the motivation for tying must reflect real efficiencies (Elhauge, 2009) or a tool for price discrimination (Choi, 2004; Carlton & Waldman, 2002).

Bowman (1957) and Tirole (2005) argues that when efficiency reasons – such as cost justification or technological interdependence - are present, tying cannot be said to exist. No coercion is required when the result is lower prices or improved performance. Consequently, Tirole (2005) argues that even a tie that forecloses on competitors can benefit consumers if there are efficiency reasons.

As a price discrimination tool, *C* can be used as an indicator to identify which consumers have the highest willingness to pay for *M*. When *M* is consumed in a fixed quantity, while *C* is consumed in variable amounts, high-frequent use of *C* could imply a higher valuation of *M* (Tirole, 1988; Bowman, 1957). Therefore, the sale of *C* serves as a measurement device of the value of *M*, and the integrated firm can use *C* to practice second-degree price discrimination. Bowman (1957) does not address the welfare implications of price discrimination but compares it to the situation where the integrated firm simply attaches a meter to *M* to measure the intensity of use. In these scenarios (tying versus meter), the output is the same, and the monopoly is not extended to the complementary market. On the other hand, Tirole (1988) argues that tie-in as a tool of second-degree price discrimination has negative welfare implications compared to the practice of two-part tariffs[7]Because in the latter case, *C* is sold at the c_C, which realizes full potential social welfare.

Many efficiency-enhancing strategies, such as low prices, can be used as predatory strategies. The same goes for tying. According to Tirole (2005), ties can enhance consumer welfare in some instances but are anticompetitive if a tie-in succeeds in protecting a monopoly or monopolize a competitive segment. The consequence of tie-ins may be dependent on the motive. Nevertheless, tying is a practice that economizes on transaction costs and is, therefore, a ubiquitous feature of economic activities (Tirole, 2005).

The Leverage Theory of Tying

The strong assumptions of competitiveness and constant marginal costs allowed the single monopoly profit theory to discredit the notion of leverage. When these market characteristics are present, it is impossible to use tying to create leverage and extract additional profits. As a result, efficiency reasons or price discrimination came to be

7 A two-part tariff is a pricing practice that consists of a fixed fee and a price or usage fee charged for each unit the consumer purchases (Pepall et al., 2014)

seen as the primary motivation for tying (Whinston, 1990; Choi, 2004). Elhauge (2009) and Whinston (1990) points out that the single monopoly profit theory is only valid when the assumptions of the market for *C* holds. By using more realistic assumptions, economics shows that tying and bundled discounts can foreclose on a substantial share of the tied market. This can increase market power, prices, and profits in both the market for *M* and the market for *C*. If a potential rival has the same economies of scale and scope as the integrated firm, and the *C* market is not characterized by perfect competition, Nalebuff (2005) suggests that tying is a strategy of no-cost predation for the integrated firm, which may exclude an equally efficient competitor. As a price strategy, tying allows the integrated firm to sacrifice current profits in the market for *C* by lowering the price, but simultaneously recoup its losses through the sales from *M.* This predatory practice can lead to foreclosure of the *C* market, and the integrated firm has leveraged its monopoly into the adjacent market (Nalebuff, 2004).

A tie can be obtained through product design (technological tie: *M* only functions with *C*) or a "virtual tie" (Carlton & Waldman, 2002). The virtual tie can be set through pricing by setting a high price for *M*, and a low price on *C* when the products are used in fixed proportions (Carlton & Waldman, 2002). Independent producers of *C'* cannot operate profitably given the low price charged by the integrated firm. The integrated firm has the benefit that it can underprice *C* (even giving it away for free) while maintaining profits through raising the price of *M*. The simultaneous recoupment of profits through *M* does, however, not have an immediate effect on consumers. The loss of rivalry in the market will potentially harm consumers in the long run (Carlton & Waldman, 2002).

In contrast to the arguments presented by Chicago School theorists, leveraging monopoly to the competitive market by foreclosing does lead to higher profits as a result of the firm extracting more of its monopoly power.

Strategic Foreclosure: A Model

Whinston (1990) demonstrated that tying might result in foreclosure of the market for *C*, when the integrated firm makes a pre-commitment to tie[8]. This commits the integrated firm to be more aggressive against a potential rival, which discourages entry in the market for *C*. Assuming that all consumers have the same valuation of the *M*, Whinston concludes that tying can lead to monopolization of the tied good market by foreclosure. Foreclosure is a result of changing the market structure of the market for *C*, and making continued operation unprofitable for rivals in the tied good market (Whinston, 1990). Because of the strong assumptions of market characteristics in the market for C in the Chicago School models, this strategic effect makes tying a profitable strategy that had previously been overlooked (Choi, 2004). The exit of the rival firm is, nevertheless, essential for the profitability of tying.

The model investigates the effects of tying when the integrated firm is and cannot make a pre-commitment to a tying arrangement. When consumers' valuations of the products are homogenous, and the integrated firm can commit to a tie, the independent firm earns less than it does when both firms have to practice independent pricing (when the integrated firm is not able to commit to a tie) of *M* and *C*. This result will be explained in the following model, based on Whinston (1987) in Tirole (1988, p 333).

Assumptions

There are two markets, the market for *M*, which is monopolized by the integrated firm (firm 1), and the market for *C*, which is differentiated and served by the integrated firm and an independent firm (firm 2). All consumers have v willingness to pay for *M*[9], and demand for *M* is normalized to 1, as long as $v \geq p_M$. Firm *i*'s demand function in the market for C can be denoted $q_i = D_i(p_i, p_j)$

[8] This can be done through product design, or the setting of the production process (Whinston, 1990)

[9] Homogenous preferences for *M* is important for this result

The unit costs for the integrated firm in the *M* and *C* market can be denoted c and c_1, respectively. Assume that the integrated firm offers the two products either separately or together. p_C is the price for *C* set by the independent firm, and p_1 is the price for *C* set by the integrated firm in the competitive market. p_B is the price of the bundle, set by the integrated firm.

Results

When the firms choose their prices, and the integrated firm decides whether to tie its products, simultaneously, the integrated firm takes p_c as given. When this is the scenario, a tie of *M–C* does not benefit the integrated firm. For the integrated firm, the fictious price[10] for *C* is $p_B - v$,

When there are simultaneous pricing and bundle decision, the integrated firm offers the bundle at price p_B so as maximize:

$$(p_B - c_1 - c)D_1(p_B - v, p_c)$$

Where $(p_B - c_1 - c)$ denotes the profit earned from the bundle. $D_1(p_B - v, p_c)$ denotes the demand for the bundle, given the price set by the independent firm.

In a simultaneous pricing game, with independent pricing, $p_B^* - v$ is set by:

[10] The fictious price is the price of C that constitutes the difference between p_B and v. The fictious price p_C, therefore, gives additional value, over and above only selling *M*.

$$(v - c) + [(p_B^* - v) - c_1]\, D_1(p_B^* - v, p_c),$$

where, $(v - c)$ is the profits from M[11]. $[(p_B^* - v) - c_1]$ denotes the profits from the C market. $D_1(p_B^* - v, p_c)$ is the demand for *C*, given the price set by the independent firm.

When the integrated firm chooses a bundle, $p_B^* - v$ is set by:

$$(p_B^* - c - c_1, p_C)\, D_1(p_B^* - v, p_c),$$

where $(p_B^* - c - c_1, p_C)$ is the profits from the bundle given p_C, and $D_1(p_B^* - v, p_c)$ is the demand for the bundle given p_C. In this scenario, the integrated firm takes p_C as given.

As we can see,

$$(v - c) + [(p_B^* - v) - c_1]\, D_1(p_B^* - v, p_c) \geq (p_B^* - c - c_1, p_C)\, D_1(p_B^* - v, p_c)$$

The left-hand side is bigger because $D_1 \leq 1$. Tying will then reduce the number of options in their pricing strategy for *C*. In this scenario, a tying arrangement hurts the integrated firm. Because some consumers have low demand for *C*, they will choose not to buy the bundle. Hence, it will also affect the sales of *M*. When the firm chooses to bundle *M* and *C;* they lose sales on both products. This indicates that, in the absence of commitment, a bundle is not a profitable strategy for the integrated firm.

11 Demand for M is normalized to 1, as long as $v \geq p_M$

However, under pure bundling, the fictious price $\overline{p}_B \equiv p_B^* - v$ is lower than any price p_1 in the *C* market under no bundling, for any p_C. Bundling shifts the reaction function of the integrated firm downward in the *C* market.

Under bundling, p_B maximizes

$$(p_B - c_1 - c)D_1(p_B - v, p_c)$$

This means that $\overline{p}_B$ maximizes

$$\{\overline{p}_B - [c_1 - (v - c)]\}\ D_1(\overline{p}_B, p_c)$$

In the absence of bundling, however (independent pricing), p_1 maximizes

$$(p_1 - c_1)\ D_1\ (p_1, p_C)$$

Under bundling, the integrated firm's production cost in the *C* market is reduced by $(v - c)$ as far as the pricing in the market for *C* is concerned.

A unit loss of sales in the *C* market costs the integrated firm the amount of $(v - c)$ in the *M* market under bundling, which means that "real" marginal cost is reduced by $(v - c)$. Because the monopoly price increases with marginal cost, the reaction function will shift upward when marginal cost increase. Therefore, absent bundling any p_C, $\overline{p}_B \leq p_1$.

In a two-stage game, the integrated firm first decides to offer the products independently or in a bundle in stage 1, and the two firms decide the prices simultaneously in stage 2. This commits the integrated firm to charge a low fictitious price in the *C* market. The independent firm will respond by lowering p_C. This is the ex-post argument for what will happen if the independent firm enters the *C* market. However, by using backward induction, the independent firm will see that a commitment to bundle, for a given p_C, will mean that the independent firm will enter the market with a loss. Therefore, they will not enter the market at all. By committing to a bundle, the integrated firm has successfully deterred entry in the *C* market. The bundle strategy is only a good strategy if the independent firm's entry or exit decision is at stake. Otherwise, it forces the independent firm to reduce its price, which will drive down prices in the *C* market. An alternative illustration of the profit increasing effect of foreclosing on a rival firm can be found in appendix 1.

Allowing for heterogeneous preferences among consumers, a commitment to tying need not always result in the competitive market's foreclosure. However, heterogeneous preferences mean that, even in the absence of commitment, tying can lead to foreclosure of the market for *C* and *C'*, because a tie incentivizes the integrated firm to foreclose the market for *C*, like the pre-commitment case. The necessary condition is that $v \geq c$. The reason is that when the integrated firm also offers *M* independently, it is assured of making sales of *M* to all consumers with a high valuation of *M* regardless of whether they buy *C*. The incentive to foreclosure arises only from the low valuation types, and the independent firm's profit falls only if the low type values *M* below its cost of production (Whinston, 1987, p 334-335 in Tirole, 1988).

Whinston (1990) concludes that when tying leads to the exclusion of rivals, the loss for consumers arises because prices may rise, and the level of variety falls. However, as is common in price discrimination models, some consumers may be made better off by the introduction of tying. The effect on aggregate welfare, on the other hand, is

uncertain because of both the ambiguous effects of price discrimination and the usual inefficiencies in the number of firms entering an industry in the presence of scale economies and oligopolistic pricing.

When tying and bundling do lead to the exclusion of rivals, the welfare effects are, in general, ambiguous (Whinston, 1990). Consumers are negatively affected by potentially higher prices and less variety. More generally, as is common in price discrimination models, some consumers may be better off by tying. Price discrimination as a result of tying may increase total welfare because the monopolist can extract more surplus from high-demand consumers (Carlton & Waldman, 2002). The overall effect on aggregate welfare is uncertain because of the ambiguous effects of price discrimination and the usual inefficiencies in the number of firms entering an industry in the presence of scale economies and oligopolistic pricing.

When the integrated firm starts from the position of two monopolies, Nalebuff (2004) states that bundling can be efficient, even in the absence of commitment (as opposed to Whinston). With the potential entry of a rival in one of the products, bundling reduces the entrant's potential profits while mitigating the profit loss to the integrated firm if entry occurs. Furthermore, by bundling *M* and *C* together, the integrated firm can use each monopoly to protect the other one, which can result in increased profits absent entry. Thus, bundling is credible even without any commitment. The integrated firm has incentives to bundle, with the most important motive being preserving monopoly power by deterring a potential entry or reducing the impact of a one-product rival (Nalebuff, 2004).

Different Market Characteristics

Tirole (2005) discusses the impact of tying in different kinds of market characteristics: 1) a market where competitors can differentiate in the tied market; 2) when the competitive market is multi-sided. In the first scenario, Tirole (2005) uses a model where the integrated firm recoups high fixed costs – and low marginal costs –

in the competitive segment. When imposing a tie-in on the consumers, the effective price of the tied good is zero (Bowman, 1957; Tirole, 2005). Therefore, consumers will get the complementary good "for free", and only purchase a rival's product when tailored to their specific needs or offer innovative features. Thus, if the independent producers in the competitive market differentiate in the tied product, a tie need not limit competition. In multi-side markets, firms must get both "sides" on board in order to be successful. Usually, one side has no interest in the product unless the other side is also on board. In a multi-sided market, the competitive product may be tied to the monopoly product on one side of the market, but not on the other side. A common practice is to give away the product to one side and covering the costs by charging a higher price on the other side (Tirole, 2005). The literature on the topic has concluded that business models like these bring good social value by getting all "sides" on board, creating trade and economic value.

A cross-ownership may negatively affect competition, but can, at the same time, provide gains in social welfare. Fanti (2015) finds that, although competition is reduced in a Cournot duopoly, social welfare may increase depending on the size of the market, the share of the cross-ownership, and the efficiency of the cross-ownership firm. Hart and Tirole (1990) investigate how vertical integration change the nature of competition in upstream and downstream markets, and when market foreclosure may appear as a consequence. They emphasize that even though there are losses accompanied by such mergers because competitors may exit the market, there are also potential gains, such as saving in investment costs. Vertical mergers can have positive and negative effects on the society, and because there may be substantial efficiency gains offsetting the anticompetitive effect, one should instead examine the cases when the foreclosure effect is significant and when such mergers significantly harm rivals. This implies that vertical integration is not necessarily individually beneficial and socially beneficial at the same time. It can be individually beneficial and, at the same time, socially undesirable (Hart & Tirole, 1990). Spengler (1950), discuss the case of vertical integration in an imperfectly competitive world. He argues that vertical integration does not reduce competition, but instead benefits both consumers and producers in that it reduces the selling prices, and increases the output.

Relevancy of the Theory

Single Monopoly Profit Theory and The Leverage Theory of Tying and Bank-Realtor Cross-Ownership

The objective of this thesis is to investigate the consequences of a bank-realtor cross-ownership. The law prohibits A tie-in between bank services and real estate services. However, even the absence of a formal tying agreement can give the bank-owned agencies a competitive advantage over independent firms if banks and realtors can provide a mixed bundle consisting of financing and real estate services (Zumpano, 2002). Based on relevant literature on tying and bundling and the structure and characteristics of the bank- and realtor market, it is difficult to say anything about whether bank-realtor cross-ownership will have anticompetitive effects in the two markets, or negatively impact consumers. On the one hand, the characteristics of the mortgage- and realtor industries point to the fact that the Chicago School assumptions of competition hold, because the market for mortgages and realtors consists of several firms and can be considered competitive. Furthermore, the motive for banks' ownership of relators seems to be efficiency reasons, rather than predation. As Tirole (2005) and Bowman (1957) have argued, tying for efficiency reasons will not make consumers worse off.

On the other hand, the leverage theory has shown that when a firm can commit to a bundle or a tie-in arrangement, it may deter market entry and harm competition in the long run (Nalebuff, 2004). However, the law states that banks and realtors cannot tie their products together (Bråthen, 2014). This mechanism, therefore, seems less likely to have an effect. When considering the development in the realtor industry in the last decades, it does not seem unreasonable to assume that the industry is headed in a direction where bank-owned agencies control more of the market. Whether this will be harmful to consumers will depend on the competitive situation in the two markets.

Furthermore, the cost of related services, fees, interest rates, and mortgage regulation is likely to affect housing prices. As the consumers can move their mortgage to another bank at any time after a housing sale, the banks will have to keep the prices competitive to retain clients. Nevertheless, the market shares of banks and realtors may differ across different areas, as they may target different customer segments. For instance, Eiendomsmegler1 is the market leader in Rogaland and Vest-Agder (not included in the sample) (Sparebank1 SR-Bank, 2018), as well as having a 37.6% market share in Trøndelag and Møre og Romsdal (also not included in the sample) (Sparebank1 SMN, 2020). However, DNB has a substantial market share for mortgages. Particularly, DNB has a 26% market share in the personal customer market for mortgages nationwide (DNB Group, 2020) (in our sample, their share is 42.93%). In line with the leverage theory of tying, DNB may use its market power in the market for mortgages to affect the realtor industry's market structure. In turn, this could increase their market share in the realtor market, and together with a high degree of market power, asymmetric information, and loyal clients, the price of realtor services may increase. However, as our data sets do not include any information about the price of realtor services, we cannot investigate this potential effect.

Other Market Characteristics

When market characteristics differ from perfectly competitive or perfectly monopolistic markets, a tying arrangement can have different effects. As was mentioned in Tirole (2005), multi-sided markets may benefit from a tying arrangement. A realtor must attract both buyers and sellers, and a bank has some elements of multi-sidedness and need both depositing clients and mortgage clients. For instance, a client who obtains a bridge loan from the bank may be required to use the bank's realtor, while the buyer of a property is not required to have a mortgage in the realtor's bank. Furthermore, during a residential real estate transaction in Norway, the seller of a property pays a fee to the realtor, but the buyer does not compensate the realtor. Multi-sidedness may impact other realtor firms in the competitive market, and affect their ability to withstand a tie, compared to a one-sided market (Tirole,

2005). Lastly, if the realtors can differentiate and target different customer segments, mortgage clients may not care that they "waste" the tied service.

Empirical Consequences

If a bank-realtor cross-ownership leads to cases of tying or mixed bundling that are problematic for competitive reasons, it could be reflected in the final price, or in the probability of having a mortgage in the bank that owns the realtor. In general, it is difficult to determine how a bank-realtor cross-ownership will affect the price, as it depends on several factors. A high price could imply that the realtors are overselling mortgages to potential buyers, for instance by offering a potential buyer a higher- or better-termed mortgage (compared to their original offer/bank) if using the bank's realtor, so that the buyer can bid on a more expensive house. If sufficiently many people accept this offer, the auction may intensify, and the price can increase. If the buyers are persuaded into obtaining a higher mortgage than they can afford, this is also a problem that could call for consumer protection, as discussed previously. In the long term, an overall higher housing price may leave the consumers worse off. In that case, the advantage of obtaining a higher or better-termed mortgage might be offset by the increased prices. Alternatively, there might be an opposite effect, namely that the price gets lower when using the same bank and realtor. For instance, the real estate agent may only be interested in approaching potential buyers that are already clients within the bank. Alternatively, the realtor could be more interested in high sales volumes than a high price, which could imply that the agent is impatient in waiting for the highest offer. Other factors that could impact the final price is the prices for mortgages and realtor services. If the interest rate is high, it will be more expensive to service a mortgage, which could decrease the final price. If realtor services are expensive, people may account for this by adjusting their willingness to pay for a property. Nevertheless, because we do not possess any information regarding the prices for realtor services or mortgages, we cannot evaluate such effects. In addition, there are other characteristics that might affect the price such as elevators, view, balcony, time since last renovation and noise from traffic.

Considering that banks can offer a mixed bundle of mortgages and realtor services, it may be a higher probability of having a mortgage in the bank that owns the realtor which conveyed the sale, compared to other banks. This is because the offer might be a superior offer compared to the previous one, and search costs may be reduced for potential buyers. If the probability of using the same bank and realtor is considerably high, it might indicate efficient cooperation between the bank and the realtor, which could be beneficial for the consumers, as mentioned above. However, it could be problematic for competitive reasons. If these banks have large market shares (in both markets), bank-realtor cross-ownership enables them to attract customers from one market to another. In turn, this could make it more difficult for independent realtors or banks to compete, so that the bank-realtor may foreclose the market in the long run.

Furthermore, we would like to see which factors contribute to an increase or a decrease in this probability. Particularly, we want to investigate if it is more common for different age groups to have a mortgage in the bank connected to the realtor, or if it has become more common in the last decade. We expect young buyers to be more likely to accept an offer of a mixed bundle, due to a less established bank relationship.

Nevertheless, whether or not a bank-realtor cross-ownership will have negative welfare effects depends on the effects on the consumers, the competition, and the survival of efficient firms. Based on the market structure, the law, and economic theory, it does not seem likely that bank-realtor cross-ownership negatively affects the price. Regarding the probability of having a mortgage in the bank that owns the realtor which conveyed the sale, it will depend on segment (for instance, some realtors exclusively deals with luxury homes), geography (local competition), and other factors.

In the following chapters, we will conduct an empirical analysis of the effect of bank-realtor cross-ownership. More specifically, we will investigate whether there is an effect of bank-ownership on the price, and on the probability of having a mortgage in the bank that owns the realtor which conveyed the sale.

Data

The data is non-experimental, administrative data provided by AMBITA AS. We have obtained two datasets, including information regarding 1) the universe of housing transactions and 2) property collateralization records - both for Oslo, Bærum, Stavanger and Bergen municipalities between 01.01.1993 and 09.02.2018. The datasets were cleaned and then merged in order to identify which bank and realtor are associated with each transaction. 71,358 observations remained. Although we have observations from 1993 to 2018, there are fewer observations after 2008 compared to the years before. When we merged the data sets, a large number of transactions were dropped due to the collateral practice of the real estate agent, which was more prevalent in the years before 2008.

Data Characteristics

Variables in the Original Data Sets

Table 1 shows the variables from the original data set.[12]The variables in the transaction data set is a unique property ID (making it possible to follow the same property over time), contract date, price, age group of the buyers, an anonymized location code, and hedonics. Hedonics comprises housing type, size, number of bedrooms, numbers of bathrooms, and floor. Before we received this data, it was already combined with a list of creditor names, so that it was possible to identify the banks and other financial institutions responsible for each transaction.

The variables in the property collateralization data is a unique property ID (same as in the first data set), start and end date for the collateralization entry, the value of the collateral, and the name of the creditor that has the collateral. In this data set, we were only interested in keeping the real estate agencies, so that we could match them with the creditors in the other data set. Therefore, we identified different creditors as layers, banks, firms, municipalities, real estate agencies, insurance companies, and housing associations.

In the merged data set, we were left with only banks and realtors. We were able to identify the banks that own a realtor and the realtors that are bank-owned. The variables included in the data sets are shown in table 1.

[12] Some of the variables were created to answer the research question and preserve the buyers' anonymity. These were not in the original data sets but were made prior to obtaining the data sets.

Table 1.

Variable description	
property_ID	Unique property ID*
etasjenr	Floor of apartment
bruksareal	Square meters
antallrom	Number of bedrooms (0≤)
antallbad	Number of bathrooms(0≤)
price	Selling price of property
boligtypekode	Type of property**
quarter	Quarter and year of transaction
parish	Anonymized location code
new_buyer	= 1 if the buyer appears in data set for the first time, 0 otherwise
age_buyer_cat	The age group of the buyer

** The unique property ID making it possible to follow the same property across time*

*** Type of property is apartment building, detached house, semi-detached house, terraced house*

New Variables

Based on the existing variables, we have created new variables. These are illustrated in table 2. *logprice* and *logsize*, are the logs of the *price* and of the *bruksareal* (apartment size). The logarithmic transformation allows for a nonlinear relationship between the dependent and independent variables (Wooldrige, 2016). Because there will be a wide range between the highest and lowest values in its original form, a log transformation narrows it. In addition, both *logprice* and *logsize* seem to have a closer to normal distribution than the distribution of *price* and *bruksareal*, as illustrated in appendix 2. The dummy variable *bankowned* indicates which realtors are owned by banks. *samebank* tells us whether the bank and real estate agency related to each transaction is connected through an ownership. *samebank* = 1 if the mortgage is given by the bank that owns the realtor that conveyed the sale. *samebank* is therefore connected to *bankowned,* because *bankowned* will always be one when *samebank* is one. We expect that young buyers will be more inclined to accept an offer of a

mortgage or proof of financing from the real estate agent because they are less likely to have an established bank relationship due to their young age. On this basis, we created *agegroup_young* which indicates whether the buyer is 34[13] years old or younger. The dummy *firstfloor*=1 if an apartment is located on the first floor. We believe that *firstfloor* controls for the negative price effect of a first-floor apartment. The variable *etasjenr* indicates the floor of the property. However, detached and semi-detached houses are listed as first-floor properties. Therefore, we are to a large extend, replacing *etasjenr* with *firstfloor*, as the former does not control for housing type. We expect a first-floor apartment to affect the price differently compared to a first floored detached house. *after2000*=1 when the transaction was made after the year 2000. Bank-realtor cross-ownership is more common after 2000 than before 2000. after2000 will allow us to control for a change in the market structure. We have also created $bank_i$, which indicates each bank that owns a realtor, and $realtor_i$ indicates each realtor owned by a bank.

Table 2.

Variable description	
logsize	Log of *bruksareal*
logprice	Log of *price*
bankowned	= 1 if the realtor is owned by a bank, 0 otherwise
samebank	= 1 if buyer has a mortgage in the bank that owns the realtor which conveyed the sale, 0 otherwise
agegroup_young	= 1 if buyer is younger than 34, 0 otherwise
firstfloor	= 1 if it is a first floor in an apartment building, 0 otherwise
after2000	= 1 for transactions after the year 2000, 0 otherwise

[13] We chose 34 as a threshold as a large share of first-time buyers are below the age of 34 (Norges Eiendomsmeglingsforbund & Ambita, 2017)

Summary Statistics

Table 3 shows summary statistics for the sample. As shown in table 4, 34.6% of the sales are conveyed by bank owned realtors. The variable *age_buyer_cat* allows us to see how age groups differ in the final price paid for a property. We find a large share of the transactions in the age category 25-34 years, which we consider to be the age period most people buy their first and second properties. As for the type of property (*boligtypekode*), apartment buildings (*blokkleilighet*) are heavily represented. This is not surprising, considering that the data is collected from highly populated areas.

Table 3.

Summary statistics for the sample.

	Obs	Mean	Std. Dev.	Min	Max
etasjenr	71,358	1.98	1.42	1	16
logsize	52,849	4.54	0.51	2.7	5.8
antallrom	52,782	3.52	1.45	0	10
antallbad	52,558	1.18	0.45	0	5
logprice	71,358	14.40	0.62	11.5	16.7

Table 4

		Freq.	Percent
bankowned	0	46,795	65.58
	1	24,563	34.42
age_buyer_cat	<25	4,652	6.52
	25-34	32,983	46.22
	35-44	18,805	26.35
	45-54	9,498	13.31
	55-64	3,643	5.11
	65<	1,777	2.49
boligtypekode	blokkleilighet	42,422	59.48
	enebolig	13,292	18.63
	rekkehus	10,008	14.03
	tomannsbolig	5,616	7.87
new_buyer	0	28,729	40.26
	1	42,629	59.74

Financing and Realtor Services Provided by the Same Firm

The merged dataset provides information on the creditor and realtor in each transaction. Table 5 shows the distribution of which banks that own a realtor, and the instances when the same bank and realtor is connected to a transaction. Bank owned realtors account for 45,441 transactions (64% of the observations), and the same bank and realtor are used for 5,862 of the transactions. It is important to note that DNB is accountable for the main part of these instances (92%) and is responsible for the financing of 43% of the transactions in the total sample. Compared to the actual distribution, the market shares in our sample were discussed in *Overview of the Norwegian Realtor Industry.*

Table 5

Bank	Nr. of transactions	Percent	*samebank* = 1	Percent
danskebank	1,976	4.35	173	2.95
DNB_bank	30,633	67.41	5,409	92.27
eika	129	0.28	8	0.14
nordea	6,636	14.60	15	0.26
sparebank1	4.265	9.39	255	4.35
storebrand	1,710	3.76	2	0.03
pareto bank	2	0.00		
spareskillingbanken	90	0.20		
Total	45,441	100.00	5,862	100.00

Table 6 shows the summary statistics when *samebank* = 1 and when *samebank* = 0. We observe that there are no noteworthy differences in the hedonics for the two samples.

Table 6.

Summary statistics for hedonic variables

	samebank = 0 obs = 65,496					*samebank* = 1 obs = 5,862				
	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
etasjenr	65,496	2	1.44	1	16	5,862	1.84	1.29	1	14
logsize	48,484	4.54	0.51	2.71	5.83	4,365	4.56	0.50	3	5.84
antallrom	48,426	3.52	1.45	0	10	4,356	3.53	1.43	0	10
antallbad	48,212	1.18	0.45	0	5	4,346	1.19	0.45	0	4
logprice	65,496	14.4	0.63	11.51	16.71	5,862	14.42	0.48	11.51	16.16

Research Method

To study the research questions, we use a hedonic price model, particularly a multiple linear regression model with fixed effects, and a linear probability model. First, we investigate if the housing price is higher when the same bank and realtor is used by applying a multiple linear regression model with fixed effects. The choice of model is

based on the fact that the hedonic controls are constant for each observation, and do not vary over time (Wooldrige, 2016). Second, we investigate the probability of having a mortgage in the bank which owns the realtor that conveyed the sale by using a linear probability model. We first examine each bank-realtor connection. Next, we look for characteristics for the transaction when the same bank and realtor are used. We use fixed effect variables as controls. We ran a Breusch-Pagan test to test for heteroscedasticity for one of the equations (as illustrated in appendix 3), which showed that heteroscedasticity is present. Therefore, we use robust standard errors in all models to correct for this problem.

Price Effect of Bank-Realtor Cross-Ownership

In order to estimate the effect of a bank-realtor relationship on price, we estimate the following equations:

1. $logPrice = \beta_0 + \beta_1 bankowned + \beta Control + e$
2. $logPrice = \beta_0 + \beta_1 samebank + \beta Control + e$
3. $logPrice = \beta_0 + \beta_1 agegroup\_young + \beta Control + e$

We estimate the equations with a base model and an extended model. We begin by running each expression independently. Because *samebank* is based on *bankowned,* these variables cannot be included in the same expression. As we would like to see how the coefficients change when including several variables of interest in the same expression, we run all models independently, and then we combine equations 2 and 3.

The base model consists of a few hedonic controls (*logsize, antallrom, antallbad, parish,* and *quarter*). We believe these variables belong in the base model as they intuitively are important factors for variation in price. In the extended model, we will also control for the variables *boligtypekode, firstfloor, age_property, new_buyer,* and *parish*quarter*. *parish*quarter* control for the fact that different locations may have had different development in prices across the period by including an interaction

between parish and quarter. We add these control variables to investigate if the coefficient of interest (β_1) or adjusted R2 changes in significant ways, as these are indicators of the robustness of the model.

In order to investigate if different bank-realtor combinations affect the price differently, we also run the following regression

4. $logPrice_i = \beta_0 + \beta_1 samebank_i + \beta_2 agegroup\_young_i + \beta Control + e_i,$

where i = *{samebank_DNB, samebank_nordea, samebank_danskebank, samebank_sparebank1, samebank_eika},* so it indicates each bank-realtor relationship. This implies that if *i = samebank_DNB,* $samebank_i$ = 1 if DNB_eiendom = 1 and DNB_bank = 1. Then the $samebank_i$ - coefficient will tell us how the price is affected by the use of a specific bank-realtor combination. The base model and the extended model include the same controls as above, and *agegroup_young* is included in both models as control.

The Probability of Having a Mortgage in the Bank Connected to the Realtor

We investigate the probability of having a mortgage in $bank_i$ if the realtor owned by $bank_i$ sold the house. For this, we use a linear probability model and estimate the following equation.

5. $bank_i = \beta_0 + \beta_1 realtor_i + \beta_2 agegroup\_young_i + \beta Control + u_i$

$bank_i$ is a dummy variable, which is one if the bank connected to the transaction owns a realtor, where *i* indicates which bank it is *(i = {DNB_bank, danskebank, eika, nordea and sparebank1}*. β_0 is the intercept. The variable of interest, $realtor_i$ is also a dummy, indicating which realtor that sold the house, where *i = {DNB_eiendom, krogsveen, aktiv, terra_eiendomsmegling, privatmegleren, eiendomsmegler1}*, so that the *i's* represent each particular bank-realtor linkage. To emphasize these linkages, we

are running the regression for the cases when *i=i,* meaning when ownership and/or cooperation connects the bank and realtor in question. For instance, if $bank_i$ = *DNB_bank*, $realtor_i$ = *DNB_eiendom*. Because $bank_i$ is a binary variable, the $realtor_i$ - coefficient tells us how much the probability of having a mortgage in $bank_i$ will increase or decrease if $realtor_i$ sold the house compared to when other realtors are selling the house when keeping other variables fixed.

We estimate the expressions for each bank-realtor ownership with a base model and an extended model. The base model only includes *parish* and *quarter* as controls, so in this model, the *agegroup_young* variable is excluded. We include *parish* because some realtors are more common in certain areas, while *quarter* is included because there has been a change in the size and number of real estate agencies during our sample period. The extended model also includes *boligtypekode*, *logsize*, and *agegroup_young* as controls. This is to allow for the possibility that using the bank connected to the realtor for a mortgage might be more common when buying certain types of dwellings or for different-aged buyers. Moreover, because these controls, except for *agegroup_young*, are constant over time for each observation, they are included as fixed effect variables.

Furthermore, we are also interested in investigating if the probability of having a mortgage in the bank that owns the realtor is more common for a specific group of customers, particularly for young people. Also, we will check if this probability differs across the periods before and after 2000, and for some specific type of dwellings. We continue to use a linear probability model, but now the dependent variable is based on the *samebank* – dummy.

6. $samebank = \beta_0 + \beta_1 agegroup\_young + \beta_2 after2000 + \beta control + u$
7. $samebank = \beta_0 + \beta_1 agegroup\_young + \beta_2 after2000 + \beta_3 new\_buyer + \beta_4 blokkleilighet + \beta control + u$

Equation 6 is our base model, while equation 7 is our extended model, including more variables of interests. β_0 is the intercept, and control is the fixed effect variables *logsize* and *parish*.

In the first equation, the coefficient of interest is β_1 and β_2. β_1 is linked to the dummy variable *agegroup_young*. This coefficient will tell us how much the probability of having a mortgage in the bank that owns the realtor that conveyed the sale will change if the buyer is younger than 34, compared to an older buyer, when keeping the other variables fixed. β_2 is connected to the dummy variable *after2000.* This coefficient will tell us how much this probability (of samebank=1) will increase or decrease if the transaction occurred after the year 2000. Equation 3 does additionally include *new_buyer* and *blokkleilighet,* so that β_3 and β_4 will tell us how much the probability will increase or decrease if new_buyer equals one and if blokkleilighet equals one. *after2000* is created based on the variable *quarter*. Thus, in the expressions, we exclude *quarter* in order to not include two time-variables in the equation, as this can cause biased results, due to a high correlation between the variables quarter and *after2000.* After running equation 6, we run equation 7 to check for robustness and changes in the β_1 and β_2 coefficients.

Results

Price Effect of Bank-Realtor Ownership

bankowned

Table 7 shows the results of equation 1, where *bankowned* is the variable of interest. The variable is not statistically significant on any level in either model. Because this variable is insignificant, we exclude it in further analysis.

Table 7.

	(1) logPrice	(2) logPrice
bankowned	-0.0022	-0.0003
	(0.0026)	(0.0024)
Adjusted R^2	0.8324	0.8691
Base model	YES	NO
Interactions	NO	YES

Robust SE in parentheses

**p<0.1 **p<0.05 ***p<0.01*

Base model include: *logsize, antallrom, antallbad, parish, quarter*

Extended model additionally include: *boligtypekode, firstfloor, age_property, new_buyer, parish*quarter*

samebank & agegroup_young

The results of the estimation of equations 2 and 3 are shown in table 8. As column (1) and (2) show, *samebank* has a statistically significant negative impact on price in both models. This means that when *samebank* = 1, the final price is approximately 1.3% lower than when *samebank* = 0 in the base model. In the extended model, the coefficient decreases in power, and the price is about 0.9% lower. Adjusted R_2 increases from the base model to the extended model.

Columns (3) and (4) display the results for *agegroup_young*. We see that being below 34 implies a lower price, compared to older age groups. The result is statistically significant in both models. Similarly to *samebank,* the coefficient on *agegroup_young* decreases in power in the extended model, while adjusted R_2 increases. Columns (5) and (6) show the results when including both variables of interest in the same expression. The coefficient for *agegroup_young* does not change, but the coefficient for *samebank* decreases in power.

Table 8.

	(1)	(2)	(3)	(4)	(5)	(6)
	logPrice	*logPrice*	*logPrice*	*logPrice*	*logPrice*	*logPrice*
samebank	-0.0129***	-0.0089**			-0.0139***	-0.0100***
	(0.0041)	(0.0038)			(0.0041)	(0.0037)
agegroup_young			-0.0807***	-0.0706***	-0.0807***	-0.0706***
			(0.0024)	(0.0022)	(0.0024)	(0.0022)
Adjusted R^2	0.8324	0.8691	0.8363	0.8719	0.8363	0.8719
Model	Base model	Extended model	Base model	Extended model	Base model	Extended model

Robust SE in parentheses
**p<0.1 **p<0.05 ***p<0.01*
Base model include: *logsize, antallrom, antallbad, parish, quarter*
Extended model additionally include: *boligtypekode, firstfloor, age_property, new_buyer, parish*quarter*

samebank$_i$

When analyzing each bank-realtor ownership separately, we see different effects on price (Table 9). However, most linkages negatively impact the price. This means that the price is lower when using the same bank and realtor. When using DNB as realtor and bank, the price is about 1% lower, which is approximately equal to the result for *samebank* on the aggregate level. Using Sparebank1 and Eiendomsmegler1 results in a 6% decrease in the base model and a 3% decrease in the extended model. The large difference between the coefficients in the base and extended model indicates that the latter model's additional variables are important for explaining the variation in price. Using Eika with either Terra or Aktiv will increase the price with almost 44% in the base model, at the 10% level. However, there are few observations where *samebank_eika* = 1, which may explain this result. The results are not statistically significant in the extended model.

Table 9.

	(1)	(2)
	logPrice	*logPrice*
samebank_DNB	-0.013***	-0.0102***
	(0.0042)	(0.0039)
Adjusted R^2	0.8363	0.8719
	logPrice	*logPrice*
samebank_nordea	-0.0231	-0.0844
	(0.0547)	(0.0596)
Adjusted R^2	0.8363	0.8719
	logPrice	*logPrice*
samebank_danskebank	0.0067	0.0123
	(0.0236)	(0.0191)
Adjusted R^2	0.8363	0.8719
	logPrice	*logPrice*
samebank_sparebank1	-0.0633***	-0.0313*
	(0.0198)	(0.0176)
Adjusted R^2	0.8363	0.8719
	logPrice	*logPrice*
samebank_eika	0.4375*	0.2301
	(0.2254)	(0.1597)
Adjusted R^2	0.8364	0.8719
Model	Base model	Extended model

Robust SE in parentheses

**p<0.1 **p<0.05 ***p<0.01*

Base model include: *logsize, antallrom, antallbad, parish, quarter, agegroup_young*

Extended model additionally include: *boligtypekode, firstfloor, age_property, new_buyer, parish*quarter*

Probability of Having a Mortgage in the Bank That Owns the Realtor

Distribution of Bank-Realtor Linkages in the Dataset

We have analyzed if the probability of having a mortgage in a bank changes when using the bank's realtor, compared to when using another realtor. The results are displayed in table 10. Column 1 shows the results from a base model, and column 2 shows the results from an extended model. The results imply that when DNB Eiendom conveys the sale, the probability of having a mortgage in DNB Bank is about six percentage points higher than when using other realtors. Given the constant term, this implies a 14% higher probability of using DNB Bank. When Eiendomsmegler1 conveys the sale, the probability of having a mortgage in Sparebank1 is 0.9 percentage points higher than when other realtors are used in the base model, while it is 1.4 percentage points higher in the extended model. When Aktiv is used, the probability of having a mortgage in Eika is higher than when using other realtors, but the probability is quite low in both models and statistically significant at the 5% level. The results show that using Terra gives a negative probability of having a mortgage in Eika. However, it is not possible to have a negative probability. The results for Nordea and Privatmegleren, and Danske Bank and Krogsveen are not statistically significant. We see that when including more controls to the equation, the coefficients on the variables of interest changes quite much. This indicates that the controls explain some of the change in probability of having a mortgage in bank$_i$

Table 10.

	(1)	(2)
	DNB_bank	*DNB_bank*
DNB_Eiendom	0.0604***	0.0593***
	(0.0053)	(0.0063)
	nordea	*nordea*
privatmegleren	0.0074	-0.0010
	(0.0262)	(0.0316)
	danskebank	*danskebank*
krogsveen	0.0026	0.0019
	(0.0022)	(0.0023)
	eiendomsmegler1	*eiendomsmegler1*
sparebank1	0.0089**	0.0143***
	(0.0038)	(0.0048)
	eika	*eika*
aktiv	0.0049**	0.0056**
	(0.0022)	(0.0027)
terra_eiendomsmegling	-0.0012***	-0.0010***
	(0.0003)	(0.0003)
Model	Base model	Extended model

Robust SE in paranthesis
**p<0.1, **p<0.05, ***p<0.01*
Base model include *parish, quarter*
Extended model include the control variable *parish, quarter, boligtypekode, logsize, agegroup_young*

samebank as the dependent variable

When using the same bank and realtor, we see that specific characteristics with the transaction stand out. The results are displayed in table 11. More specifically, we see that young buyers are less likely to use the bank that owns the realtor. This is contrary to our expectations. On the other hand, the probability of using the same bank and realtor increases when looking at the sample after the year 2000, which we consider is in line with the development in the market. First-time buyers (which we believe are

captured by *the variable new_buyer*) increases the probability of using the same bank and realtor.

Furthermore, buying a "blokkleilighet" decreases the probability of using the same bank that owns the realtor. This implies that it is more common to use the bank that owns the realtor if it is a different housing type. From the data, we found that younger buyers are more inclined to buy an apartment than a house, so this decline in probability may be connected to this finding.

Table 11.

	(1) *samebank*	(2) *samebank*
agegroup_young	-0.0034	-0.0066***
	(0.0024)	(0.0025)
after2000	0.0639***	0.0651***
	(0.0023)	(0.0023)
new_buyer		0.0133***
		(0.0025)
blokkleiglighet		-0.0105***
		(0.0039)
Model	Base model	Extended model

Robust SE in paranthesis
**p<0.1, **p<0.05, ***p<0.01*
Both models include the control variables *parish, logsize*

Discussion

We have investigated whether using the same bank and realtor affects the price and whether the probability of having a mortgage in a particular bank is affected by which realtor is conveying the sale.

Price Effect of Bank-Realtor Cross-Ownership

First, we show the effect of bank-realtor relationships on price. We find that the variable *bankowned,* which captures whether or not a bank owns a realtor do not affect the price. Based on relevant literature and market characteristics and competition in the market, it seems reasonable that whether a bank owns the realtor does not affect the price in any statistically significant way. The variables *samebank,* and *agegroup_young,* which implies cases where buyers use the same bank and realtor, as well as being young, have a statistically significant negative effect on the final price. Specifically, the results indicate that when the buyer uses the same bank and realtor, the final price decreases by about 1%. Furthermore, we see that younger buyers pay 7% less compared to other groups.

The second and third findings have different interpretations. Particularly, because a 1 % “discount” can be economically significant for both buyers and sellers. However, we do not know the reason why this discount may apply. It can be that the real estate agent is less interested in collecting offers from several potential buyers if they already have one or more potential buyers that already is a client within “their” bank. This may reduce the number of people that participate in the auction, which may reduce the price. Similarly, the real estate agent could be less interested in obtaining a high price, and more interested in speeding up the sales process to get more selling assignments. This resembles a case where asymmetric information between the realtor and the seller results in the seller obtaining a lower price.

The results may also be due to unobserved heterogeneity in the sample, as well as not having sufficient controls, which implies the problem of omitted variable bias. Although we control for important hedonics such as size and number of bedrooms, other characteristics might affect the price. Some examples are the presence of elevators, view, balcony, time since the last renovation, and noise from traffic. Although we control for the parish, and therefore that different parishes have different benchmark standards for housing, there can be many variations in the characteristics mentioned above within a parish that can affect the price.

If using the same bank and realtor leads to a 1% lower price, this will initially negatively affect the seller, and positively affect the buyer. However, if the buyer also has a property to sell (not a new buyer), they might receive a lower price on their offering, depending on whether they use the same bank and realtor. Alternatively, the real estate agent may be so interested in obtaining new clients that the bank issues a proof of financing, so these people make an offer on the house. In order to gain these people as mortgage clients at the bank, the real estate agent advises the seller to accept the offer, even though a better offer could have come if the seller was willing to wait. Unfortunately, we do not have credit information on the seller, so it is only possible to see how the buyer-realtor relationship affects the price. It would be interesting to know whether the seller uses the same bank and realtor to clarify to which degree a realtor uses the network of bank clients to speed up the process.

The third finding is that being a young buyer negatively affects the price, compared to older ones. We believe this is a natural consequence of being young and having a lower budget. Furthermore, younger buyers might be more patient and less picky about characteristics such as balcony, elevator, the general condition of the apartment. Such characteristics are likely to impact the final price, besides the ones already controlled for. This implies that this negative price effect could also be due to unobserved heterogeneity. A particular case that would have been interesting to know is the income of the young buyers and their parents' income, as it is common for young buyers, especially first-time buyers, to receive financial support from parents.

When we investigate the effect on the price for each bank–realtor linkage, we find that using DNB Bank and DNB Eiendom results in a 1% lower price. When using DNB as realtor and bank, the price declines approximately equally as much as when using samebank on the aggregate level. This could be explained by the fact that DNB comprises a large share of our sample. As DNB and DNB Eiendom constitute 5,409 of 5,862 (approximately 92.3 %) of the cases where the same bank and realtor is used, we believe that the result for DNB drives the overall result for samebank, and it might indicate that we have unobserved heterogeneity between *samebank_DNB* and the other *samebank*$_i$-variables. The results for Eika, Aktiv, and Terra Eiendomsmegling show the opposite result, with an increase in price when using the same bank and realtor. However, the result is not statistically significant in the extended model, and there are only eight instances in the sample where Eika is used together with Aktiv or Terra.

Probability of Having a Mortgage in the Bank That Owns the Realtor

Next, we provide evidence that specific bank-realtor relationships have different effects on the probability of having a mortgage in the bank that owns the relator. More precisely, we find that using DNB Eiendom increases the probability of having a mortgage in DNB Bank by six percentage points. However, an important note is that we do not know whether the buyer has switched banks in relation to the purchase.

This result may imply realized efficiency gains from DNB's bank-realtor relationship in that that DNB Eiendom efficiently convinces their clients to use DNB Bank for a mortgage. However, as mentioned, we do not have data on the sellers, and we cannot see if the seller used their banks' realtor. As was described under *Overview of the Norwegian Realtor Industry,* it is not uncommon that case handlers in banks are rewarded for every loan customer that also enters into a house selling agreement (Finanstilsynet, 2016). If it is the case that DNB Bank is able to "push" their clients into house selling agreements, and maintaining them as loan customers through their

next purchase, it will make it difficult for other banks and realtors to compete for these customers.

In order to investigate if this probability applies for the whole sample period, we run the same analysis for DNB in the periods 1993-2011 and 2012-2018, as illustrated in appendix 4. The result shows that for the period 1993-2011, the probability of obtaining a mortgage in DNB Bank when using DNB Eiendom is about six percentage points in both the base and extended models, which is similar to the result for the whole sample period. On the other hand, in the period 2012-2018, this probability is only one percentage points in the base model and -1 percentage point in the extended model. Neither results are statistically significant. Besides, a negative probability is not possible. Nevertheless, this result is unexpected, considering that the market share of DNB Eiendom has increased since 2012 (DNB-Konsernet, 2016). However, the result may be due to selection effects, as there are fewer observations after 2008 than the years before. The time fixed effects may not be sufficient to account for this.

As expected, we find that the probability of having a mortgage in the bank which owns the realtor that conveyed the sale increases after 2000. This expectation stems from the fact that around the year 2000, most of the bank-owned realtors were established, and the bank-owned realtors acquired independent realtors.

For younger buyers, we find that they are less likely to use the same bank and realtor. This finding was partly contradictory to our expectations, as we expected young buyers to be more inclined to accept the realtor's offer. On the other hand, young buyers are likely more inclined to receive financial support from their parents than older buyers. If young buyers do not already have an established relationship with a bank, they might use the same bank as their parents. Furthermore, the age category 18-34 is rather broad, and there is probably unobserved heterogeneity in the observations. For instance, we do not know whether the distribution is similar across

the age category. Additionally, we expect that young buyers are more willing to put in effort into collecting offers from different banks, as they most likely have lower budgets compared to older age groups.

Concluding Remarks

In this thesis, we investigated whether a bank-realtor cross-ownership affects the price and the probability of having a mortgage in the bank that owns the realtor which conveyed the sale. Based on our findings, it is difficult to conclude whether bank-realtor cross-ownership has anticompetitive effects in the markets for mortgages or realtors or has negative implications for the consumers. Although DNB has a substantially larger market share than the other banks and realtors in our sample, the market for realtor services and mortgages could be considered competitive from a nationwide perspective. As was mentioned when discussing the market shares, the distribution in our sample does not reflect the actual distribution.

Although the result of a 1% price reduction is statistically significant, the effect is small. The result could be due to unobserved heterogeneity as well. A six percentage point increase in the probability of obtaining a mortgage in DNB Bank when DNB Eiendom is the realtor sounds quite much compared to the other bank-realtor linkages that are rather low non-significant. However, several factors could explain this number. Firstly, it could be due to realized efficiency effects as a result of the bank-realtor ownership. Alternatively, it could indicate that the bank's realtor is pushing mortgages on the clients, but we do not have enough information to determine this. In addition, this result could also be affected by unobserved heterogeneity in that we have not included enough controls.

When taking our sample into account, it seems like a potential future consequence could be a higher concentration in the market for mortgages, because one bank, in particular, has a substantial share of this market. However, as the data only represents a few areas in Norway, this finding does not apply to the whole nation. From a

nationwide perspective, the market shares are, to a larger extent, more evenly distributed among the players in both markets. Hence, it is difficult to evaluate the consequences of tying and bundling in a bank-realtor context, as the competitive situation differs across areas.

Appendix

Appendix 1.

This shows the result from a pre-commitment to a tie-in, based on Pepall et al (2014):

The integrated firm has marginal cost of *1* per unit of M and C. Each consumer will buy at most one unit of either, depending on whether the price exceeds or is less than the consumer's valuation.

	Nuts value	*Profits nuts*	Bolts value	*Profits bolts*	Bundle value	*Bundle profits*
1	0.5	*0*	5.0	*32*	5.5	*35*
2	1.5	*4,5*	6.0	*35*	7.5	*44*
3	2.0	*8*	**7.0**	***36***	9.0	*42*
4	2.5	*10,5*	4.0	*30*	6.5	*40,5*
5	**3.2**	***13,2***	4.5	*31,5*	7.7	*39,9*
6	3.5	*12,5*	7.5	*32,5*	**11.0**	***45***
7	4.0	*12*	8.0	*28*	12.0	*40*
8	4.5	*7,5*	8.5	*22,5*	13.0	*33*
9	5.0	*8*	9.0	*16*	14.0	*25*
10	5.5	*4,5*	10.0	*9*	15.5	*13,5*

When nuts is priced at 3.5, 5 people will buy nuts, which yields a profit of 5(3.5 – 1)=12.5. When bolts is priced at 7.0, 6 people will buy bolts, which yields a profit of 6(7 – 1)=36. Total profits for the integrated firm is 12.5+36= 48.5.

If the integrated firm decides on a bundle, the profit maximizing price of 11 will attract 5 consumers and yield a profit of 5(11-2)=45. In this case, the integrated firm will not engage in bundling, as the profit from the bundle is less than the combined profits from the independent prices.

If a potential, more efficient rival is able to sell nuts at the price of 1, this rival will steal all customers in nuts from the integrated firm. If the rival has marginal costs of 0, and a sunk cost of investment of 5, it will earn a profit of 9 from the market for nuts, enough to cover investment cost. The rival will enter the market, and the integrated firm will only earn its monopoly profits from the market for bolts of 36.

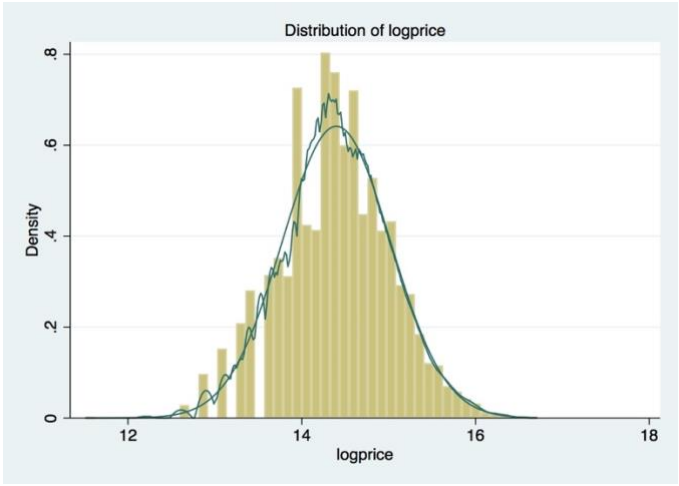
In order to deter entry, the integrated firm may want to offer a bundle of nuts-bolts at the price of 7. Consumers will decide on whether to buy the bundle or nuts independently, dependent on the consumer surplus they obtain from each purchase.

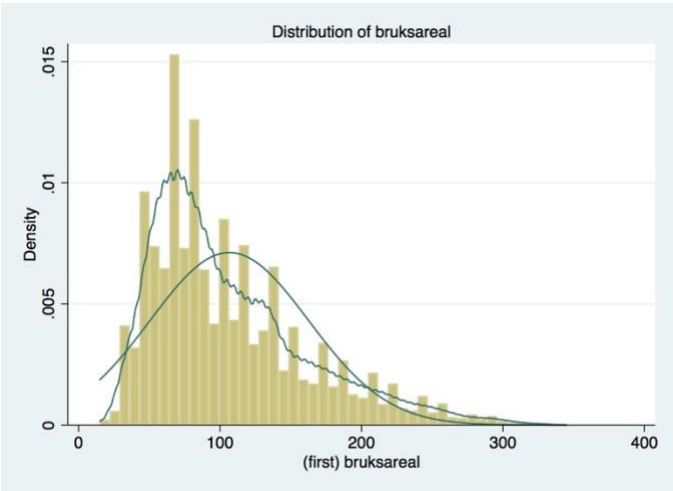
	Nuts value	Surplus nuts (1)	Bundle value	Surplus bundle (7)
1	0.5	*-0.5*	5.5	*-1.5*
2	1.5	*0.5*	7.5	*0.5*
3	2.0	*1*	9.0	*2*
4	2.5	*1.5*	6.5	*-0.5*
5	3.2	*2,2*	7.7	*0.7*
6	3.5	*2.5*	11.0	*4*
7	4.0	*3*	12.0	*5*
8	4.5	*3.5*	13.0	*6*
9	5.0	*4*	14.0	*7*
10	5.5	*4.5*	15.5	*8.5*

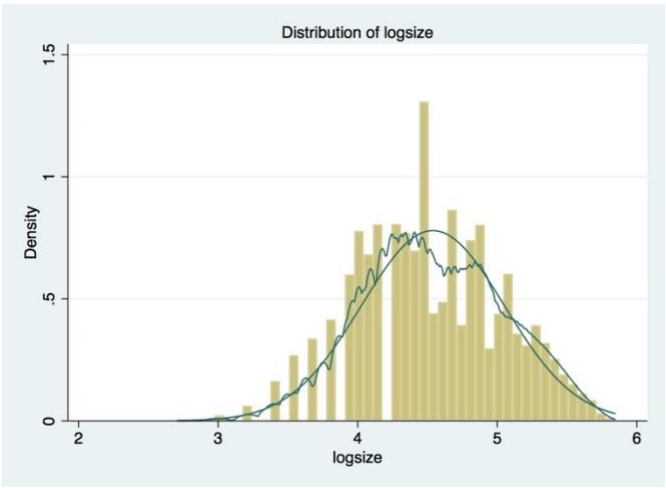
Consumer 1 will buy neither. Consumer 4 and 5 will buy nuts from the rival, giving them a profit of 2. Even if consumer 2 chooses to buy nuts from the rival (consumer 2 have the same surplus from the bundle at price 7 and nuts at price 1), it is still not able to cover fixed costs. In the absence of a rival, the incumbent will now sell its bundle to all consumers with valuations equal to or higher than 7. This is a total of 8 consumers, which yields a profit of 8(7-2) =40. This profit is higher than that what the integrated firm earns by accepting the rival's entry into the market for nuts.

Appendix 2

Distribution of price vs logprice and bruksareal vs logsize



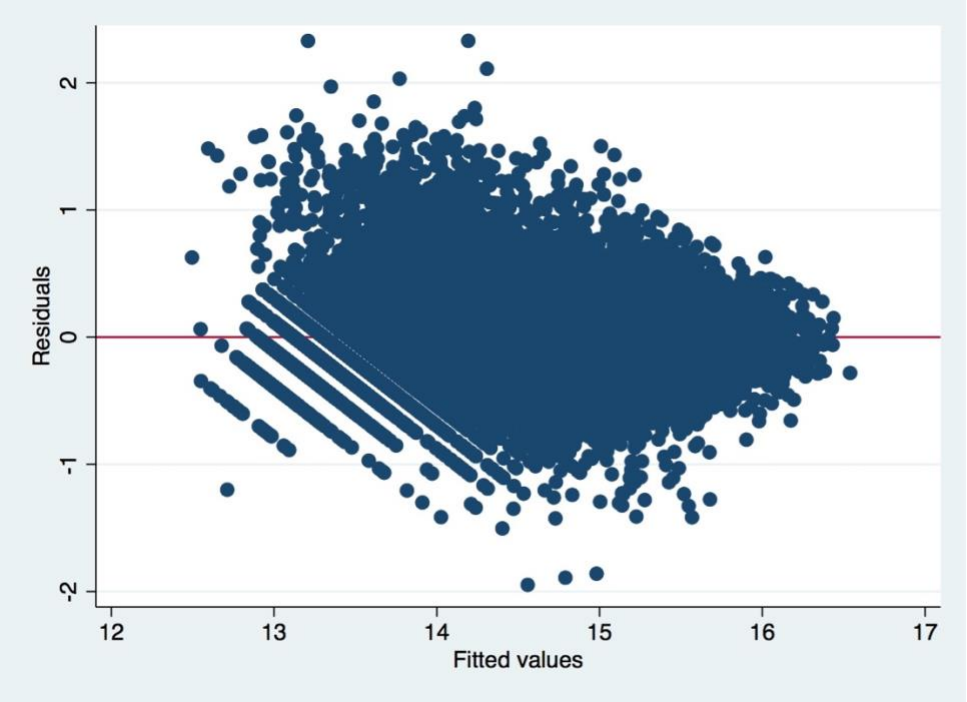




Appendix 3

Heteroscedasticity test

1. $logPric = \beta_0 + \beta_1 samebank + \beta Control + e$




```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logprice

         chi2(1)      =   337.88
         Prob > chi2  =   0.0000
```

Appendix 4

Probability of using DNB Bank when DNB Eiendom are used, for different time periods.

	1993-2011		2012-2018	
	(1)	(2)	(1)	(2)
	DNB_bank	*DNB_bank*	*DNB_bank*	*DNB_bank*
DNB_Eiendom	0.0618***	0.0607***	0.0112	-0.014
	(0.0054)	(0.0064)	(0.03)	(0.0485)
Model	Base model	Extended model	Base model	Extended model

Robust SE in paranthesis

**p<0.1, **p<0.05, ***p<0.01*

Base model 1993-2011 include *parish, timecontrol*****

Extended model include the control variable *parish, timecontrol*****, *boligtypekode, logsize, agegroup_young*

**** timecontrol for 1993-2011 is *bf2012* (= *year* if *year* < 2012)
timecontrol for 2012-1028 is *from2012* (= *year* if *year* >= 2012)

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