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Real Estate Underpricing and the Removal of Surveyor Valuations

Norsk tittel: Underprising i boligmarkedet og avskaffelsen av verditakst

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Abstract

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by Vinh Duy Nguyen and Ole Sigurd Nørstebøen

According to Norwegian law, it is illegal to strategically underprice (in Norwegian "Lokkeprise") real estate, which involves setting an asking price that the seller is not willing to accept and/or a low asking price compared to the expected market value of a dwelling. We analyse the 2016 policy shift of abolishing third party surveyor valuations (in Norwegian "Verditakst") on underpricing in Oslo and Bergen. We argue that real estate agents prefer a quicker sale compared to sellers, and are therefore interested in setting a low asking price to attract more bidders. Further, we suggest that abolishing surveyor valuations increases information asymmetry between the agent and the seller, thus enhancing the agent's opportunities to underprice. Using both non-experimental and quasi-experimental analyses, we find strong evidence in favour of increased underpricing from removing the surveyor valuation in Oslo. The average increase in the spread between the sales price and asking price is estimated at 2 - 3 percentage points, corresponding to NOK 100 000 - 150 000.

Keywords: Strategic underpricing, real estate agents, surveyor valuation, asking price, principal-agent, time-on-market

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Bergen, 20 December 2016

Vinh Duy Nguyen and Ole Sigurd Nørsteбøen

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1. Introduction

In the Norwegian real estate market, there are two commonly used measures of expected market value of dwellings listed for sale; (i) the asking price (in Norwegian "Prisantydning") set by the real estate agent and (ii) the surveyor valuation (in Norwegian "Verditakst") provided by a third party technical surveyor (in Norwegian "Takstmann"). In February 2016 and June 2016 respectively, collective initiatives by real estate agents in Bergen and Oslo implemented a new policy of excluding the surveyor valuation in sales prospects of dwellings (Dreyer, 2016). This implies that only one price estimate of a dwelling is available for potential buyers. As evident in Figure 1.1, the share of houses sold with a surveyor valuation in Oslo declines rapidly from approximately 100% to zero, with the largest drop at the end of June.

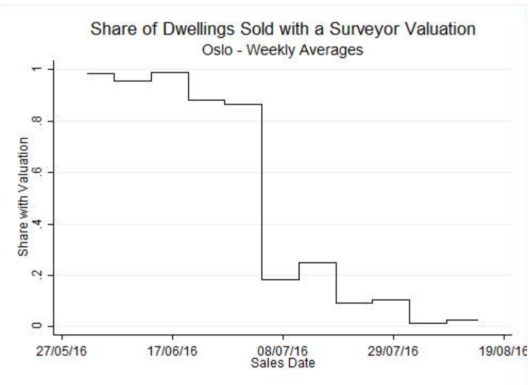

FIGURE 1.1: *Time Series of Average Weekly Share of Dwellings Sold with a Surveyor Valuation in Oslo from 03/06/16 to 12/08/16.*

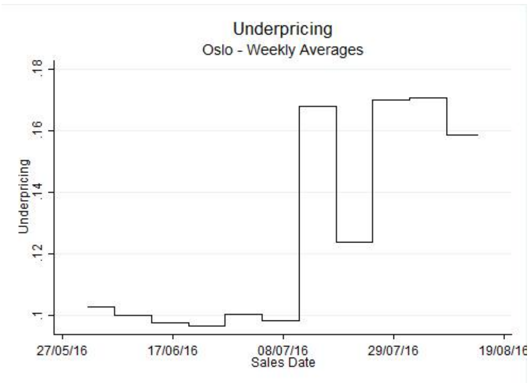

FIGURE 1.2: *Time Series of Average Weekly Underpricing in Oslo from 03/06/16 to 12/08/16. Underpricing is presented as: (Sales Price/Asking Price) -1.*

According to Statistics Norway (2015) two thirds of the average Norwegian household's wealth consist of real estate. Thus, the sale or buying of a home is likely to be the most significant financial transaction of a person's lifetime. Furthermore, most sellers go through this process a few times only, and it is common to engage a real estate agent. An important task real estate agents fulfil, is to set the asking price for dwellings in collaboration with the seller. By law and the industry code of conduct, real estate agents are obliged to market homes fairly, which means setting the asking price at an objectively expected market value, or at a price that the seller is willing to accept. The removal of the surveyor valuation has raised concerns of increased levels of strategic underpricing (in Norwegian "Lokkeprising"), as the real estate agent is the only party that sets an estimated market value. In Figure 1.2 the underpricing, measured as the average percentage difference between sales price and asking price, increases rapidly after the abolition of the surveyor valuation, from 9.8% in June to 13.0% in July.

In this thesis, we empirically analyse the effects of removing the surveyor valuation in Oslo and Bergen. The main analysis considers the following question:

Has the removal of surveyor valuations increased underpricing?

We expect underpricing to increase following the removal of surveyor valuations, due to a greater information asymmetry between the real estate agent and the seller. The agent has more in-depth information about the local housing market and the potential market value of a dwelling, than the seller who hires him/her. The information asymmetry might enable the agent to act more in his/her own interest. Levitt and Syverson (2008) find that, when real estate agents market their own home, the dwelling achieves a higher sales price and stays on the market longer, compared to when they act as intermediaries. They argue that when the real estate agent sell dwellings on behalf of principals, he/she only receives a small share of a marginal increase in price, but bears the majority of marginal costs of marketing the dwelling. Thus, the agent prefers a lower sales price in exchange for a shorter Time-on-Market (TOM), compared to the seller. Further, Levitt and Syverson (2008) find that a greater information asymmetry results in an even lower sales price and TOM.

The asking price can be used as a tool to affect the final sales price and TOM, and the consensus view among researchers is that there exists a trade-off between a higher price and a quicker sale. E.g., Anglin et al. (2003) finds that a reduction of the asking price, reduces the TOM of a dwelling. In a recent analysis of the real estate market in Oslo, Skjærholt (2015) find that underpriced dwellings achieve significantly lower sales prices. Thus, the agent's underlying objective with underpricing is unlikely a price increase. Acknowledging Levitt and Syverson's findings, we argue that the removal of the surveyor valuation increases the asymmetric information between the real estate agent and the seller, as the seller loses a comparable value estimate. This enhances the agent's possibility to report a false expected market value of the house to the seller. The seller is then more likely to accept the listing of a low asking price, which could accomplish the agent's goal of a quick sale. To test if a reduced marketing time could be the underlying objective for real estate agents to conduct strategic underpricing, we perform a supplementary analysis, where we test if the TOM decreased after surveyor valuation abolition in Oslo.

We use a unique dataset of dwelling transactions surrounding the dates of policy change in Bergen and Oslo. Initially, we apply non-experimental regression analysis. Here, we investigate the relationship between having a surveyor valuation and the level of underpricing. The rapid removal of surveyor valuations in Oslo represents a natural experiment, and can be regarded as an exogenous shock. Thus, we use two quasi-experimental research designs to obtain results with a more certain causal interpretation. First, we estimate an average treatment effect, by analysing the average underpricing before and after abolition of surveyor valuations. Second, we apply a Difference-in-Differences (DiD) test, where we compare the underpricing in Oslo before and after the abolition with control groups that did not undergo a similar policy change at the same time. In order to control for market factors, we compare the development in Oslo with Trondheim. The rationale for using Trondheim as a control group is that sales prospects in the municipality have not included surveyor valuations for decades. In addition, the movement in key variables, such as price and sales volume is similar for Oslo and Trondheim at the time of policy shift in Oslo. We control for seasonality by comparing the underpricing in Oslo in 2016 with Oslo in 2015.

For Oslo, the results support an increase in underpricing from removing surveyor valuations. The estimated average increase in the ratio of sales price-to-asking price is 2 - 3 percentage points, corresponding to approximately NOK 100 000 - 150 000[1]. This thesis does not investigate the impact on the sales price from the increased underpricing, but research by e.g., Skjærholt (2015) suggest that increased underpricing has a negative impact on sales price. We find no robust evidence of a reduced TOM in the supplementary analysis. However, the time variation of the variable is substantial, making it difficult to isolate potential effects of policy shifts.

The results of increased underpricing in Oslo from surveyor valuation abolition pass all robustness tests. We do not find significantly increased underpricing for dates other than the treatment date, implying that the increase results from a one-time shift

[1] The effect is calculated using the average sales price on freeholder dwellings in Oslo for the +/- 5 weeks surrounding the defined date of policy change (01/07/2016)

following the date of surveyor valuation abolition. We control for deal specific effects and the results are significant and consistent for all three regression designs. In the DiD, the effects are significant and consistent if compared to both Trondheim, Bergen, a combination of Trondheim and Bergen, in addition to Oslo in 2015.

For Bergen, we find that dwellings sold without a valuation have a higher level of underpricing. However, as quasi-experimental designs cannot be used to analyse the policy shift in Bergen, the results for the municipality have no causal interpretation.

To our knowledge, this thesis is the first to empirically address the effects of the removal of surveyor valuations in the Norwegian real estate market. We show that the level of underpricing in Oslo increased from the removal. Thus, re-introducing surveyor valuations could possibly lower the level of underpricing. However, the average level of underpricing in Oslo in 2016 prior to the removal of surveyor valuations was already high at 9%[2]. Other measures are likely required to lower the underpricing to an unproblematic level.

[2]The figure is calculated as the average percentage difference between the sales price and asking price of freeholder dwellings in Oslo from 01/01/2016 to 30/16/2016.

2. Background information

2.1 The Role of the Real Estate Agent and the Asking Price

The real estate market is characterized by complex and infrequent market transactions, a heterogeneous product and high information and transaction costs (Liu and Weidel, 2009). It is typically in these type of markets that intermediaries, such as real estate agents are present. These intermediaries can benefit from economies of scale in the gathering of information and produce gains in the form of lower information and transaction costs. The majority of consumers rely on real estate agents to buy and sell their homes, since the agents often are better informed about local housing markets. A report by the National Institute for Consumer Research reveals that 83% of Norwegian housing sales were facilitated by real estate agents in 2012 (Stamsø, 2012).

A real estate agent is responsible for the professional process of buying and selling properties, subject to the applicable laws and regulations. “Real estate agent” is a protected title, and the completion of higher education and two years of relevant real estate experience is required to practice as an authorized agent (Real Estate Norway, 2013). As a professional party with insight into the real estate market, a seller should expect professional guidance and assistance from the agent concerning all aspects of sales strategies (Rosén and Torsteinsen, 2008). This includes, among others, when it is beneficial to add the property up for sale, marketing, design of prospect and setting an asking price.

According to the real estate agents’ code of conduct, the asking price should reflect the market value of the property according to the agent’s objective assessment (Forbrukerombudet, 2014). Further, the asking price should not be set lower than the seller is willing to sell for. The asking price is a discretionary assessment of the property’s price, and the real estate agent will consider factors such as location, attractiveness, standard, year of construction and size when assessing the property. The seller is not legally obliged to accept bids at, or above the asking price.

2.2 The Role of the Surveyor and the Surveyor Valuation

A real estate surveyor is a specialist who sets the value of real estate property and performs other tasks, such as preparation of condition reports (NITO Takst, 2016). The title "Surveyor" is not protected, and there are no official requirements regarding education. However, it is common to have some sort of education or/and experience related to construction (Aamo, 2012). In addition, industry organisation offer different types of surveyor courses, that needs to be passed in order to become a certified member of the organisation.

The surveyor estimate an expected market value of dwellings, which in this thesis is referred to as the surveyor valuation. This is the amount the surveyor believes the property normally will sell for on the day of valuation. The surveyor value is based on visual inspection and the surveyor will typically consider factors such as dwelling age, condition, need for maintenance or replacements, location and size (Nordstrøm, 2015). In theory, the surveyor valuation should be independent of the real estate agent's value assessment, but is in practice often the same as the asking price, as seen in Figure 2.1 in the next section. The neutrality of the surveyor has been questioned by the Norwegian Consumer Council, since the surveyor is usually hired by a real estate agent on behalf of a seller (Dalen, 2011). They state that an agent typically uses a limited number of trusted surveyors, which could weaken the impartial role that the surveyor is supposed to have.

2.3 Comparison of the Sales Price, Asking Price and Surveyor Valuation

The sales price, asking price and surveyor valuation are highly correlated, as reflected in Figure 2.1. The correlation coefficient of the asking price and the surveyor valuation is 0.998, the correlation coefficient of the asking price and the sales price is 0.986, while the correlation coefficient of the surveyor valuation and sales price is 0.982[1]. Using the entire dataset of observations with a surveyor valuation in Oslo, the average asking price is NOK 318 000 lower than the sales price and NOK 33 000 lower than the surveyor valuation. In other words, the surveyor valuation is somewhat closer to the sales price on average.

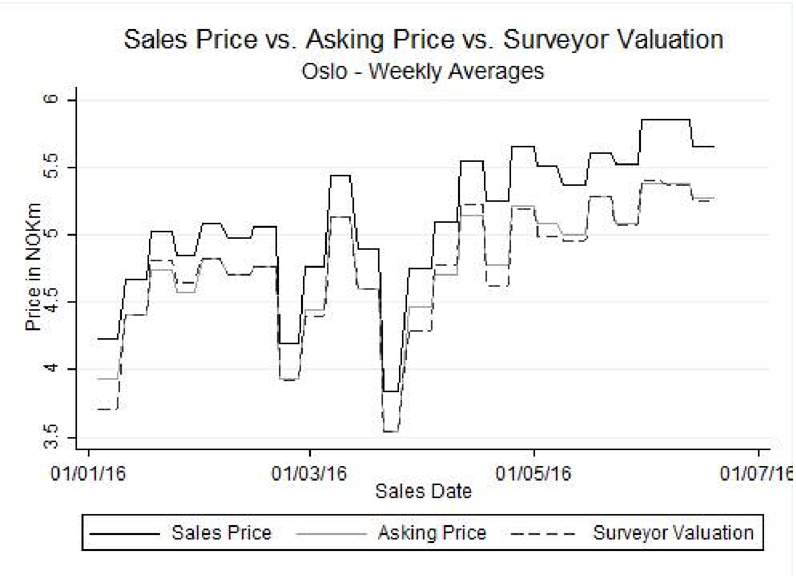

FIGURE 2.1: *Time series of weekly average sales price, asking price and surveyor valuation in Oslo from 02/01/16 to 19/06/16. We compute the time series using only the observations that report a surveyor valuation.*

The most common asking price strategy, prior to the abolition of surveyor valuations, was to set the asking price equal to the surveyor valuation. 79% set the asking price equal to the surveyor valuation. 20% set the asking price below the surveyor valuation. Only 1% set the asking price above the surveyor valuation. 77% of the dwellings were sold above the asking price. 8% were sold at exactly the asking price, while 15% were sold below the asking price.

[1]We compute all figures in this section using all observations in the dataset with a surveyor valuation, in the period from 01/10/2015 to 30/09/2016.

2.4 What is Strategic Underpricing?

There is no official definition of strategic underpricing in the marketing of housing. However, Bartholdsen (2015), director of dwellings in the Norwegian Consumer Council uses the following definition: Strategic underpricing is when a real estate agent sets the asking price below his/her objective assessment of the dwellings market value, and what the seller is willing to sell for. The often cited objective of strategic underpricing is that a lower asking price will attract more potential buyers to viewings and increase the number of bids, potentially starting a bidding war. The phenomenon has been problematized and discussed for over a decade, and a number of initiatives have been enacted to counter the problem (see e.g., Fondenes (2006)). In 2013, Real Estate Norway (in Norwegian "Eiendom Norge"), the national association for Norwegian realtor brokerages, launched new guidelines which all member firms adapted (Wig, 2013). In particular, the real estate agents had to inform the seller when the asking price was set below the surveyor valuation, and why it was the case.

The agent is obliged by the Real Estate Act § 6-3. to carry out assignments in accordance with good estate agency practice, without undue delay and taking due care of both parties' interests (emgll, §6-3, 2007). Of great importance in this connection is the agent's information and investigation duty, which ensures that the buyer receives complete and accurate information about the property and its value. The estate agent is also obliged to follow the marketing law and the real estate agents' own industry code (Wig, 2016a). Section 3.2.4 of the industry code states that the asking price must not intentionally be set lower than what the seller is willing to accept at the time of marketing. It must not be lower than the agent's objective assessment would indicate (Forbrukerombudet, 2014). This implies that the use of strategic underpricing is forbidden. Strategic underpricing may result in a fine or a loss of real estate agent privileges (Bartholdsen, 2012). Several real estate agencies have received warnings by the consumer council for the use of such pricing strategies.

The use of strategic underpricing has implications for both the seller and buyer. As described in the introduction, the seller should expect to receive a lower sales price, than what could have been received if the asking price was set higher. Further, strategic underpricing may attract buyers on false premises. Some might join a bidding war they initially cannot afford, which requires a higher loan from the bank.

2.5 Policy Shift - the Abolition of the Surveyor Valuation

The practice of using a third party surveyor in the valuation process of a dwelling varies across Norway. Cities such as Trondheim, Stavanger and Kristiansand have no surveyor valuation attached to the sales prospects. Many real estate agents have been dissatisfied with the policy of using surveyor valuations, which accumulated in the phase out of such valuations in the two largest cities of Norway, Oslo and Bergen (Mikalsen, 2016b). Instead, the agents have agreed to replace the surveyor- and loan value reports with the more in-depth condition reports, which has been common practice in many cities, such as Trondheim (Dreyer, 2016). In Bergen, a gradual removal of the surveyor valuation was initiated in February 2016. The agents in Oslo performed a more rapid abolition towards the end of June 2016.

The real estate agents and surveyors generally have opposing views on the benefits of the surveyor valuation. The arguments of the real estate agents in favour of removing the surveyor valuation have mainly been focused around surveyors' lack of local market knowledge (Mikalsen, 2016b). According to Carl O. Greving, CEO of the Norwegian Association of Real Estate Agents, the surveyor value has made it difficult for the real estate agents to set a higher price, because of mispricing by surveyors. He states that the agents have relied to much on the surveyor to estimate the market value.

On the other hand, the surveyors state that the agents have their own agenda with the removal, as the agents may manipulate the asking price in order to achieve the best possible price (Dalseg, 2016). According to Are Andenæs Huser (2016), CEO of The Norwegian Valuers and Surveyors Association, the surveyor valuation is an important counterweight to the use of underpricing and other tactical pricing strategies. Further, he claims that the collective agreement of the real estate agents to remove the surveyor valuation is an effort from the agents to strengthen their position at the expense of the consumers. He argues that the surveyor is the only party in the selling process whose gain is independent of the finalized sales price.

3. Literature Review and Theory

3.1 Literature Review

Asking price strategies have been researched extensively. With regard to real estate transactions, a body of literature exists on the trade-off between sales price and TOM, and how these factors are affected by the initial asking price. There is a fairly unison agreement that the initial listing price plays a critical role in the marketing of dwellings. E.g., Yavaş and Yang (1995) find that an increase in the asking price increases TOM, which is supported by both Anglin et al. (2003) and Merlo and Ortalo-Magné (2004). Furthermore, Han Bin and Mona J. (1989) find that overpriced homes take longer to sell. By setting a high asking price, a seller may discourage potential buyers and risks having the property on the market for a long time. On the other hand, if the asking price is set too low, the result may be a speedy sale at the expense of a higher price that the seller could have received if the house had been on the market longer. Similar results are found for the Swedish market (Bjørklund et al., 2006).

Skjærholt (2015) uses transaction data from the Norwegian real estate market from 2006 to 2014, and discovers that dwellings where the asking price equals the surveyor valuation, consistently obtain a higher final sales price than other listing price strategies. He concludes that the effect of underpricing is estimated to have a (strong) negative effect on the final sales price. For every NOK the asking price is set below the surveyor valuation, the seller loses between 0.8 and 0.9 NOK. This implies that the change in asking price is larger than the change in sales price, when the asking price is reduced.

What seems to make the Norwegian market special is the fact that houses are usually sold at the asking price or above. This is the case for approximately 80% of the transactions in our dataset. In studies on US data, both (Horowitz (1992) and Yavaş and Yang (1995)) find that less than 5% of the properties were sold at a price higher than the initial listing price. However, sales prices above asking prices have become more common in the US as well (Case and Shiller, 2003).

It is unclear why underpricing strategies are so widely used, as they seem to have a negative impact on the final sales price. The principal-agent literature on real estate transactions provides a possible explanation. Most of this literature examines the contractual relationship between a home seller (the principal) and the seller's real estate agent (the agent). Levitt and Syverson (2008) investigate how real estate agents sell their own house versus when they sell other's houses. They argue that real estate agents have an incentive to convince clients to sell their houses too cheaply and too quickly, and emphasize that agents obtain only a small portion of the marginal increase in the price offer. This implies that sellers and agents will have diverging interest because the goal of maximizing price while minimizing marketing time is not completely compatible with the agent's goal of maximizing net commission revenue while minimizing marketing time. The authors find that agents keep their own properties on the market longer, on average 9.55 days and obtain a higher price of 3.7% after controlling for a wide range of housing characteristics. These results align with research by (Rutherford et al., 2007).

3.2 Theory

3.2.1 Game- and Principal-Agent Theory in relation to the House Selling Process

The economic reasoning of this thesis builds on Game Theory and Principal Agent Theory. Ross (1973) defines a principal agent relationship to have arisen "between two or more parties when one, designated as the agent, acts for, on behalf of, or as a representative for the other, designated the principal, in a particular domain of decision problems". The real estate agent and seller relationship is a classic manifestation of the Principal Agent relationship, where the agent assists in the process of selling the owner's house and receives compensation for doing so.

At the heart of Principal-Agent conflicts are incentive issues. Such issues arise when (i) the principal delegates a task to an agent with private information, and (ii) the principal and agent have interchanging goals (Laffont and Martimort, 2001). Thus, a certain degree of self-interest for both parties is assumed. The agent's private information can take on many forms, but the case of hidden knowledge is most relevant for the real estate agent and seller relationship, i.e. that the agent avoids sharing informational elements with the principal.

3.2.2 Crawford and Sobel (1982) – Strategic Information Transmission

Crawford and Sobel (1982) build a game theory model, which is conceptually illustrated in Figure 3.1. It can be used to show how a real estate agent might be incentivized to introduce noise to the signal of a dwellings value, in order for the seller to accept the listing of a low asking price. In the model, a sender (S) observes a value, m, unobservable to the receiver (R), representing the private information of S. S and R strategically interact, where S decides to send an information signal to R about m. Based on the signal, R makes a decision which impacts both the welfare of R and S. Both parties are assumed to be completely self-interested.

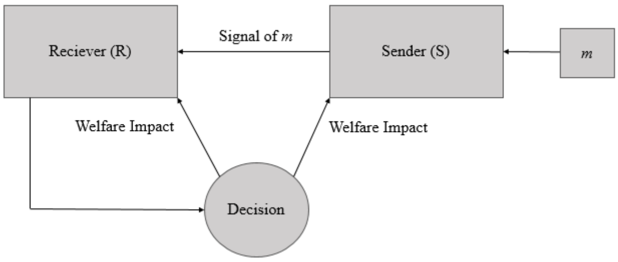

FIGURE 3.1: *An Illustrative Overview of Crawford and Sobel's (1982) Strategic Information Transmission Model.*

S might choose to introduce noise to the signal, and not reveal all information about m. It can been shown that in the Nash-equilibrium(s)[1] with standard assumptions, the amount of noise included in the signal depends on how closely related the parties' goals are. If they perfectly coincide, the optimal strategy for S is to reveal all information. However, increasing the conflict of interest, incentivises S to conceal more information.

The presented framework can be used to better understand the Principal Agent conflict between a home seller and her real estate agent. Here, the agent (S) is hired on behalf of the seller (R), to assist in the sales process. Assume that the decision to be made by the seller is to set the asking price of the house, based on the advice of the agent. In order to make a decision, information on the value of the house is transmitted from the agent. The agent is hired because of her expertise in the real estate market, and it is thus likely that the agent knows more about the expected sales price and asking price strategies, representing the private information (m) of the agent.

If the goals of the agent and the seller are conflicting, the agent's optimal strategy, according to the model, is to introduce noise in the signal of m. Levitt and Syverson (2008) find that real estate agents prefer to to sell quicker compared to the seller, despite achieving a lower final sales price. In addition, e.g. Skjærholt (2015) and Anglin et al. (2003) find that a lower asking price results in a lower sales price and a lower TOM respectively. Thus, in order to achieve his/her goal of a quick sale, the agent could introduce noise to the signal of the market value of the dwelling, in order to convince the seller to agree on a lower asking price.

The size of the information asymmetry decides the extent to which S can disturb the signal sent to R. The hypothesis of this thesis assumes that the surveyor valuation is another channel for the seller to receive information on the expected sales price

[1]The term Nash-equilibrium refers to the decision rules where all players maximize their utility, taking into account the optimal responses of the other players.

of the dwelling (m). A decrease in the information asymmetry between the seller and agent weakens the possibility for the agent to affect the seller's decision through noisy information sharing. However, the hypothesis hinges on the assumption that the surveyor is an objective party whose pay-off does not depend on the provided price estimate. Then, the signal of m from the surveyor might also be noisy.

3.2.3 The Incentives of the Typical Norwegian Real Estate Agent

The presence of information asymmetry seems obvious in the real estate agent and seller relationship. However, as the model of Crawford and Sobel (1982) implies, a Principal-Agent Problem further requires interchanging goals. Inspired by Levitt and Syverson (2008) we investigate the compensation structure of the typical Norwegian real estate agent, to see if it gives rise to conflicting goals in the trade-off between sales price and TOM.

Assuming rationality, one expects the seller to maximize price while minimizing TOM. On the other hand, the agent maximizes his/her net compensation while minimizing TOM. These goals are not necessarily perfectly aligned, which may give rise to a principal–agent problem. The compensation an agent receives following a dwelling-sale can be based on a commission (a percentage of the sales price), a fixed price or an hourly rate. *Ceteris paribus*, a pure commission-based compensation would ensure alignment of the seller and agents welfare from a home sale. However, if the real estate agent receives a fixed price in addition, his welfare will be less dependent on a marginal increase in price of a single dwelling and more dependent on the number of dwellings sold. According to a survey by Stamsø (2011), the most common form of income for Norwegian real estate agencies is commission in combination with a fixed price for certain service, such as marketing fees and fees related to viewings. Most of these fixed cost are pure disbursements transferred to other parties, while some such as the facilitation fee may raise profits to the agent. However, the main compensation of the typical agent is variable.

According to The Financial Supervisory Authority of Norway (2016), the average commission on the sale of residential property in Norway as a whole remained stable at approximately 1.9 % from 2012 to the first half of 2015. The initial commission paid by the seller, is received by the agency that employs the agent, which in turn will typically distribute 25-40% to the agent (Matanovic, 2014). We perform a "back-of-the-envelope" calculation of the marginal income of an average real estate agent from waiting for an increased bid of NOK 100 000. We use the average commission received by the agencies (1.9%) and assume that the share redistributed is 40%. An increase of NOK 100 000 in sales price, will increase the gain of the seller with NOK 98 100, disregarding potential costs of prolonged advertising or additional viewings. However, the agent's compensation will increase by NOK 760 only[2]. Thus, the marginal income of the agent from waiting is very low. The marginal costs from waiting could however be larger, especially the opportunity cost of time. The time spent by the agent of organising another viewing and assisting in an additional bidding process has an alternative use: The agent could have marketed another dwelling and received commission from a potential sale. If we assume a sales price of 3 000 000, the agent would have received an additional NOK 22 800[3], under equal assumptions as the previous calculations. Thus, the fact that the agent has limited available time and that the compensation is dependent of the number of sold dwellings, might create conflicting goals with regards to sales price and TOM. It could therefore be optimal for the real estate agent to get the seller to agree on a lower listing price, in order to reduce the TOM.

[2]Based on an agency commission rate of 1.9% and agent transfer rate of 40%, the agent will increase income by NOK 100 000 $*$ 1.9% $*$ 40% = NOK 760. The seller will gain NOK 100 000 $*$ (100% - 1.9%) = NOK 98 100. We disregard taxes and additional costs related to viewings and prolonged marketing.

[3]NOK 3 000 000 $*$ 1.9% $*$ 40% = NOK 22 800

4. Data

The data is provided by Eiendomsverdi AS and gathered from their online database. Since the data is viewable in a a web browser only, we download and convert the data to an analysable format using a self-written macro routine. The sample consists of one year of dwelling transactions for the municipalities Oslo, Bergen and Trondheim for sales dates between 01/10/2015 and 31/09/2016. In addition, we extract observations for Oslo in the period from 01/05/2015 to 31/08/2016. Overall, we use approximately 11 months in regression analyses. We extract the remaining months for use in graphical presentations. The dwellings are limited to those defined as freeholder type (in Norwegian "Selveier"), and therefore does not include any information about the developments in housing markets with other forms of ownership, such as the housing cooperative market (in Norwegian "Borettslag")[1]. The data downloaded from Eiendomsverdi.no does not contain city district information, but include postcodes. We use the postcodes to match each transaction with the respective city district.

The data consist of manually added transaction input from real estate agents. Eiendomsverdi matches the input with official records for the dwelling, before they automatically clean the data and remove obviously erroneous entries. We use both dwelling specific and transaction specific variables in the analysis. Dwelling specific variables include Type of Dwelling, Living Area, Age and City district. Transaction specific variables include; TOM, Registered Date, Sales Date, Judicial Registration Date, Asking Price, Sales Price, Surveyor Valuation, Real Estate Agency and Price per m^2. We provide a more detailed explanation of each variable in Section 8 of the Appendix.

The original data totals 20 408 observations of sold dwellings. We remove 3 504 observations with missing information, including observations that either do not have an asking price and/or sales price. We drop 385 observations because the judicial

[1] In essence, "Freeholder" is the term for a dwelling where the person in possession of the dwelling is the owner. The term "Housing Cooperative" is used when the person in possession owns the right to use the dwelling, but the cooperative of which he/she is a member of is the owner.

registration date and sales date are the same. These are cases where it is uncertain whether the reported sales date is correct. Further, we exclude 7 observations because of unrealistic differences between two or three of the value measures. Lastly, we remove 333 observations due to extreme values: If TOM is larger than 180 days, the observations are dropped. According to Eiendomsverdi, it is uncertain whether these observations have actually been in the market for the specified time. We drop the observations where TOM equals zero, as these will likely involve cases with wrongly specified dates. We drop a total of 4 229 observations, and the final database includes 16 179 transactions.

A limitation of the data is the measure provided for TOM. It is defined as the number of days between the sales date and the registered date. If one of these dates are wrongly specified, TOM is falsely reported. Further, as the data set only contains observations of sold dwellings, we have no information on whether a dwelling has been listed on the market and withdrawn. Thus, if a dwelling is re-registered on the market and sold, TOM will be downwards biased. This implies that periods of low market temperature, with a large number of withdrawals, will have a downwards-biased TOM.

5. Empirical Results and Analysis

Figure 5.1 illustrates how to interpret frequently used terms. In this thesis, "Treatment Date" is the day where the real estate agents removed the surveyor valuation. An "Event Window" is the number of weeks before and after the treatment date. Thus, the treatment date is also a "Window Centre".

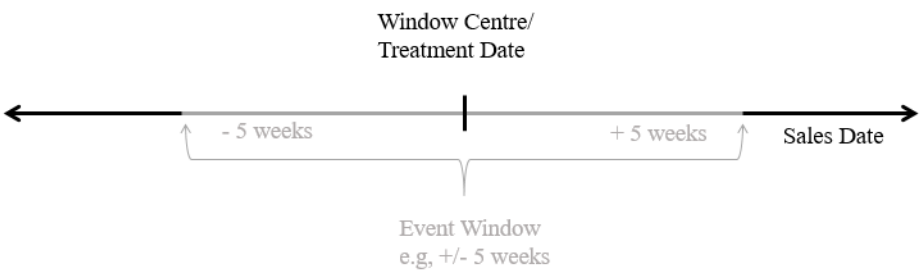

FIGURE 5.1: *Illustration of frequently used terms.*

5.1 Describing the Policy Shifts

5.1.1 Policy Shift in Oslo

In Figure 5.2, the date of policy change is set after the large initial drop in the use of surveyor valuations. For the remainder of the analysis, the beginning of the new regime of Oslo is therefore set to begin on Friday 01/07/2016, illustrated by the solid gray line in Figure 5.2. The timing of the drop corresponds well with what the agents have communicated in the media.

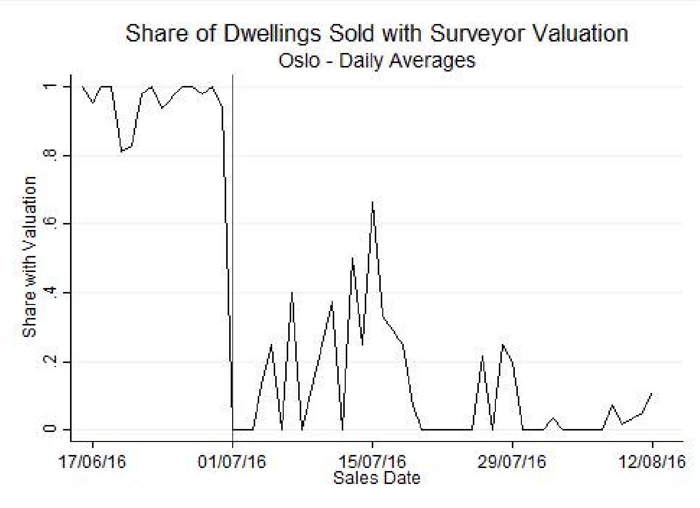

FIGURE 5.2: *The graph shows the daily average share of dwellings sold with a surveyor valuation in the municipality of Oslo, from 16/06/16 to 12/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo. Days with less than three sales are excluded, due to graphical convenience. The time dimension is defined by the sales date.*

The policy shift in Oslo is rapid, but not strictly dichotomous. Although most dwellings are sold without a surveyor valuations after 01/07, some are still reporting it. Correspondingly, some dwellings are sold without a surveyor valuation prior to 01/07. As seen in Figure 5.2, the highest volatility is found in the weeks after 01/07, before the share settles at the zero level. These weeks have a low number of sales. The signs of policy shift are however clearly evident and the movement from 100% use to zero runs over a short time span. Thus, the case of Oslo can be regarded as a natural experiment, where we treat the policy shift as an exogenous treatment. By doing so, we have fewer potential sources of endogeneity, which leads us closer to a causal interpretation of the effects of surveyor valuation abolition.

The real estate agents' choice of timing for the policy shift in Oslo complicates the causal interpretation of the results. July is by many means an atypical month in the Norwegian real estate market: It contains the three week national summer holiday, it has the lowest number of available objects, the lowest sales volume and the longest TOM of all months (Real Estate Norway, 2016). Thus, proving that movement in key variables is driven by a policy shift is particularly difficult in July.

5.1.2 Policy Shift in Bergen

In contrast to Oslo, surveyor valuations were more gradually phased out in Bergen. In Figure 5.3, there is a drop from almost 100% to approximately zero in the course of seven months, where the decline accelerates during February. The window centre is therefore set more arbitrary at Monday 04/04/2016. This is in the period where the share drops below 50%, and there is a decent amount of data with declining share both before and after. It is inexpedient to apply pretest-posttest designs to Bergen, as the gradual decline does not represent a one-time exogenous shock. However, the gradual decline enables us to control for market conditions through time fixed effects.

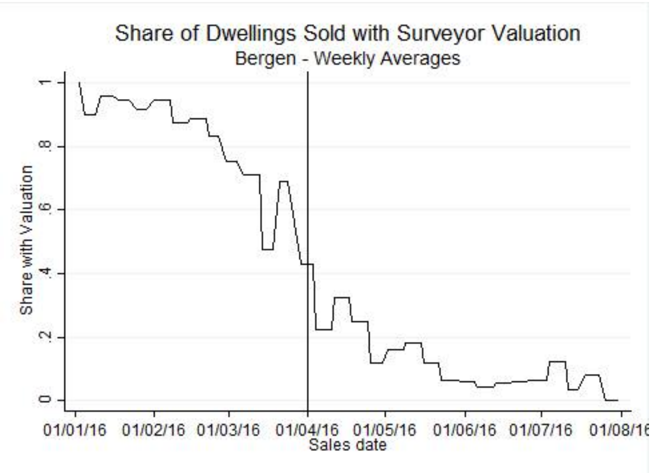

FIGURE 5.3: *Time Series of Daily Average Share of Dwellings Sold with a Sureyor Valuation in Bergen, from 01/06/16 to 30/07/16. The vertical solid line on 04/04/16 indicates the window centre.*

5.2 Descriptive Statistics

Underpricing is in Equation 5.1 defined as the ratio of sales price-to-asking price for each transaction. A high ratio is associated with high underpricing as the asking price is low compared to the realized sales price. TOM is defined in Equation 5.2 as the number of days between the registered date and sales date.

$$\text{Underpricing}_{i,t} = \text{Sales Price}_{i,t}/\text{Asking Price}_{i,t} \tag{5.1}$$

$$\text{TOM}_{i,t} = \text{Sales Date}_{i,t} - \text{Registered Date}_{i,t} \tag{5.2}$$

5.2.1 Descriptive Statistics around the Policy Shift in Oslo

We present descriptive statistics for Oslo pre and post abolition of surveyor valuations in Table 5.1 in Panel (1) and (2), respectively. We use a +/- 5 week event window around the treatment date of 01/07/2016. We report the underpricing as the relative difference between the sales price and asking price. The average underpricing level jumps from 10% to 14%, following the removal of surveyor valuations. Table 5.2 and 5.3, show descriptive statistics for Bergen and Trondheim respectively, using the same time windows as for Oslo. The statistics for Bergen and Trondheim are presented in order to compare the development of Oslo with other cities that did not undergo a similar policy change at the same time. Further, Bergen and Trondheim are used as counterfactuals for Oslo in a DiD analysis in Section 5.3.6. There is no corresponding jump for Bergen and Trondheim in terms of underpricing. For Bergen, underpricing is reduced marginally from 3.6% to 3.4%, while underpricing in Trondheim increases from 3.8% to 4.4%. Further, the general level of underpricing is much higher in Oslo compared to the other cities.

The average TOM increases in all three cities after the the date of Oslo's policy change, which is likely a result of the national summer holiday. Further, the number of observations drops after the treatment date. Overall, the standard deviation of TOM is high relative to the mean in all cities.

The average share of dwellings reporting a surveyor valuation in the five weeks prior to the window centre is 96%. The corresponding figure for the five weeks following the window centre is 11%. Thus, by investigating the differences between the left and right window, we obtain a good estimate of the effects of surveyor valuation abolition in Oslo.

TABLE 5.1: *Descriptive Statistics Oslo*

	Oslo Pre Treatment Date (1)						Oslo Post Treatment Date (2)					
Variable	Mean	# of obs.	Std.	Min	Max	Skewness	Mean	# of obs.	Std.	Min	Max	Skewness
Underpricing	0.10	1,113	0.10	-0.11	0.44	0.43	0.14	245	0.12	-0.19	0.48	-0.03
Asking Price	5.25	1,113	3.16	1.65	27.90	2.03	4.45	245	3.64	1.40	35.00	4.55
Sales Price	5.67	1,113	3.27	2.00	27.90	2.08	4.84	245	3.22	1.79	30.50	4.30
Surveyor Valuation	5.22	1,065	3.15	1.65	27.90	2.05	6.39	27	6.17	2.00	25.00	2.13
TOM	12.80	1,113	13.57	1.00	160.00	5.36	16.60	245	23.11	1.00	178.00	3.59

Panel (1) is descriptive statistics for Oslo before the treatment date. Panel (2) is statistics after the treatment date. The treatment date is set to 01/07/2016, and the event window is 5 weeks pre or post this date. Underpricing is presented as: (Sales Price/Asking Price)-1. Asking price, sales price and surveyor valuation are measured in NOK millions.

Table 5.2: *Descriptive Statistics Bergen - Using the Treatment Date of Oslo*

	Bergen Pre Treatment Date of Oslo (1)						Bergen Post Treatment Date of Oslo (2)					
Variable	Mean	# of obs.	Std.	Min	Max	Skewness	Mean	# of obs.	Std.	Min	Max	Skewness
Underpricing	0.036	453	0.08	-0.15	0.36	1.31	0.034	215	0.07	-0.13	0.31	1.13
Asking Price	3.76	453	1.68	0.99	13.50	1.57	3.05	215	1.20	1.10	8.50	1.56
Sales Price	3.89	453	1.77	0.90	13.30	1.63	3.13	215	1.17	1.26	8.40	1.55
Surveyor Valuation	4.38	23	2.31	1.80	11.00	1.58	2.85	11	0.69	2.15	4.30	0.95
TOM	19.67	453	27.33	1.00	180.00	8.02	30.29	215	37.65	2.00	179.00	1.86

Descriptive statistics for Bergen Using treatment date for Oslo. Panel (1) is descriptive statistics for Bergen before the treatment date. Panel (2) is statistics after the treatment date. The treatment date is set to 01/07/2016, and the event window is 5 weeks pre or post this date. We present underpricing as (Sales Price/Asking Price)-1. Asking price, sales price and surveyor valuation are measured in NOK millions.

Table 5.3: *Descriptive Statistics Trondheim - Using the Treatment Date of Oslo*

	Trondheim Pre Treatment Date of Oslo (1)						Trondheim Post Treatment Date of Oslo (2)					
Variable	Mean	# of obs.	Std.	Min	Max	Skewness	Mean	# of obs.	Std.	Min	Max	Skewness
Underpricing	0.038	364	0.07	-0.11	0.29	0.81	0.044	147	0.07	-0.11	0.25	0.70
Asking Price	3.97	364	1.60	1.29	11.70	1.30	3.26	147	1.14	1.25	6.90	1.00
Sales Price	4.12	364	1.65	1.26	11.20	1.23	3.37	147	1.07	1.23	6.65	0.83
Surveyor Valuation	2.40	1	-	2.40	2.40	-	-	-	-	-	-	-
TOM	15.91	364	20.92	2.00	179.00	4.22	30.12	147	38.36	2.00	176.00	2.14

Descriptive statistics for Trondheim Using treatment date for Oslo. Panel (1) is descriptive statistics for Bergen before the treatment date. Panel (2) is statistics after the treatment date. The treatment date is set to 01/07/2016, and the event window is 5 weeks pre or post this date. We present underpricing as (Sales Price/Asking Price)-1. Asking price, sales price and surveyor valuation is measured in NOK millions.

5.2.2 Descriptive Statistics around the Policy Shift in Bergen

We present descriptive statistics for Bergen in Table 5.4, during the municipality's period of policy change. We use 04/04/2016 as the window centre. The level of underpricing increases during the phase out of the surveyor valuation, from 2.5% to 4.0%. For Bergen, the number of observations increases from 233 to 420. TOM is stable around 19 days, both before and after the window centre.

The average share of dwellings reporting a surveyor valuation in the five weeks prior to the window centre is 61%. The corresponding figure for the five weeks following the window centre is 20%. These figures reflect the gradual phase out in Bergen.

Table 5.4: *Descriptive Statistics Bergen*

	Bergen Pre Window Centre (1)						Bergen Post Window Centre (2)					
Variable	Mean	# of obs.	Std.	Min	Max	Skewness	Mean	# of obs.	Std.	Min	Max	Skewness
Underpricing	0.025	233	0.07	-0.25	0.40	0.89	0.040	420	0.08	-0.20	0.41	1.01
Asking Price	3.87	233	1.68	1.10	12.50	1.72	3.80	420	1.61	1.05	12.50	1.40
Sales Price	3.95	233	1.69	1.12	11.90	1.48	3.95	420	1.68	1.27	13.00	1.36
Surveyor Valuation	4.12	143	1.82	1.30	12.50	1.81	3.90	83	1.49	1.05	8.60	0.73
TOM	19.25	233	28.47	3.00	152.00	3.47	19.40	420	27.60	2.00	179.00	3.21

Panel (1) is descriptive statistics for Bergen for the dates to the left of the window centre. Panel (2) is statistics for the date after the window centre. The window centre is set to 04/04/2016, and the event window is 5 weeks pre or post the policy date. We present underpricing as (Sales Price/Asking Price)-1. Asking price, sales price and valuation are measured in NOK millions.

5.3 Estimating the Impact on Underpricing

We use the ratio of sales price-to-asking price to define underpricing. The measure could increase due to a higher sales price or a lower asking price. All though the measure does not provide information on why the ratio changes, a potential increase in the deliberate use of low asking prices will be captured by the measure. As discussed in the Literature Review of Section 3.1, previous research shows that a reduction of the asking price by 1 NOK, leads to a reduction of the sales price by less than 1 NOK. Thus, the percentage difference between the sales price and asking price will increase if the asking price is lowered. In all regressions, the logarithm of underpricing multiplied with a factor of 100 is used. By doing so, the measure provides the continuous percentage difference between the sales price and the asking price.

5.3.1 Regression 1 - Non-Experimental Design

The first regression investigates the effect of having a surveyor valuation in the event window surrounding the treatment date. Ignoring control variables, we estimate Equation 5.3 with the logarithm of underpricing as the dependent variable, where I(No Valuation) is a dummy variable equal to zero if a surveyor valuation is provided and one if there is no surveyor valuation provided. Thus, if surveyor valuations have a reducing effect on underpricing, we expect the coefficient of I(No Valuation) to be positive.

$$y_{i,t} = \alpha_{i,t} + \beta * \text{I}(\text{No Valuation}_{i,t}) + \epsilon_{i,t} \tag{5.3}$$

5.3.2 Regression 1 - Oslo

The most simple regression, with only I(No Valuation) as independent variable is presented in Table 5.5, Column (1) and (3) for two different window lengths. The coefficients are multiplied by 100 to convey percentage points. We observe a significantly higher underpricing for the dwellings listed without a surveyor valuation. In Column (2) and (4), we include a battery of deal specific control variables. The control variables included are Living Area, the Age of the Dwelling, the Type of Dwelling and City District dummies. We provide regression coefficients of all control variables in Table A.6 in the Appendix. TOM is not included as a control in Regression 1, as the policy change is expected to affect TOM as well. It would be classified as a "bad control"[1], as we include a control variable that potentially is an outcome variable in the experiment. The mean of underpricing conditional on the test variable would not have had a causal interpretation. The results in Table 5.5 are still significant after including deal specific controls, and the difference in underpricing is estimated at around 2 - 2.5 percentage points, between the houses that report a surveyor valuation and the ones that do not. Using the average sales price of the +/- 5 week sample surrounding 01/07, this corresponds to an average difference in underpricing of approximately NOK 100 000 - 125 000[2]. We emphasize that this is the increase in the spread between sales price and asking price. This thesis does not investigate the effect on the sales price.

TABLE 5.5: *Regression 1 - Non-Experimental design: Underpricing in Oslo*

	(1)	(2)	(3)	(4)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(No Valuation)	3.14***	2.42***	2.91***	1.40***
	(0.39)	(0.36)	(0.68)	(0.59)
Deal Specific Controls	No	Yes	No	Yes
Time Fixed Effects	No	No	No	No
Number of observations	2453	2447	1358	1352
Event Window	+/-8 weeks	+/-8 weeks	+/-5 weeks	+/-5 weeks
SE	Robust	Robust	Robust	Robust

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(No Valuation) is a dummy variable equal to one if the dwelling is sold without a surveyor valuation. The window centre is 01/07/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City District.

Although significant, a causal interpretation of the results in Table 5.5 could be spurious due to time variation in underpricing. As illustrated in Figure 5.4, underpricing seems to vary pro-cyclically with the market price, i.e. in a hot market underpricing is expected to be higher. A large difference between sales price and asking price in a

[1]See for example Angrist and Pischke (2009) for a discussion on bad controls.

[2]The average sales price in our dataset for Oslo in the period from 27/05/2016 to 07/08/2016 is NOK 5.52 million.

hot market does not necessarily imply deliberate use of low asking prices to impact the sales price or TOM. It could solely be a result of the sales price being higher than predicted by the real estate agents' pricing models. In Figure 5.4, the price increases around the period of policy change. As the majority of observations with a surveyor valuation is found at the point in time where prices were lower, the estimated effect of abolition in Table 5.5 could be overestimated.

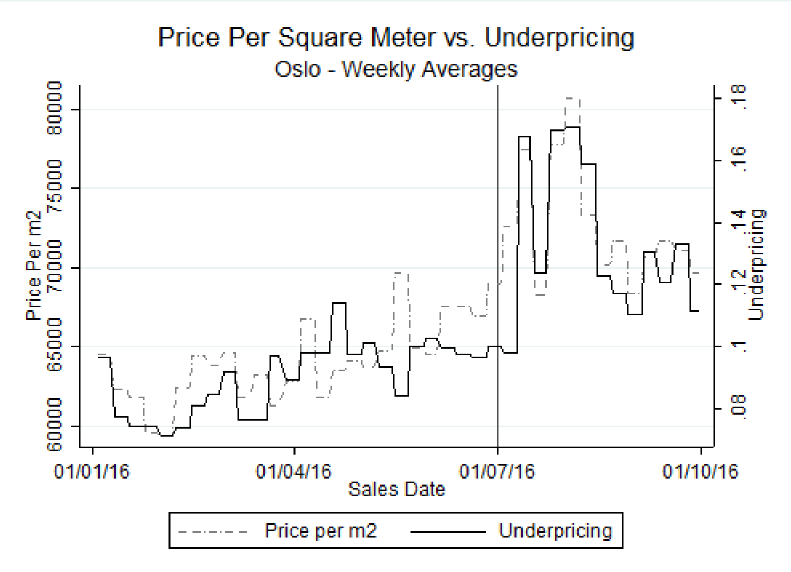

FIGURE 5.4: *Price per m^2 VS. Underpricing in Oslo. The graph shows the weekly average price per m^2 and underpricing in Oslo from 02/01/16 to 30/09/16. We present underpricing as (Sales Price/Asking Price) – 1. The vertical solid line on 01/07/16 indicates the treatment date of Oslo. We measure price per m^2 on the left axis and underpricing on the right axis.*

Controlling for impacts of market temperature on underpricing is difficult with the non-experimental design, in the case of Oslo. A contemporaneous measure of price on the right hand side of Equation 5.3 would be a "bad control", as valuation abolition is expected to affect underpricing, which in turn is expected to affect the price. One could use time dummies to capture the overall time dependent variability in underpricing. This is however infeasible in Oslo, as the drop in the valuation share is too rapid. Due to co-linearity between the time dummies and the valuation dummy, the entire potential effect from not having a surveyor valuation would be captured by the time dummies.

Narrowing the time window of the analysis reduces the probability of time fixed effects affecting the estimated impact of policy change. Reducing the time window down to +/- 5 weeks still yields significant results, as seen in Column (3) and (4) of Table 5.5. Insignificant results are found only for time windows of +/- 4 weeks and shorter, as seen in the robustness tests of Table A.1 in the Appendix. There are few observations in these windows. We observe in the robustness tests that the coefficient estimates are consistent.

5.3.3 Regression 1 - Bergen

The time series of underpricing in Bergen is presented in Figure 5.5 and shows a volatile development, with no clear trend. The underpricing level in Bergen is low compared to Oslo.

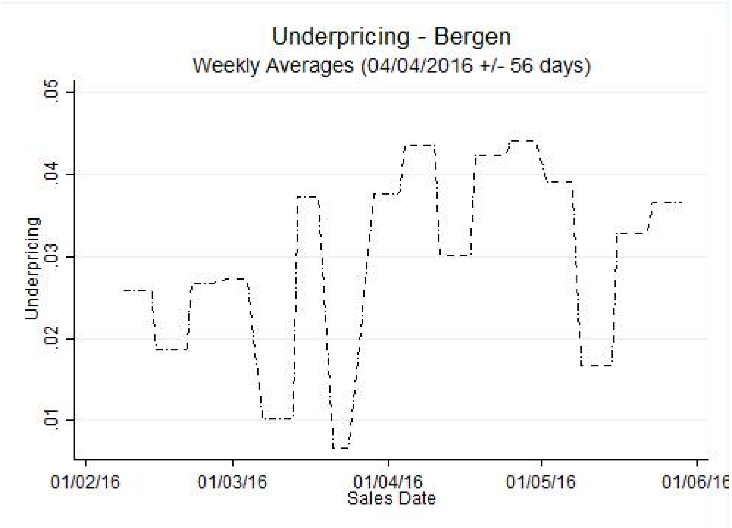

FIGURE 5.5: *Time series of Weekly Average Underpricing in Bergen during the policy shift, from 08/02/16 to 29/05/16. We present underpricing as (Sales Price/Asking Price)-1.*

The results in Table 5.6 correspond with the findings in Oslo. As the removal of surveyor valuations in Bergen was more gradual than in Oslo, we are able to include weekly time dummies to control for potential time fixed effects. Thus, if some periods are characterized with higher or lower underpricing, this is captured by the dummies. Controlling for time fixed effects as seen in Column (3) and Column (6) does not change the coefficients noticeably. After controlling for time fixed effects and deal specific effects, the dwellings sold without a surveyor valuation have 1.5 - 2 percentage points higher underpricing. Changing the event window does not alter the significance, as seen in the Robustness Tests in Table A.2 in the Appendix.

TABLE 5.6: *Regression 1 - Non-Experimental Design: Underpricing in Bergen*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(No Valuation)	1.77***	1.72***	1.65***	2.40***	2.12***	1.73***
	(0.42)	(0.41)	(0.51)	(0.54)	(0.54)	(0.62)
Deal Specific Controls	No	Yes	Yes	No	Yes	Yes
Time Fixed Effects	No	No	Weekly	No	No	Weekly
Number of observations	1088	1082	1082	653	650	650
Event Window	+/-8 weeks	+/-8 weeks	+/-8 weeks	+/-5 weeks	+/-5 weeks	+/-5 weeks
SE	Robust	Robust	Robust	Robust	Robust	Robust

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.1. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(No Valuation) is a dummy variable equal to one if the dwelling is sold without a surveyor valuation. The window centre is 04/04/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City district. We include weekly dummies to control for time fixed effects.

The issue related to Regression 1 is the fact that the surveyor valuation is endogenous. In other words, utilizing a surveyor valuation or not is a choice. Thus, the significant effect does not necessarily imply causality, as the use of surveyor valuations is not randomly assigned. In order to cope with this problem, we apply two quasi-experimental designs are in the next sections. These designs will focus on Oslo only, as the decline in the use of surveyor valuation in Bergen is too gradual to apply pretest posttest designs. Thus, we are unable to causally interpret the results for Bergen.

5.3.4 Regression 2 - Estimated Treatment Effect

In Equation 5.4, we introduce I(Post) as the new test variable, with value one if a dwelling is sold on the treatment date of 01/07 or later, and zero if it is sold prior to this date. Contrary to I(No Valuation) in Regression 1, I(Post) is exogenous, and a significant coefficient of I(Post) is a stronger sign of causality.

$$y_{i,t} = \alpha_{i,t} + \beta * I(\text{Post}_{i,t}) + \epsilon_{i,t} \tag{5.4}$$

If the hypothesis is correct, one would expect I(Post) to be significant and positive, meaning that underpricing is significantly higher post surveyor valuation abolition.

5.3.5 Regression 2 - Oslo

As seen in Table 5.7, the coefficient of I(Post) is positive, both with and without deal specific control variables and for the eight and five week windows. This indicates that the underpricing level is higher after the policy shift. The estimated increase in underpricing from the policy shift is approximately 1.5 - 2.5 percentage points, depending on the window size, as seen in Table A.3.

TABLE 5.7: *Regression 2 – Estimated Treatment Effect: Underpricing in Oslo*

	(1)	(2)	(3)	(4)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Post)	3.19***	2.35***	3.51***	1.58**
	(0.40)	(0.37)	(0.73)	(0.63)
Deal Specific Controls	No	Yes	No	Yes
Time Fixed Effects	No	No	No	No
Number of observations	2453	2447	1358	1352
Event Window	+/-8 weeks	+/-8 weeks	+/-5 weeks	+/-5 weeks
SE	Robust	Robust	Robust	Robust

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. The treatments date is 01/07/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City district.

Similar to Regression 1, a potential weakness of Regression 2 is that it does not control for potential time variation in underpricing that might correlate with the policy change. In order to investigate the potential scale of this problem, placebo regressions are used on Trondheim and Bergen, i.e. the policy shift date and windows of Oslo are used on the Trondheim and Bergen data. The two other municipalities are used as placebos, as no similar policy changes in Trondheim or Bergen were made around the policy shift date in Oslo, and the decline in use of surveyor valuations in Bergen had flattened out before the investigated event windows of Oslo. If the increase in underpricing in Oslo was driven by surveyor valuation abolition, one would not expect any similar significant results for Trondheim and Bergen. Correspondingly, if the significant increase in underpricing was due to market factors common for the three municipalities, we would expect to find similar effects of I(Post) in Bergen and Trondheim as well. The indicator variable in Table 5.8 is far from significant in both Bergen and Trondheim for both eight and five week windows, improving the robustness of the findings in Table 5.7.

TABLE 5.8: *Regression 2 – Placebo Test for Underpricing in Oslo Using Trondheim and Bergen*

	Trondheim		Bergen	
	(1)	(2)	(3)	(4)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Post)	0.068	-0.65	-0.16	-0.39
	(0.42)	(0.57)	(0.47)	(0.62)
Deal Specific Controls	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No
Number of observations	1157	663	851	509
Event Window	+/-8 weeks	+/-5 weeks	+/-8 weeks	+/-5 weeks
SE	Robust	Robust	Robust	Robust

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. Placebo groups are the municipalities of Trondheim and Bergen. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on 01/07/16 or later, and zero if sold prior to 01/07/16. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City district.

5.3.6 Regression 3 - Difference-in-Differences (DiD)

Another way of addressing the problem of time variation in underpricing and the endogeneity in the use of surveyor valuations, is to use a DiD test. The concept of the test is to compare the treated group (Oslo) with an otherwise equal control group, that did not undergo the same treatment. Disregarding control variables, this implies estimating Regression Equation 5.5, with the logarithm of underpricing as dependent variable. I(Oslo) equals one if the dwelling is located within Oslo, and zero if it is located within the counterfactual. Testing the effect of policy change boils down to testing whether the coefficient of the product of I(Post) and I(Oslo), β_3, is different from zero. A positive coefficient implies a larger increase in underpricing in Oslo after the policy shift, compared to the counterfactual. The statistical robustness of the method depends on the validity of the chosen counterfactual. In particular, the treatment group and counterfactual must experience parallel time trends in the dependent variable both before and after treatment.

$$y_{i,t} = \alpha_{i,t} + \beta_1 * I(\text{Post}_{i,t}) + \beta_2 * I(\text{Oslo}_{i,t}) + \beta_3 * I(\text{Post}_{i,t}) * I(\text{Oslo}_{i,t}) + \epsilon_{i,t} \quad (5.5)$$

5.3.7 Regression 3 - Oslo

In this section, we focus in particular on Trondheim as the counterfactual for Oslo, as it proves to be most valid: The trends in underpricing are parallel and the development in key variables for Oslo and Trondheim is similar. Further, there are no problems of potential lagged effects of surveyor valuation abolition, which could be the case for Bergen. For completeness, Bergen in addition to Trondheim and Bergen combined are used as counterfactuals. A short discussion on the validity of Bergen as counterfactual is provided in Section 5 in the Appendix.

The rationale for using Trondheim as a counterfactual for Oslo is that Trondheim did not receive the same treatment as Oslo during the summer of 2016. The real estate agencies in Trondheim have not used surveyor valuations for years. However, in order for the results from the DiD to be valid, the assumption of parallel time trends of the municipalities must hold. By visual inspection of Figure 5.6, a similar flat trend is observed in underpricing for both municipalities pre treatment, however slightly more decreasing for Trondheim. Post surveyor valuation abolition, we see a much more rapid increase in Oslo, than in Trondheim. Post treatment, the trends also seem to follow a similar flat pattern. The increased difference in underpricing after treatment seems to derive from a one time upwards shift in Oslo following the treatment date.

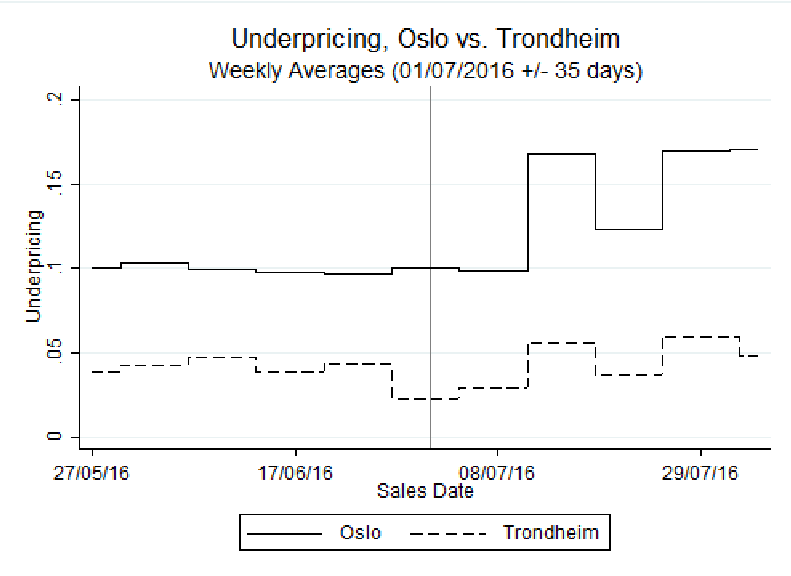

FIGURE 5.6: *Comparison of Underpricing Trends in Oslo and Trondheim from 27/05/16 to 04/08/16. We present underpricing as (Sales Price/Asking Price) – 1. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

All though the trends in underpricing follow a parallel pattern, there could be fundamental differences between the two markets, limiting the validity of the DiD. Ideally, they should be completely identical. Then, the only difference between the municipalities would be the policy change in Oslo, and we would obtain a certain causal interpretation of the effects from removing the surveyor valuation. However, such true natural experiments seldom exist.

Figure 5.7, shows the time series of price per m^2 in Oslo compared to Trondheim. Observe that the average price level in Oslo is higher, but that they follow each other closely in terms of change. Both cities experienced an upwards trend in price per m^2 around the treatment date of Oslo. Figure 5.8, compares the number of sold dwellings per week in Oslo and Trondheim. First, note by the scale of the two y-axes that the average number is higher in Oslo. However, the relative change during the event frame in the two cities is very similar.

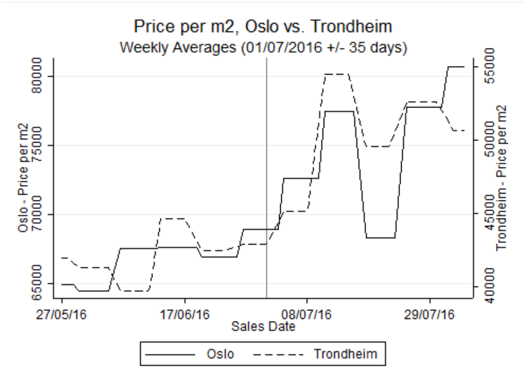

FIGURE 5.7: *The graph shows the weekly average price per m*^{2}*, in Oslo and Trondheim from 27/05/16 to 04/08/16. Price per m*^{2} *is defined as Sales Price/Living Area. The vertical solid line on 01/07/16 indicates the treatment date of Oslo. The price is measured in NOK on the right axis for Oslo and the left axis for Trondheim.*

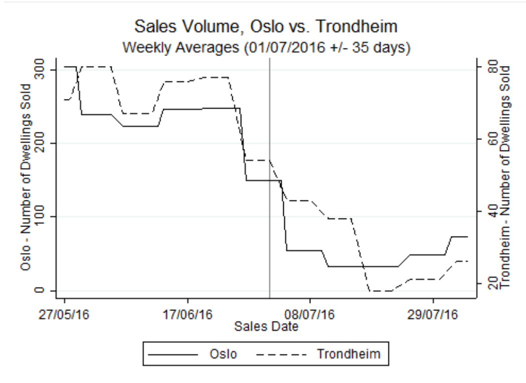

FIGURE 5.8: *The graph shows the weekly average sales volume in Oslo and Trondheim from 27/05/16 to 04/08/16. Sales Volume is defined as the number of observations in the dataset. The vertical solid line on 01/07/16 indicates the treatment date of Oslo. Figures for Oslo are measured on the left axis and figures for Trondheim on the right axis.*

Even though Trondheim and Oslo experienced adequately parallel time trends in underpricing around the policy shift, and similar movements in volume sold and price per m^2, there are other key differences that might affect the validity of the counterfactual. Oslo is the capital and by far the most populated city in Norway, with a population of 660 000 in April 2016 (SSB, 2016). The corresponding figure for Trondheim is 187 000. Moreover, despite being subject to the same macroeconomic developments, there are possibly differences in the resilience towards shocks between the municipalities. Further, the summary statistics of the three municipalities in Section 5.2 indicate that Bergen and Trondheim are more similar than Oslo and the two other cities. Lastly, Oslo is currently to a greater extent categorized with excess demand (Mikalsen, 2016a).

Despite some fundamental differences indicating that Oslo is a special case in the Norwegian Real Estate Market, Trondheim has a strong validity as counterfactual, if we regard the development in key variables of our dataset. To a large extent, the same is true for Bergen and thus the combination of Bergen and Trondheim. Being the second and third largest cities in Norway, they serve as the most natural counterfactuals.

We report the results of the DiD test in Table 5.9. From the test-coefficient of the regression without deal specific control variables in Column (1), it is clear that the level of underpricing in Oslo increased after abolition, compared to Trondheim. In Column (2) the battery of control variables are included without changing the coefficient noticeably. The estimated increase is approximately 3 percentage points. DiD regressions with Bergen as counterfactual in Column (3) and (4) and the two cities combined as counterfactuals in column (5) and (6), yield similar results. We perform robustness tests for different time windows in Table A.5 in the Appendix. The significance of the test-variable is unaltered, except for windows of +/- three weeks and shorter.

TABLE 5.9: *Regression 3 – DiD: Underpricing in Oslo*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Post)	0.58	-0.87	-0.24	-1.27**	0.086	-0.97**
	(0.65)	(0.63)	(0.59)	(0.57)	(0.44)	(0.42)
I(Oslo)	5.62***	4.97***	5.81***	5.81***	5.73***	5.49***
	(0.43)	(0.46)	(0.43)	(0.43)	(0.36)	(0.36)
I(Post)*I(Oslo)	**2.93*** **	**2.83*** **	**3.75*** **	**3.31*** **	**3.42*** **	**3.17*** **
	(0.98)	**(0.89)**	**(0.94)**	**(0.86)**	**(0.85)**	**(0.77)**
Deal Specific Controls	No	Yes	No	Yes	No	Yes
Time Fixed Effects	No	No	No	No	No	No
Number of observations	1869	1861	2026	2015	2537	2524
Event Window	+/-5 w	+/-5 w	+/-5 w	+/-5 w	+/-5 w	+/-5 w
SE	Robust	Robust	Robust	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	Bergen	Bergen	Both	Both

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactuals are the municipalities of Trondheim and Bergen, in addition to Trondheim and Bergen combined. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. The treatment date is 01/07/16 i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

In order to further test the robustness of the DiD, we move the defined treatment date in Table 5.10. None of the event windows in the table include the actual treatment date of 01/07. If the underpricing in Oslo varies compared to Trondheim on dates without a policy shift, we would be less certain that the significant effect in the DiD test was due to surveyor valuation abolition. However, no significant effects are found in the robustness tests. Thus, an upwards shift in underpricing compared to Trondheim is only found for the actual treatment date of 01/07, which strengthens the validity of Trondheim as a counterfactual.

TABLE 5.10: *Regression 3 – DiD: Underpricing in Oslo, Varying the Treatment Date*

	(1)	(2)	(3)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)
I(Post)	-0.351	-0.81	0.11
	(0.92)	(0.68)	(0.51)
I(Oslo)	7.89***	4.40***	4.73***
	(0.64)	(0.57)	(0.43)
I(Post)*I(Oslo)	**-0.91**	**0.51**	**0.12**
	(1.033)	**(0.78)**	**(0.58)**
Deal Specific Controls	Yes	Yes	Yes
Time Fixed Effects	No	No	No
Number of observations	1572	2181	4054
Treatment Date	26/08	03/06	05/05
Event Window	+/-4 w	+/-4 w	+/-8 w
SE	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	T.heim

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactual is the municipality of Trondheim. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the defined treatment date or later, and zero if sold prior to this date. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. Deal specific controls are: Living Area, Age of Dwelling and Type of Dwelling.

The national summer holiday coincides with the treatment date, and it could be that the Oslo market responds differently to the holiday than Trondheim. We perform another DiD test with Oslo one year earlier, as the counterfactual. If the summer holiday in Oslo is generally characterized by a higher level of underpricing, we would not expect the underpricing in Oslo in 2016 to increase after 01/07, compared to Oslo in 2015 after 01/07. From Table 5.11, we see that the underpricing after the policy shift increases with approximately 2.5 percentage points compared to Oslo in 2015, where almost all sold dwellings reported a surveyor valuation. The size of the coefficient corresponds well with coefficients from all other analyses of underpricing in Oslo. It is therefore unlikely that the summer holiday alone should cause the increase in underpricing in 2016.

Table 5.11: *Regression 3 - DiD: Underpricing in Oslo 2016, with Oslo in 2015 as Counterfactual.*

	(1)	(2)
Dependent Variable	ln(UP)	ln(UP)
I(Post 01/07)	0.75**	0.22
	(0.37)	(0.35)
I(Oslo 2016)	2.62***	2.73***
	(0.33)	(0.32)
I(Post 01/07)*I(Oslo 2016)	**2.44*** **	**2.34*** **
	(0.54)	**(0.51)**
Deal Specific Controls	No	Yes
Time Fixed Effects	No	No
Number of Observations	4290	4273
Event Window	+/- 5 weeks	+/- 5 weeks
SE	Robust	Robust
Counterfactual	Oslo 2015	Oslo 2015

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactual is the municipality of Oslo at the same dates in 2015. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post 01/07) is a dummy variable equal to one if the dwelling is sold on the 01/07 or later in a given year, and zero if sold prior to 01/07 in a given year. I(Oslo 2016) is a dummy variable equal to one if the dwelling is sold in Oslo in 2016 and zero if it is sold in Oslo in 2015. The treatment date is 01/07 i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

The positive correlation between the market temperature and underpricing is considered a potential source of endogeneity, i.e. that the ratio of sales price to asking price shifts upwards due to an unexpected price increase, not because of a lowered asking price. In Table 5.12, we compute the average sales- and asking prices per square meter in the five week window prior to and after the policy shift, for both Oslo and Trondheim. Trondheim experience a stronger price growth than Oslo. Despite this, we find a significantly larger growth in underpricing in Oslo. Further, the growth rates of the sales price and asking price are quite similar in Trondheim, with a difference of 0.9 percentage points. For Oslo, the asking price grows less than the sales price, with a larger difference of 4.8 percentage points. This implies that the increased underpricing compared to Trondheim was due to a relatively lower asking price, i.e. a reduction of the denominator of the underpricing ratio. This is a result we would expect if the increased underpricing in Oslo was due to "strategic underpricing". We emphasize that the growth in price per m^2 between the two periods does not reflect the true price development, as the numbers in the table have not been hedonically adjusted, which is the norm for the Norwegian House Price Indexs[3]. According to the Norwegian House Price Index, Oslo and Trondheim had the strongest price growth in Norway from June to July, with 1.8% and 1.0% respectively. (Real Estate Norway, 2016).

TABLE 5.12: *Growth in Sales Price and Asking Price: Oslo VS. Trondheim*

	Oslo		
	Pre	Post	Growth
Sales Price per m^2	66 845	76 307	14.2 %
Asking Price per m^2	60 929	66 617	9.3 %
	Trondheim		
	Pre	Post	Growth
Sales Price per m^2	42 071	50 124	19.1 %
Asking Price per m^2	40 521	47 909	18.2 %

Table of the average sales price and asking price per m^2 in Oslo and Trondheim. Pre is the figures before the treatment date, post is after. We use a +/- five week event window. Growth rate is given as a discrete percentage. Asking price and sales price is given in NOK.

Figure 5.9 decomposes the underpricing measure into sales price and asking price. It illustrate the same mechanics as Table 5.12. The asking price in Oslo follows a flatter path, than the sales price. We do not find similar deviations for Trondheim.

[3] A hedonic price regression assigns a value to each attribute of the dwelling and compute a price index based on the difference between the observed prices and the predicted prices.

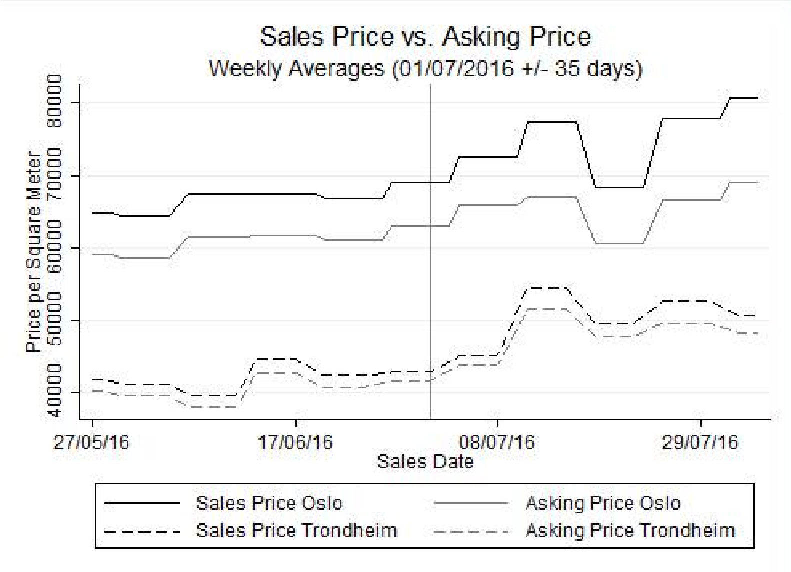

FIGURE 5.9: *The graph shows the development in weekly average sales price and asking price per* m^2 *for Oslo and Trondheim, from 27/05/16 to 04/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

The increased underpricing difference between Oslo and Trondheim seems to derive from lower asking prices in Oslo compared to Trondheim. However, it is not necessarily proof that the real estate agents deliberately lowered the asking prices to manipulate the finale sales price and/or TOM. Alternatively, it could be that the real estate agents in Trondheim are better at estimating the expected sales price of a dwelling, and therefore forecasted the price increase of July better. As Oslo and Trondheim are two separate markets with some obvious differences, it could be more difficult to estimate the market value of a dwelling on Oslo. Thus, the question of intent is hard to answer empirically. However, In October, the Norwegian Consumer Council considered economic sanctions of ten real estate agencies in Oslo (Wig, 2016a). They claimed that the difference between the sales price and asking price in August was above what could be considered natural.

5.4 Supplementary Analysis: Estimating the Impact on Time-on-Market (TOM)

We define TOM as the number of days between the sales date and the registered date. TOM is neither normally distributed, nor log-normally distributed, as seen in Figure 5.10. TOM is a count variable, which only appears in non-negative integer values. The histogram resembles a Poisson distribution. However, a Poisson regression model assumes that the mean (μ) equals the variance (σ^2). The mean of TOM in the dataset is 18 days, while the variance is 632. Thus, the assumption of equidispersion ($\mu = \sigma^2$) is violated. The Negative Binomial Regression (NBR) provides a solution. Optionally, we could use a Logit-model. However, the Logit model uses a categorical dependent variable. We want to exploit all the information in the count variable and therefore use NBR.

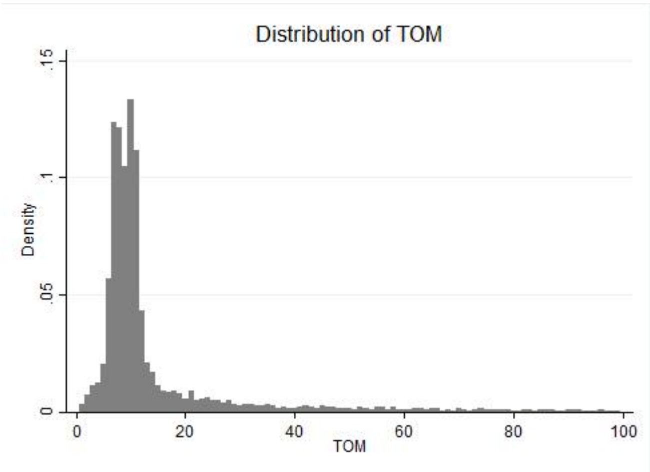

Figure 5.10: *Frequency Density Distribution of TOM in Oslo, Bergen and Trondheim from 01/01/2016 to 30/09/2016. We exclude observations larger than 99 days, due to graphical convenience.*

With n independent variables, the NBR estimates Equation 5.6. This is common for the Poisson model. The regression coefficients ($\beta_1, ..., \beta_n$) of the NBR are estimated with Maximum Likelihood Estimation (MLE). For a given set of observations, MLE finds the parameter values that maximize the probability of making the observations, given the parameters.

$$E(y|x_1, ..., x_n) = e^{a+\beta_1 x_1+...+\beta_n x_n} \tag{5.6}$$

The NBR model with the NB2 variance function is robust to distributional misspecification and is the most common implementation of the NBR-model (Cameron and Trivedi, 1998). The NB2 variance function is specified in Equation 5.7. The NBR model estimates an appropriate value of α. With α equal to zero, the NBR model converges to the Poisson model, with Var(y) = μ. However, fitting positive values of α allows to model cases with overdispersion ($\mu < \sigma^2$).

$$Var(y) = \mu + \alpha\mu^2 \tag{5.7}$$

Using NBR on our dataset yields more consistent results with a better behaving error term. Thus, in the analysis with TOM as dependent variable, we apply the NBR model. The functional form of the regression equation is given by Equation 5.6, but all independent variables in the DiD test are otherwise equal to the OLS regression with underpricing as dependent variable.

For indicator variables, the interpretation of the NBR coefficient is the expected difference in log counts between the indicated group and reference group. This yields the continuous percentage difference. As the estimated coefficients of TOM generally are larger than for underpricing, we report both the regression coefficient and the coefficient converted to a discrete percentage[4]. E.g. the interpretation of a regression coefficient of -0.15, is that a change in the indicator variable from 0 to 1 is associated with a reduction of $100 * (e^{-0.15} - 1) = -14\%$ in the mean TOM. For further information on the NBR Model, see e.g., Cameron and Trivedi (1998).

5.4.1 Negative Binomial Regression - DiD Tests of TOM in Oslo

We argue that the real estate agents' objective with underpricing is to reduce TOM, and thus we expect TOM to decrease after the abolition of surveyor valuations. As the seasonal variation in TOM is substantial, Regression 1 and 2 provide little value added. The TOM in July is always high (Real Estate Norway, 2016) and the first two tests would be strongly affected by this seasonal pattern. However, the DiD-test has the ability to control for seasonal variation in the dependent variable, assuming

[4]For small differences, the continuous and discrete percentages are approximately the same. However, as the differences increase the two percent measures deviate more. The discrete percentage is given by $100 * (e^{\beta} - 1)$, where β is the regression coefficient.

it is equal for the treatment group and the counterfactual. A negative coefficient of I(Post)*I(Oslo) in the DiD test would imply a reduced TOM in Oslo, compared to the counterfactual.

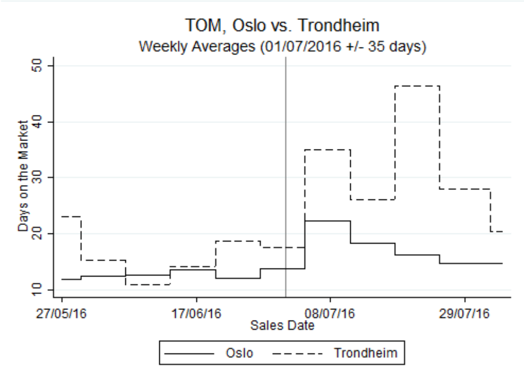

FIGURE 5.11: *Comparison of TOM trends in Oslo and T.heim. The graph shows the weekly average TOM in Oslo and T.heim from 27/05/16 to 04/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

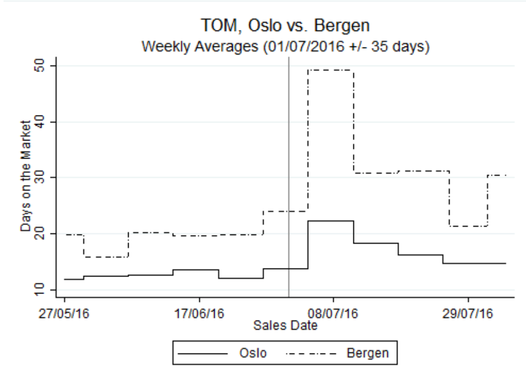

FIGURE 5.12: *Comparison of TOM trends in Oslo and Bergen. The graph shows the weekly average TOM in Oslo and Bergen from 27/05/16 to 04/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

We estimate the exponential of Equation 5.5, with TOM as dependent variable, using NBR. The results in Table 5.13 are mixed. With Bergen as counterfactual, we obtain no significant results. With Trondheim as counterfactual, we obtain significant results in favour of a reduced TOM in Oslo. However, by visual inspection of Figure 5.11, the parallel trend assumption for TOM of Oslo and Trondheim is questionable. In Figure 5.12, the trends in Oslo and Bergen are more parallel. Thus, the insignificant results of Bergen seems more valid. The significant results with the combination of Trondheim and Bergen as the counterfactual are likely affected by the non-parallel trend of Trondheim. We present regression coefficients of all control variables in Table A.10.

Table 5.13: *Negative Binomial Regression - DiD: TOM in Oslo*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	TOM	TOM	TOM	TOM	TOM	TOM
I(Post)	0.64***	0.69***	0.43***	0.45***	0.52***	0.54***
	(0.13)	(0.12)	(0.11)	(0.10)	(0.082)	(0.080)
I(Oslo)	-0.22***	-0.20***	-0.43***	-0.47***	-0.34***	-0.36***
	(0.076)	(0.072)	(0.073)	(0.069)	(0.058)	(0.055)
I(Post)*I(Oslo)	**-0.38****	**-0.38*****	**-0.17**	**-0.15**	**-0.26****	**-0.24****
	(0.16)	**(0.15)**	**(0.14)**	**(0.14)**	**(0.12)**	**(0.12)**
As Percent	-31.48	-31.55	-15.79	-14.11	-22.78	-21.44
Deal Specific Controls	No	Yes	No	Yes	No	Yes
Time Fixed Effects	No	No	No	No	No	No
Number of observations	1869	1861	2026	2015	2537	2524
Event Window	+/-5 weeks	+/-5 weekss	+/-5 weeks	+/-5 weeks	+/-5 weeks	+/-5 weeks
SE	Robust	Robust	Robust	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	Bergen	Bergen	Both	Both

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the TOM. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. The centre date is 01/07/16 i.e the right window begins on this date. "As Percent" is the regression coefficient converted to a discrete percentage. The centre date is 01/07/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

Further scepticism arises towards the significant results with Trondheim as counterfactual, by looking at the robustness tests in Table A.7 in the Appendix. Here, the estimated effects vary between -15% to -40%. It is unrealistic with a reduction of TOM by 40% from surveyor valuation abolition. In addition, we move the treatment date in Table A.8. We find significant differences on the 10% level between Trondheim and Oslo for dates that does not include the policy shift. This implies that the time variation of TOM is not parallel for Trondheim and Oslo. Thus, we cannot conclude that the estimated increased difference in TOM between Trondheim and Oslo is caused by surveyor valuation abolition.

For completeness, in Table A.9 we run a DiD test with Oslo in 2015 as the counterfactual. The coefficients are negative and insignificant. Thus, we do not have robust results indicating that TOM decreased after the removal of surveyor valuations. However, there are some issues related to our measure of TOM, as discussed in the next section.

5.5 Limitations of Analysis

This thesis does not investigate the long term effects of the surveyor valuation removal. There could be differences in the long term and short term effects of the policy shift. However, the strength of using a narrow time frame around the time of policy change is that it is easier to isolate the causal effects of the abolition.

The variable used to measure underpricing does not provide information on why the ratio change. According to the Norwegian Consumer Council's definition, the asking price must deliberately be set low in order to categorize as strategic underpricing. It is difficult to empirically prove the intention of the real estate agents. However, as argued in Section 5.3.6, the asking price in Oslo is reduced relatively to Trondheim following the policy shift. Further, the Norwegian Consumer Council approached ten real estate agencies short time after the policy shift and considered the deviation between sales price and asking price to be larger than what could be considered natural. Thus, there are indications that the increase in underpricing was intentional. However, the increase in underpricing might be due to extreme market conditions in Oslo. The real estate prices in Oslo are at an all time high and the interest rates are historically low. In addition, after the policy shift, the real estate agents lack the opportunity to compare their valuation estimate with the surveyor valuation. These unfamiliar conditions could make it difficult to set a correct price, and it may take time for the real estate agents to adjust. Nevertheless, theory and our empirical results suggest that the increased spread between sales price and asking price could be due to strategic underpricing.

The results concerning TOM might be biased, as we only have observations of sold dwellings. We measure TOM as the difference between the sales date and the date when the dwelling was registered in the market. We do not have information on dwellings that have been listed for sale and withdrawn. If a dwelling is withdrawn from the market for a period, before it is re-listed and sold, TOM will be downward biased. The average TOM will be more downward biased in periods where several dwellings are withdrawn and re-listed. Thus, our measure of TOM does not show the true marketing time, which might affect the results in Section 5.4.1.

As we do not find robust evidence in favour of a reduced TOM, other factors might motivate the increased underpricing. Theses are not analysed in this thesis. One potential driver is the reputation of achieving sales prices above asking prices. There are reports of real estate agents marketing an ability to sell dwellings far above the asking price (see e.g., Mordt et al. (2016)). A track record of sales above asking price may be more appealing for sellers, than agents that typically manage sales at the asking price. Further, some real estate agents might use underpricing in an attempt to achieve a higher sales price. A higher sales price would result in a higher commission. Despite a consensus view among researchers that underpricing reduces the final sales price, some practitioners might believe otherwise.

6. Implications for Policy

The analysis shows that underpricing increased after the abolition of surveyor valuations in Oslo. There is a high level of agreement between the Norwegian Consumer Council and Real Estate Norway that underpricing needs to be reduced. Reintroducing surveyor valuations could be an effective measure to reduce the underpricing. A reasonable estimate of the cost to the seller of such valuations is NOK 3 000 - 6 000, depending on size and housing type[1]. According to economic theory, transaction costs create an efficiency loss. If possible, it is preferred to reduce underpricing at zero transaction costs.

In October and November the difference between the average sales price and asking price in Oslo was down to 10.3% and 8.5% respectively (Wig, 2016b), from nearly 15% in August. In media, the decline is attributed to a closed meeting organized by Real Estate Norway and the Norwegian Association of Real Estate Agents, where a collective decision to reduce underpricing was made (Hartwig, 2016). However, such meetings have been organized earlier, and some journalists question the effectiveness of these meetings (Wig, 2015).

A latent question is why the underpricing was as high as 10% in the weeks leading up to the surveyor valuation abolition. One explanation could be that the surveyors are not truly neutral. If the agent has a possibility to affect the surveyor's valuation, the surveyor valuation will not reflect an unbiased market value. Thus, the reducing effect of surveyor valuations on the information asymmetry between the seller and the agent will be weaker. One suggestion for increasing the neutrality of the surveyor valuation is to introduce random assignment of surveyors to sales objects. Then, the surveyors would not be dependent on established relationships with real estate agents to be awarded new surveyor assignments.

[1] Based on the price list of Privatmegleren Ålesund, which operates in an area where surveyor valuations are used as of December 2016 (Privatmegleren, 2016)

7. Conclusion

This thesis investigates the effects of abolishing the surveyor valuation, initiated by the real estate agents in Oslo and Bergen in February and June of 2016 respectively. With the former policy, two measures of the expected market value of a dwelling were available for potential buyers; the asking price set by the real estate agent and the surveyor valuation set by a third party technical surveyor. Assuming that the abolition increases the asymmetric information between the agent and seller, we argue that the policy shift leads to an increase in the level of underpricing, i.e. the spread between sales price and asking price. Skjærholt (2015) find that underpricing has a negative impact on the final sales price. Further, Levitt and Syverson (2008) find that real estate agents' prefer a lower sales price and a shorter Time-on-Market, compared to the seller. Based on these results, we perform a supplementary analysis, where we test whether TOM was reduced from the surveyor valuation abolition.

We use dwelling transactions in Oslo and Bergen, surrounding the dates of policy change. Resembling a dichotomous policy shift, we treat the abolition of surveyor valuations in Oslo as a natural experiment. This allows for the use of quasi-experimental research designs, which improves the causal interpretation of the results. In particular, Trondheim is used as a counterfactual in a Difference-in-Differences test, as no contemporaneously policy shifts were undertaken in the municipality.

For Oslo, where the problem of underpricing is most severe[1], we find strong support for an increase in underpricing from surveyor valuation abolition. The estimated increase in the ratio of sales price-to-asking price of removing surveyor valuations is 2 - 3 percentage points, corresponding to approximately NOK 100 000 - 150 000.[2] The estimated effects on underpricing are consistent with both the non-experimental and the quasi-experimental designs. The DiD is significant with both Trondheim, Bergen,

[1] In the first half of 2016, the average difference between sales price and asking price was 9.1%, for Oslo, compared to 3.2% and 3.8% for Bergen and Trondheim respectively.

[2] The figures are calculated using the average price of Oslo freeholder dwellings sold in the +/- 5 week period around the surveyor valuation abolition (27/05/2016-04/08/2016).

Oslo in 2015 and a combination of Trondheim and Bergen as counterfactuals. Combined, the different counterfactuals control for both market and seasonal factors. We find a positive relationship between not having a surveyor valuation and underpricing in Bergen. However, quasi-experimental analyses cannot be used to investigate the policy shift in Bergen, as the removal of surveyor valuations was more gradual. Thus, contrary to Oslo, the evidence in Bergen has no causal interpretation. We find no robust effects of a reduced TOM from surveyor valuation abolition.

The coverage of strategic underpricing in Norwegian media emphasizes the extent of the problem. To our knowledge, we are the first to provide empirical results on the effects of the surveyor valuation removal in Oslo and Bergen. Our results indicate that the surveyor valuation could be a measure to reduce the level of underpricing in Oslo. Further, we argue that increased independence of the surveyors could contribute to a lower level of underpricing.

Bibliography

Aamo, V. (2012). Hvem som helst kan kalle seg takstmann [Anyone can use the Title "Surveyor"]. *E24, 07/07/12*. URL: http://e24.no/privat/eiendom/hvem-som-helst-kan-kalle-seg-takstmann/20241853, Accessed 24/10/16.

Anglin, P. M., Rutherford, R., and Springer, T. M. (2003). The Trade-off Between the Selling Price of Residential Properties and Time-on-the-Market: The Impact of Price Setting. *Journal of Real Estate Finance & Economics*, 26(1):95.

Angrist, J. D. and Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Are Andenæs Huser (2016). Meglerne dropper verditakst på boliger i oslo [Real Estate Agents Abolish Surveyor Valuation for Dwellings in Oslo]. *Dagens Næringsliv, 28/04/16*. URL: http://www.dn.no/privat/eiendom/2016/04/28/1402/Boligkjp/meglerne-dropper-verditakst-p-boliger-i-oslo.

Bartholdsen, T. (2012). Meglere på ville veier [Real Estate Agent Astray]. *Forbrukerrådet, 29/09/12*. URL: http://www.forbrukerradet.no/vi-mener/meglere-pa-ville-veier/, Accessed 24/10/16.

Bartholdsen, T. (2015). Lokket på visning [Tricked to Dwelling-Viewings]. http://www.forbrukerradet.no/vi-mener/2015/fpa-bolig-2015/lokket-pa-visning/ Accessed 12/11/16.

Bjørklund, K., John Alex, D., and Mats, W. (2006). Offer Price, Transaction Price and Time-on-Market. *Property Management*, 24(4):415 – 426.

Cameron, A. C. and Trivedi, P. K. (1998). *Regression Analysis of Count Data (Econometric Society Monographs)*. Cambridge University Press.

Case, K. E. and Shiller, R. J. (2003). Is There a Bubble in the Housing Market? *Brookings Papers on Economic Activity*, 34(2):299–362.

Crawford, V. P. and Sobel, J. (1982). Strategic Information Transmission. *Econometrica*, 50(6):1431–1451.

Dalen, A. (2011). Takstmenn for megleravhengige [Surveyors to dependent of Agents]. *E24, 12/03/11.* URL: http://e24.no/privat/eiendom/takstmenn-for-megleravhengige/10099170, Accessed 03/12/16.

Dalseg, E. (2016). Takstordningen er gått ut på dato [Practice of Using Surveyor Valuation is Outdated]. *DinSide, 09/02/09.* URL: http://www.dinside.no/bolig/takstordningen-er-gatt-ut-pa-dato/61997649, Accessed 03/12/16.

Dreyer, C. V. (2016). Møte om underprising av boliger i oslo kommune [Meeting About Underpricing of Dwellings in the Municipality of Oslo]. *NEF, 28/10/16.* URL: http://www.nef.no/wp-content/uploads/2016/10/Brev-oslo-kommune-161027-003.pdf, Accessed 05/11/16.

emgll, §6-3 (2007). emgll. Lov om eiendomsmegling. LOV 29/06/07 nr. 73 [Real Estate Act].

Fondenes, Y. (2006). Meklernes skitne triks [The Dirty Tricks of Real Estate Agents]. *Dagbladet, 17/08/06.* URL: http://www.skup.no/metoderapporter/2006/2006-49%20Meklernes%20skitne%20triks.pdf, Accessed 10/10/16.

Forbrukerombudet (2014). Bransjenorm for markedsføring av bolig [Industry Norm for Marketing of Dwellings]. *Bransjenorm for Markedsføring av Bolig.* URL: https://forbrukerombudet.no/lov-og-rett/veiledninger-og-retningslinjer/bransjenorm-markedsforing-bolig, Accessed 04/12/16.

Han Bin, K. and Mona J., G. (1989). Selling Price and Marketing Time in the Residential Real Estate Market. *Journal of Real Estate Research*, 4(1):21.

Hartwig, K. (2016). Oppvaskmøte om lokkepriser gir resultater: - på noen visninger kommer det ikke mennesker [Meeting About Strategic Underpricing Gives Positive Results]. *Dagens Næringsliv 30/10/16.* URL: http://www.dn.no/privat/2016/10/30/1256/Bolig/oppvaskmote-om-lokkepriser Accessed 04/12/16.

Horowitz, J. L. (1992). The Role of the List Price in Housing Markets: Theory and an Econometric Model. *Journal of Applied Econometrics*, 7(2):115 – 129.

Laffont, J.-J. and Martimort, D. (2001). *The Theory of Incentives: The Principal-Agent Model.* Princeton University Press.

Levitt, S. D. and Syverson, C. (2008). Market Distortions When Agents Are Better Informed: The Value of Information in Real Estate Transactions. *Review of Economics & Statistics*, 90(4):599 – 611.

Liu, P. and Weidel, R. (2009). Compensation Structure of Buyer Brokers and Residential Real Estate Transactions. *Cornell Real Estate Review*, 7(11):74–88.

Matanovic, D. (2014). Hva tjener en eiendomsmegler? [What Does the Real Estate agent Really Earn]. *boligmani.no, 11/11/14*. URL: http://www.boligmani.no/aktuelt/kommentar/hva-tjener-en-eiendomsmegler/4372, Accessed 10/12/16.

Merlo, A. and Ortalo-Magné, F. (2004). Bargaining Over Residential Real Estate: Evidence from England. *Journal of Urban Economics*, 56(2):192 – 216.

Mikalsen, B.-E. (2016a). Frykter boligprisene i Oslo skal stige 40 % på fire år [Fears that House Prices will Rise 40%]. *Dagens Næringsliv, 30/04/16*. URL: https://www.dn.no/privat/eiendom/2016/04/30/0859/frykter-boligprisene-i-oslo-skal-stige-40-prosent-p-fire-r, Accessed 06/12/16.

Mikalsen, B.-E. (2016b). Meglerne dropper verditakst på boliger i Oslo [Real Estate Agents Remove Surveyor Valuations for Dwellings in Oslo]. *Dagens Næringsliv, 25/04/16*. URL: http://www.dn.no/privat/eiendom/2016/04/28/1402/Boligkjp/meglerne-dropper-verditakst-p-boliger-i-oslo, Accessed 10/11/16.

Mordt, H., Wilden, V., and Mikalsen, K. S. (2016). Meglere skryter av egne feilvurderinger– kaller det «rekordsalg» [Real Estate Agents Brag about own Miscalculation - Names it "New-Record Sale"]. *NRK, 16/09/16*. URL: https://www.nrk.no/ostlandssendingen/meglere-skryter-av-egne-feilvurderinger_-kaller-det-_rekordsalg_-1.13136724, Accessed 14/12/16.

NITO Takst (2016). Hvordan bli takstmann og få karriere som takstingeniør [How to Become a Surveyor and Start a Career as an Surveyor Engineeer]. *NITO*. URL: https://www.nito.no/fagmiljo/nito-takst/bli-takstmann/, Accessed 01/12/16.

Nordstrøm, J. (2015). Forbrukerrådet: – sjansespill å kjøpe bolig uten tilstandsrapport [The Norwegian Consumer Council : - Very Risky to buy a House Without a Condition Report]. *E24,05/07/15*. URL: http://e24.no/privat/eiendom/

forbrukerraadet-sjansespill-aa-kjoepe-bolig-uten-tilstandsrapport/23471854, Accessed 04/12/16.

Privatmegleren (2016). Prisliste, [Price List]. *Privatmegleren Ålesund*. URL: https://www.privatmegleren.no/alesund/prisliste Accessed 18/12/16.

Real Estate Norway (2013). About the Industry. *Eiendom Norge*. URL: http://eiendomnorge.no/en/about-the-industry/, Accessed 04/12/16.

Real Estate Norway (2016). Boligprisstatistikken [The Norwegian Housing Price Statistics]. *Eiendom Norge*. URL: http://eiendomnorge.no/boligprisstatistikken/, Accessed 04/12/16.

Rosén, K. and Torsteinsen, D. H. (2008). *Eiendomsmegling - Rettslige spørsmål [Real Estate - Legal Issues]*. Gyldendal akademisk, 2 edition.

Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *American Economic Review*, 63(2):134–39.

Rutherford, R., Springer, T., and Yavas, A. (2007). Evidence of Information Asymmetries in the Market for Residential Condominiums. *Journal of Real Estate Finance & Economics*, 35(1):23 – 38.

Skjærholt, A. (2015). Behavioral Biases in Housing Markets - The Case of Oslo. Master thesis, University of Oslo.

SSB (2016). Folkemengde og befolkningsendringar, 3. kvartal 2016 [Population and Population Changes, 3rd Quarter of 2016]. Statistics.

Stamsø, M. A. (2011). Kjøp og salg av bolig - eiendomsmegleres rolle [Buying and Selling Dwellings - The Role of the Real Estate Agent]. *Fagrapport*, 1:49–56.

Stamsø, M. A. (2012). Boligsalg og salgsmetoder [Sale of Dwellings and Sales Methods]. *Fagrapport*, 7.

Statistics Norway (2015). Dette er norge 2015 - hva tallene forteller [This is Norway - What the Numbers Tell]. *Statistics Norway*, pages 16–18.

The Financial Supervisory Authority of Norway (2016). Eiendomsmegling [Real Estate Brokerage]. *Årsmelding 2015*, pages 79–81.

Wig, K. (2013). Innfører nye megler-regler mot lokkepriser [Introduces New Brokerage-Rules to Fight Strategic Underpricing]. *E24, 07/05/13*. URL: http://e24.no/privat/eiendom/innfoerer-nye-megler-regler-mot-lokkepriser/20366403, Accessed 25/10/16.

Wig, K. (2015). Meglertopp varsler ny lokkepris-kamp: – det er en ukultur i oslo [CEO of NEF Announces another War Against Strategic Underpricing: - There Exists a Bad Culture in Oslo]. *E24, 24/09/15*. URL: http://e24.no/privat/eiendom/meglertopp-varsler-ny-lokkepris-kamp-det-er-en-ukultur-i-oslo/23529745, Accessed 04/12/16.

Wig, K. (2016a). 10 meglerkjeder tatt for lokkeprising i oslo [10 Real Estate Agencies Caught Conducting Strategic Underpricing in Oslo]. *E24, 16/10/16*. URL: http://e24.no/privat/bolig/10-meglerkjeder-tatt-for-lokkeprising-i-oslo/23820356, Accessed 20/10/16.

Wig, K. (2016b). Nye avvikstall: Så mye underprises Oslo-boligene [New Deviation Figures: This is how Much the Oslo Homes are Underpriced]. *E24, 02/12/16*. URL: http://e24.no/privat/bolig/nye-avvikstall-saa-mye-underprises-oslo-boligene/23862184, Accessed 04/12/16.

Yavaş, A. and Yang, S. (1995). The Stategic Role of Listing Price in Marketing Real Estate: Theory and Evidence. *Real Estate Economics*, 23(3):347 – 368.

Appendix

1 Robustness Tests Underpricing - Regression 1

A Changing the Event Window in Oslo

In Table. A.1 we vary the event window to test the robustness of the result found in Table 5.5. We move the event window from three to ten weeks, excluding the five and eight week windows used in the main analysis. The results are robust for all windows above four weeks, and the coefficients are stable around 2 - 2.5 percentage points.

TABLE A.1: *Regression 1 – Non-Experimental Design: Underpricing in Oslo, Changing the Event Window*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(No Valuation)	0.60	1.14	2.36***	2.44***	2.23***	2.23***
	(0.76)	(0.69)	(0.48)	(0.41)	(0.39)	(0.37)
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No
Number of observations	783	1033	1807	2049	2936	3396
Event Window	+/-3 weeks	+/-4 weeks	+/-6 weeks	+/-7 weeks	+/-9 weeks	+/-10 weeks
SE	Robust	Robust	Robust	Robust	Robust	Robust

White standard errors in parentheses. P-value indicators =* $p<0.1$ ** $p<0.05$ *** $p<0.01$. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(No Valuation) is a dummy variable equal to one if the dwelling is sold without a surveyor valuation. The centre date is 01/07/16, i.e the right window begins on this date. Window sizes vary from three to ten weeks. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City District.

B Changing the Event Window in Bergen

In Table A.2 we vary the event window from three to ten weeks. The robustness test yields similar results as the main analysis in Table 5.3.3. The coefficients are stable around 1.5 - 1.75 percentage points.

TABLE A.2: *Regression 1 Underpricing Bergen - Changing the Event Window*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Valuation)	1.71**	1.56**	1.68***	1.63***	1.56***	1.57***
	(0.80)	(0.70)	(0.57)	(0.53)	(0.50)	(0.44)
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	348	513	807	925	1230	1381
Event Window	+/-3 weeks	+/-4 weeks	+/-6 weeks	+/-7 weeks	+/-9 weeks	+/-10 weeks
SE	Robust	Robust	Robust	Robust	Robust	Robust

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(No Valuation) is a dummy variable equal to one if the dwelling is sold without a surveyor valuation. The centre date is 04/04/16, i.e the right window begins on this date. Window sizes vary from three to ten weeks. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City district. Weekly dummies are included to control for time fixed effects.

2 Robustness Tests Underpricing - Regression 2

A Changing the Event Window

In Table A.3, we vary the event window as in prior sections. In addition we drop observations one week before and after the treatment date in Column (7) and (8), as the weeks closest to the treatment date shows volatility in the use of surveyor valuations. The coefficients are significant and consistent for window size larger than 4 weeks.

Table A.3: *Regression 2 - Estimated Treatment Effect: Underpricing in Oslo, Varying the Event Windows*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Post)	0.54	1.29*	2.39***	2.42***	2.15***	2.20***	2.20***	2.89***
	(0.87)	(0.76)	(0.50)	(0.43)	(0.32)	(0.30)	(0.33)	(0.53)
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No
Number of observations	783	1033	1807	2049	2936	3396	2735	1604
Event Window	+/-3w	+/-4w	+/-6w	+/-7w	+/-9w	+/-10w	excl. 2w +/-8w	excl. 2w +/-5w
SE	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. The centre date is 01/07/16 i.e the right window begins on this date. Window sizes vary from three to ten weeks. In addition, Column (7) and (8) excludes the two weeks closest to the event date and uses a +/- 5 week window. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City District.

B Moving the Treatment Date

Table A.4 includes robustness tests for Underpricing, where the treatment date is moved forwards four weeks and backwards four and eight weeks. The window sizes are set to not include the actual treatment date of 01/07/2016. The coefficient is insignificant in all cases, supporting the validity of the main analysis.

Table A.4: *Regression 2 – Estimated Treatment Effect: Underpricing in Oslo, Moving the Treatment Date*

	(1)	(2)	(3)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)
I(PostOslo)	-0.19	-0.14	0.23
	(0.46)	(0.38)	(0.28)
Deal Specific Controls	Yes	Yes	Yes
Time Fixed Effects	No	No	No
Event Date	26/08	3/6	6/5
Number of observations	1490	1655	3113
Event Window	+/-4 weeks	+/-4 weeks	+/-8 weeks
SE	Robust	Robust	Robust

White standard errors in parentheses. P-value indicators =* $p<0.1$ ** $p<0.05$ *** $p<0.01$. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the specified treatment date or later, and zero if sold prior to the date. The treatment date is moved forwards one month and backwards one month and two months. Window sizes are set to not include the actual treatment date of 01/07/2016. Deal specific controls are: Living Area, Age of Dwelling, Type of Dwelling and City district.

3 Robustness Tests Underpricing - Regression 3

A Changing the Event Window

For the DiD regression with Underpricing as dependent variable, event windows larger than three weeks yields significant and consistent results, as shown in Table A.5, with Trondheim as counterfactual.

Table A.5: *Regression 3 – DiD: Underpricing in Oslo, Varying the Event Window*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(Post)	0.43	-0.50	-1.095	-0.84	-0.75	-0.72	-0.32	-0.45	-0.76
	(1.27)	(0.89)	(0.77)	(0.72)	(0.57)	(0.52)	(0.46)	(0.43)	(0.63)
I(Oslo)	5.035***	4.85***	4.55***	4.54***	4.77***	4.65***	4.55***	4.68***	4.69***
	(1.093	(0.73)	(0.59)	(0.52)	(0.41)	(0.40)	(0.35)	(0.34)	(0.44)
I(Post)*I(Oslo)	**0.18**	**1.36**	**1.91**	**2.55****	**3.68*****	**3.50*****	**2.57*****	**2.69*****	**4.26*****
	(1.83)	**(1.36)**	**(1.17)**	**(1.05)**	**(0.75)**	**(0.67)**	**(0.56)**	**(0.52)**	**(0.81)**
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No	No
Number of observations	310	721	1094	1430	2427	2761	3896	4474	2135
Event Window	+/-1 w	+/-2 w	+/-3 w	+/-4 w	+/-6 w	+/-7 w	+/-9 w	+/-10 w	Excl. 2 w. +/-5 w
SE	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactual is the municipality of Trondheim. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. The treatment date is 01/07/16 i.e the right window begins on this date. Window sizes vary from one to ten weeks. In addition, Column (9) excludes the two weeks closest to the event date and uses a +/- 5 week window. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

4 Regression 1 on Underpricing with All Coefficients Reported

Table A.6: *Regression 1 with All Coefficients Reported*

	(1)	(2)	(3)	(4)
Dependent Variable	ln(UP)	ln(UP)	ln(UP)	ln(UP)
I(No Valuation)	3.14***	2.42***	2.91***	1.40**
	(0.39)	(0.36)	(0.68)	(0.59)
ln(Living Area)		-5.74***		-6.59***
		(0.43)		(0.55)
Age		0.028***		0.036***
		(0.0045)		(0.0064)
I(Detached)		3.77***		4.33***
		(0.90)		(1.29)
I(Semi detached)		2.109**		2.302**
		(0.86)		(1.14)
I(Terraced house)		0.41		0.26
		(0.80)		(1.080)
I(Alna)		-0.010		1.82
		(1.54)		(2.23)
I(Bjerke)		0.32		1.18
		(1.45)		(1.93)
I(Frogner)		-4.015***		-3.16*
		(1.21)		(1.73)
I(Gamle Oslo)		0.90		1.65
		(1.27)		(1.80)
I(Grorud)		0.79		4.73**
		(1.63)		(2.38)
I(Grunerlokka)		0.61		1.092
		(1.23)		(1.78)
I(Marka)		5.27		0.16
		(7.66)		(7.80)
I(Nordre Aker)		-0.79		0.980
		(1.32)		(1.89)
I(Nordstrand)		-2.60*		-1.20
		(1.33)		(1.95)
I(Sagene)		0.82		2.98*
		(1.24)		(1.77)
I(Sentrum)		-3.21		-6.41
		(2.99)		(5.65)
I(Sthanshaugen)		-1.45		-1.33
		(1.26)		(1.80)
I(Stovner)		0.36		1.73
		(1.58)		(2.30)
I(Sondre Nordstrand)		-2.42*		-1.14
		(1.49)		(2.045)
I(Ullern)		-3.61***		-2.29
		(1.33)		(1.88)
I(Vestre Aker)		-2.92**		-0.83
		(1.29)		(1.81)
Constant	9.051***	33.34***	9.20***	35.60***
	(0.21)	(2.17)	(0.26)	(2.88)
N	2453	2447	1358	1352
Adj. R-sq	0.027	0.191	0.015	0.204
Event Window	+/- 8 weeks	+/- 8 weeks	+/- 5 weeks	+/- 5 weeks

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the logarithm of the underpricing ratio x 100, showing percentage points. I(No Valuation) is a dummy variable equal to one if the dwelling is sold without a surveyor valuation. The centre date is 01/07/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling, Type of Dwelling and City district.

5 Regression 3 - A discussion on Bergen as Counterfactual

As argued in the DiD analysis of Section 5.3.7, Trondheim is the most suitable counterfactual for the underpricing variable. However, being the second largest city in Norway, Bergen also serves as a natural candidate. The validity of Bergen as counterfactual is rather strong. In Figure A.1, we see that trends in underpricing are not completely parallel, but follow each other closely. Development in price per m^2 and sales volume is similar for the two municipalities, as seen in Figure A.2 and Figure A.3 respectively. Further, Bergen is the second largest municipality in Norway, with a population of 280 000 (SSB, 2016). However, the decline in the use of surveyor valuation flattened out right before the investigated event windows of Oslo. It is therefore uncertain to what extent Bergen can act as a control group for Oslo. This, and the more parallel underpricing trends of Trondheim and Oslo are the main reasons why the validity of Trondheim is discussed to a greater extent in the main analysis.

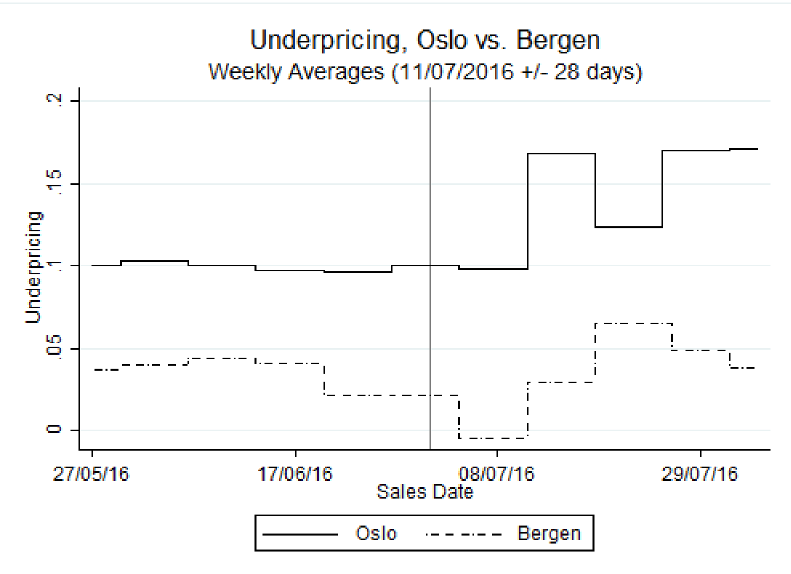

FIGURE A.1: *The graph shows the weekly average underpricing in Oslo and Bergen from 27/05/16 to 04/08/16. We present underpricing as (sales price/asking price)-1. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

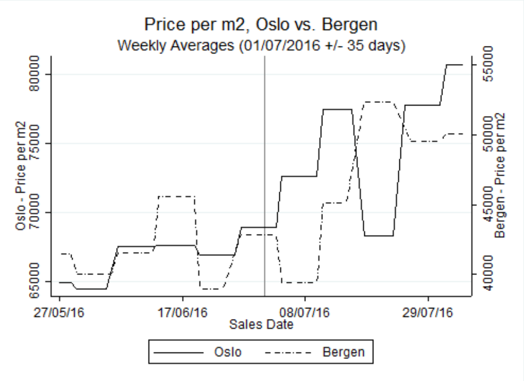

FIGURE A.2: *The graph shows the weekly average price per* m^2 *in Oslo and Bergen from 27/05/16 to 04/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

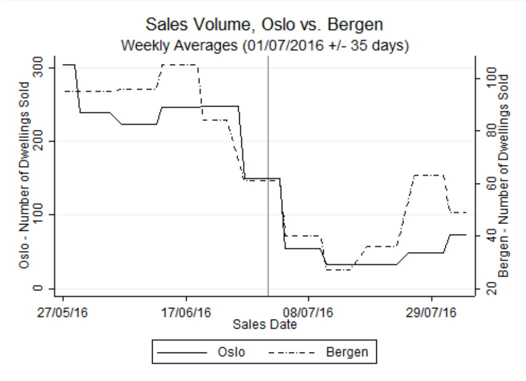

FIGURE A.3: *The graph shows the weekly average sales volume in Oslo and Bergen from 27/05/16 to 04/08/16. The vertical solid line on 01/07/16 indicates the treatment date of Oslo.*

6 Robustness Test TOM - Negative Binomial Regression (DiD)

A Changing the Event Window

In Table A.7, we vary the window length of the negative binomial DiD regression with TOM as dependent variable and Trondheim as counterfactual. We obtain significant, but inconsistent results for most window sizes, reflecting the difference in time variation of TOM between Trondheim and Oslo.

TABLE A.7: *Negative Binomial Regression – DiD: TOM in Oslo, Changing the Event Window*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent Variable	TOM	TOM	TOM	TOM	TOM	TOM	TOM	TOM	TOM	TOM
I(Post)	0.72***	0.47***	0.74***	0.75***	0.57***	0.48***	0.37***	0.32***	0.30***	0.47***
	(0.21)	(0.16)	(0.14)	(0.13)	(0.11)	(0.10)	(0.091)	(0.086)	(0.081)	(0.12)
I(Oslo)	-0.051	-0.29***	-0.18*	-0.14	-0.26***	-0.28***	-0.26***	-0.26***	-0.28***	-0.28***
	(0.15)	(0.11)	(0.10)	(0.084)	(0.067)	(0.065)	(0.061)	(0.060)	(0.057)	(0.073)
I(Post)*I(Oslo)	**-0.50****	**-0.17**	**-0.43****	**-0.45*****	**-0.27****	**-0.23****	**-0.20***	**-0.20****	**-0.18****	**-0.18**
	(0.234)	**(0.18)**	**(0.17)**	**(0.15)**	**(0.13)**	**(0.11)**	**(0.10)**	**(0.096)**	**(0.091)**	**(0.15)**
As Percent	-40.36	-16.92	-35.32	-36.13	-23.66	-20.65	-17.50	-18.48	-17.01	-15.08
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No	No	No	No	No
Number of observations	310	721	1094	1430	2427	2761	3298	3896	4474	2135
Event Window	+/-1 w	+/-2 w	+/-3 w	+/-4 w	+/-6 w	+/-7 w	+/-9 w	+/-10 w	Excl. 2w +/-8 w	Excl. 2 w +/-5 w
SE	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim	T.heim

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactual is the municipality of Trondheim. The dependent variable is TOM. As percent shows the discrete percentage difference, given by $100 * (e^{\beta} - 1)$. I(Post) is a dummy variable equal to one if the dwelling is sold on the treatment date or later, and zero if sold prior to it. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. Window size vary from one to ten weeks. Column (9) and (10) exclude one week on each side of the window centre. Deal specific controls are: Living Area, Age of Dwelling and Type of Dwelling.

B Moving the Treatment Date

Table A.8 includes robustness tests for TOM, where the treatment date is moved forwards four weeks and backwards four and eight weeks, for the municipalities of Bergen and Trondheim as counterfactuals. The window sizes are set to not include the actual treatment date of 01/07/2016. Two of the coefficients are significant for Trondheim, implying that there are differences in time variation of TOM between Oslo and Trondheim. No significant coefficients are found for Bergen, implying that the parallel trend assumption for TOM is more valid in Bergen.

Table A.8: *Negative Binomial Regression - DiD: TOM in Oslo, Changing the Treatment Date*

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	TOM	TOM	TOM	TOM	TOM	TOM
I(Post)	-0.039	-0.24**	-0.24***	-0.016	-0.079	-0.076
	(0.13)	(0.11)	(0.088)	0.083	0.076	0.059
I(Oslo)	-0.31***	-0.40***	-0.44***	-0.40***	-0.43***	-0.38***
	(0.12)	(0.086)	(0.076)	(0.083)	(0.068)	(0.057)
I(Post)*I(Oslo)	**-0.144**	**0.22***	**0.17***	**-0.16**	**0.058**	**-0.0013**
	(0.15)	**(0.12)**	**(0.10)**	**(0.11)**	**(0.092)**	**(0.072)**
As Percent	-13.41	24.86	18.16	-15.21	5.96	-0.13
Deal Specific Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	No	No	No	No
Number of observations	1917	2181	4054	2584	2867	5267
Treatment Date	26/08	03/06	05/05	26/08	03/06	05/05
Event Window	+/-5 weeks	+/-5 weeks	+/-8 weeks	+/-5 weeks	+/-5 weeks	+/-8 weeks
SE	Robust	Robust	Robust	Robust	Robust	Robust
Counterfactual	T.heim	T.heim	T.heim	Bergen	Bergen	Bergen

White Standard errors in parentheses. P-value indicators =* $p<0.1$ ** $p<0.05$ *** $p<0.01$. The counterfactuals are the municipalities of Trondheim and Bergen respectively. The dependent variable is TOM. "As Percent" shows the discrete percentage difference, given by $100*(e^{\beta}-1)$. I(Post) is a dummy variable equal to one if the dwelling is sold on the specified treatment date or later, and zero if sold prior to it. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. The treatment date is moved forwards one month, backwards one month and two months. Window sizes are set to not include the actual treatment date of 01/07/2016. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

C DiD with Oslo 2015 as counterfactual

To control for seasonal variation of Oslo, we estimate a negative binomial DiD regression with Oslo 2015 as the counterfactual. We find no significant differences between Oslo 2016 and 2015 in terms of TOM.

Table A.9: *Negative Binomial Regression - DiD: TOM in Oslo 2016, with Oslo in 2015 as Counterfactual.*

	(1)	(2)
Dependent Variable	TOM	TOM
I(Post 01/07)	0.26***	0.28***
	(0.061)	(0.058)
I(Oslo 2016)	-0.17***	-0.16***
	(0.050)	(0.048)
I(Post 01/07)*I(Oslo 2016)	-0.080	-0.10
	(0.084)	(0.078)
As Percent	-7.67	-9.86
Deal Specific Controls	No	Yes
Time Fixed Effects	No	No
Number of Observations	4290	4273
Event Window	+/- 5 weeks	+/- 5 weeks
SE	Robust	Robust

White Standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The counterfactual is the municipality of Oslo at the same dates in 2015. The dependent variable is TOM. As Percent" shows the discrete percentage difference, given by $100*(e^{\beta}-1)$. I(Post 01/07) is a dummy variable equal to one if the dwelling is sold on the 01/07 or later in a given year, and zero if sold prior to 01/07 in a given year. I(Oslo 2016) is a dummy variable equal to one if the dwelling is sold in Oslo in 2016 and zero if it is sold in Oslo in 2015. The centre date is 01/07 i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

7 Negative Binomial Regression on TOM with All Coefficients Reported

TABLE A.10: *Negative Binomial Regression: TOM in Oslo - With all Coefficients Reported*

	(1)	(2)	(3)	(4)	(5)	(6)
	TOM	TOM	TOM	TOM	TOM	TOM
I(Post)	0.64***	0.69***	0.43***	0.45***	0.52***	0.54***
	(0.13)	(0.12)	(0.11)	(0.10)	(0.082)	(0.080)
I(Oslo)	-0.22***	-0.20***	-0.43***	-0.47***	-0.34***	-0.36***
	(0.076)	(0.072)	(0.073)	(0.069)	(0.058)	(0.055)
I(Post)*I(Oslo)	-0.38**	-0.38***	-0.17	-0.15	-0.26**	-0.24**
	(0.16)	(0.15)	(0.14)	(0.14)	(0.12)	(0.12)
Living Area		0.50***		0.40***		0.40***
		(0.065)		(0.067)		(0.062)
Age		-0.0039***		-0.0031***		-0.0034***
		(0.00058)		(0.00057)		(0.00053)
I(Detached)		-0.58***		-0.51***		-0.54***
		(0.10)		(0.098)		(0.090)
I(Semi detached)		-0.39***		-0.041		-0.11
		(0.095)		(0.13)		(0.11)
I(Terraced house)		-0.29***		-0.33***		-0.38***
		(0.10)		(0.10)		(0.091)
Constant	2.77***	0.88***	2.98***	1.52***	2.89***	1.46***
	(0.069)	(0.28)	(0.065)	(0.29)	(0.048)	(0.26)
Alpha	0.54	0.48	0.61	0.56	0.64	0.59
N	1869	1861	2026	2015	2537	2524
Event Window	+/- 5w	+/- 5w	+/- 5w	+/- 5w	+/- 5w	+/- 5w

White standard errors in parentheses. P-value indicators =* p<0.1 ** p<0.05 *** p<0.01. The dependent variable is the TOM. I(Post) is a dummy variable equal to one if the dwelling is sold on the 01/07/16 or later, and zero if sold prior to 01/07/16. I(Oslo) is a dummy variable equal to one if the dwelling is sold in Oslo and zero otherwise. The centre date is 01/07/16 i.e the right window begins on this date. Estimated using Negative Binomial Regression. The centre date is 01/07/16, i.e the right window begins on this date. Deal specific controls are: Living Area, Age of dwelling and Type of Dwelling.

8 List of Variables Used in the Analysis

TABLE A.11: *Explanation of Variables Used in the Analysis*

English	Norsk	Explanation
Form of Ownership	Eierform	Describes the ownership status of the dwelling. The database only include freeholder dwellings.
Type of Dwelling	Boligtype	Dwellings can be either apartment, detached, semi-detached or terraced house.
Living Area	P-rom	A measure of the area intended for primary use.
Date Registered	Registrert dato	The day the sales prospect is registered on Finn.no.
Sales Date	Salgsdato	The day the real estate agent reports the sale.
Judicial Registration	Tinglysningsdato	Date of public registry, when the transaction is processed by the official government agency.
Asking Price	Prisantydning	The price the real estate agent and the seller have agreed to list in the sales prospect.
Sales Price	Pris	The amount transferred from buyer to seller after the signing of a contract.
Surveyor Valuation	Verditakst	Expected market value of the dwelling set by a professional surveyor
Age	Byggeår	2016 - Year Built. "Year built" is the year when the building was ready for occupation.
Price per m^2	Kvadratmeterpris	Sales price per m^2 of living area
City district	Bydel	The city district the dwelling is located in, e.g., Frogner