

HOME MORTGAGE CONSTRAINTS AND RENTAL MARKET FRICTIONS

LESSONS FROM NORWAY

HARALD BROBACKE

OSKAR GARHOLM BIRKELAND

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Home Mortgage Constraints and Rental Market Frictions: Lessons from Norway

Abstract:

We investigate frictions in the housing market affecting the dynamics between the tenant- and owner-occupied parts of the market in a predominantly unregulated environment. We do this by analyzing the Norwegian housing market. Most prominently, we find data indicating that the tightened government-imposed down payment requirements of 2011 alter market dynamics and increase the pressure on the rental market. Subsequently, we argue that those households affected by mortgage constraints in general not only include low-income households but also high-income immigrant households with a lacking credit history. Furthermore, our findings suggest that some private information variables can explain the variation of rents and prices, although this is clearer for purchase prices than for rents.

Keywords:

Household Finance, Housing Economics, Real Estate Finance

Authors:

Harald Brobacke (25002)
Oskar Garholm Birkeland (25536)

Tutor:

Alvin Chen, Assistant Professor, Department of Finance

Examiner:

Adrien d'Avernas, Assistant Professor, Department of Finance

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1. Introduction

1.1 Research Question and Related Literature

Homeownership is one of the largest investments an average household can make. Thus, deciding between renting and buying one's home is perhaps the most important financial decision for any household. Furthermore, from a social perspective, it can be argued that the financial security generated by homeownership is an important driver for economic equality. The dynamics of housing markets and the intuition behind households' housing decision should therefore be well understood.

The outcome of a household's housing decision is notoriously known to turn out very differently depending on the country in which it is made. In Norway, homeownership is unquestionably the most widespread housing option for households, with a homeownership rate of approximately 80% (Eurostat, 2021). For comparison, otherwise comparable economies such as Sweden and Denmark have homeownership rates of respectively 64.9% and 59.2% (ibid., 2021). At the same time, Norway has a highly unregulated rental market, which cannot be said about the other mentioned countries. This makes the Norwegian housing market a unique environment in which to examine housing market frictions, which we will do in this thesis. By doing so, we aim to improve the understanding of housing market dynamics in general.

We will investigate how down payment requirements for home mortgages might create a friction in the rental market, by increasing the demand for rentals and pushing up rents. We will also consider how immigrants from developed countries in the Western world might struggle to receive a mortgage offer despite potentially high earnings and ability to post a down payment. Thereby, we will not only attempt to contribute to the explanation for why rentals in Norway are not seen as a viable long-term option. Instead, we will also explore how mortgage constraints in general might create frictions in the housing market, as well as discussing which households are affected by these.

The literature is plentiful when it comes to frictions in the real estate market increasing rental demand, such as higher transaction costs related to collateral requirements for home

mortgages, or higher transaction costs related to buying and selling a home, compared to renting.

Gete and Reher (2018) analyze one such friction, by investigating how the “contraction of the mortgage credit supply has been a significant driver of housing rents and homeownership since the 2008 crisis”. They find this by investigating how regulatory costs in the banking sector, following the financial crisis, pushed up lending expenses for households. This, combined with frictions related to substitution across lenders, led to more households being denied credit. Consequently, since most households need a mortgage to buy a home and because the rental market supply elasticity is imperfect, housing rents increased, and the rent-to-price ratio decreased. Similarly, we will in this thesis investigate how a 2011 regulatory change in Norway restricted mortgage supply, which seems to have pushed up rents and increased rental market frictions.

Other related findings include Acolin, Bricker, Calem and Wachter (2016) who also show how tightening mortgage supply can significantly restrict market entry for potential homeowners and increase rental demand. Furthermore, Fuster and Zafar (2016) interestingly find that even small positive changes in down payment requirements can decrease consumer propensity for buying significantly. Intuitively therefore, in their hypothetical scenarios, Fuster and Zafar (2016) find that these down payment effects are particularly clear for financially constrained individuals. In this thesis, we will show that rents, in relative terms, are particularly high for smaller homes (i.e., rents are relatively higher for those homes which are likely to be inhabited by financially constrained households).

On the other hand, there is no real consensus on frictions that favor purchasing a home, partly since these frictions are under-measured and under-modeled, according to Halket and di Custozza (2015). In their article, they attempt to fill this gap, creating a model in which scarcity of rentals is an equilibrium outcome. This can help explain why rentals are undersupplied in the Norwegian market even though we argue that particularly rents for smaller homes in Norway might be overpriced. Halket and di Custozza (2015) argue that the availability of rentals is constrained by private information about how long households intend to stay, in theory pushing people toward homeownership. However, as

we will establish, people might also be constrained from purchasing a home, even though this might be the best theoretical solution.

1.2 A Description of the Norwegian Housing Market

1.2.1 The Rental Market

Rental homes in Norway are supplied by both the private and the public sector, primarily regulated by the Tenancy Act of 1999 (LOV-1999-03-26-17, Norwegian: Lov om husleieavtaler) and secondarily regulated by the Housing Accountability Act of 2022 (LOV-2022-12-20-121, Norwegian: Lov om kommunenes ansvar på det boligsosiale feltet). In large, the rental market in Norway is uniquely deregulated compared to other European and particularly Scandinavian countries, as we will explain next.

The private sector market is an almost entirely deregulated market, where landlords and tenants can agree on any rent level (LOV-1999-03-26-17, Section 3-1), as long as it is not considered “unreasonable compared with that which is normally obtained when concluding an agreement concerning the new letting of similar property on similar terms” (LOV-1999-03-26-17, Section 4-1, official translation). This kind of rent setting resembles market rent. However, after fixing the rent, it can only be adjusted annually in line with the retail price index (*ibid.*, Section 4-2). Further adjustments can be made every 2.5 years, but only to align with “the current level of rents for similar property on similar terms of agreement” (*ibid.*, Section 4-3). Therefore, it is an important notion that rent setting in the rental market is not frictionless, and although there is no rent control, rent growth is determined not entirely by market forces.

It is also worth mentioning that the owner of a condominium apartment (Norwegian: Borettslagsleilighet, Swedish: Bostadsrättslägenhet) can be denied renting out his apartment by the tenant owners’ association if he does not have any explicit reason to do so, such as studies, working abroad, etc. (LOV-2003-06-06-39, Lov om burettslag 2003, Section 5-3 to 5-6). In 2024, approximately 14% (Statistics Norway, n.d. a) of Norwegian homes are condominiums, thereby creating another friction in the rental market.

The public sector market consists of municipality-owned homes, known as municipal social housing (Norwegian: Kommunale boliger). This kind of housing made up approximately 18% of the rental market in 2022 (Statistics Norway, 2023, n.d. a). An important notion is that according to the Housing Accountability Act of 2022, this kind of housing is only meant for those who are “disadvantaged in the housing market”, meaning that they are “not able to look after their own interests in the housing market, and therefore need support to find and retain suitable housing” (LOV-2022-12-20-121, Section 4, own translation). Examples of such tenants are physically or mentally disabled, low-income individuals (City of Oslo, n.d.). Municipal social housing is furthermore usually meant to be a temporary solution for the tenants, until they retain suitable, long-term housing (ibid., n.d.). According to the City of Oslo (n.d.), the average duration of stay in this kind of housing is 3-5 years. Due to its particular nature, and the modest supply of such housing, we will not consider it any further in this thesis.

1.2.2 The Owner-Occupied Housing Market

A unique feature of the Norwegian housing market is that a key goal of the housing policy is to assist individuals in buying their own homes (Royal Norwegian Ministry of Local Government and Modernisation, 2020). To facilitate this, authorities offer subsidized loans to households which are financially disadvantaged in the long run and unable to secure traditional mortgages from private banks (ibid., 2020). As an alternative, such households might be granted a home mortgage by the Norwegian State Housing Bank according to the Norwegian State Housing Bank Act of 2009 (LOV-2009-05-29-30, Norwegian: Lov om Husbanken) and its corresponding regulations of 2019 (FOR-2019-11-18-1546, Norwegian name: Forskrift om lån fra Husbanken). Similarly, municipalities, in collaboration with the Norwegian State Housing Bank, are encouraged to continuously assess whether tenants of municipal social housing could benefit from and afford purchasing the homes which they currently rent (Royal Norwegian Ministry of Local Government and Modernisation, 2020). When households are found to do so, they might qualify for the “tenancy-to-ownership program” and might be granted a mortgage to purchase their current home (ibid., 2020).

These two kinds of home mortgages are known as “start-up loans” (Norwegian: Startlån). In 2023, the Norwegian State Housing Bank granted such mortgages amounting to a total of NOK 16 billion (Norwegian State Housing Bank, n.d.).

2. Data Description and Empirical Methodology

2.1 Our Data

We base our thesis on several different information sources. An important source for us has been the extensive publicly available data from Statistics Norway covering a range of data categories, including homeownership, income, employment, gross domestic product (GDP) and average credit rates. Furthermore, we have been able to access an exclusive data set to all sold homes in Norway between 2021 and 2023, through a collaboration with a leading Norwegian statistics- and analytics group, 4CastGroup AS. We have used the data from the four largest cities (Oslo, Bergen, Stavanger, and Trondheim), amounting to approximately 90,000 sales. Our last source of data has been the RSS feed of finn.no, from which we have extracted a data set of approximately 40,000 rental listings¹ between 2021 and 2022 for the four largest cities in Norway.

Finn.no is a major platform for selling and renting property in Norway. Of course, its RSS feed will not capture the entire spectrum of rentals for any given year, since rental contracts may not be advertised online at all, or they might be advertised via other services. Furthermore, the agreed upon rent between the landlord and tenant might differ from the rent which is advertised on finn.no. We can also not be certain that all listed rental homes have been matched with a tenant. The homes that are listed on finn.no are also not a random sample of homes being rented out. That being said, considering our data, the number of rental listings is approximately 45% of actual sales in the period, thus we have likely been able to capture a large share of actual rentals, considering the homeownership rate in Norway being 80%.

¹ The number of rental listings refers to the number of listings we are left with after cleaning the raw data from the RSS feed.

We have modified the RSS feed data from finn.no in several ways. We removed all rental listings other than private homes, i.e. keeping villas, row houses, studio apartments, and duplex homes (Norwegian names in data: Enebolig, hus, leilighet, rekkehus, studio, tomannsbolig). We chose to exclude parking spaces for obvious reasons, as well as farms (only one data point), “hybel” and “rom i bofellesskap”. The latter two home types, which roughly translate to “rooms”, we chose to exclude since they are not private homes, but rather part of someone else’s home. We also excluded the category “others” (“andre”) since this category contained all the above categories, including parking spaces, etc.

We also removed those cells with “abnormal” rents or square meterage. That is, we excluded those ads with monthly rents less than NOK 4,000 (only a few homes), since these are clearly mispriced. Similarly, we removed those rental listings with monthly rents above NOK 1,000,000. In addition, we excluded those cells with a square meterage below 10 (including those with no listed square meterage) or above 1,000 since these would likely alter our subsequent classification into size categories due to incorrect listed size.

The data set on sold homes and the data set on rental listings contain street address, asking rent or selling price, size of the home in square meters, and the type of home (e.g., apartment or row house). The reason why we have used data from these four cities is that the rental market is very limited outside them, and that Statistics Norway has more detailed statistics for these municipalities.

2.1 Empirical Methodology

2.1.1 Definitions

We will make use of three geographical definitions, coinciding with the data from Statistics Norway. The smallest of these is a “basic statistical unit” (Norwegian: Grunnkrets). This is the smallest geographical unit used by Statistics Norway, of which there are in total approximately 2,500 in the four largest cities. We eliminate, however, approximately 1,500 of these due to less than 10 rental listings and/or sold homes in our data. Next, the term “statistical tract” (Norwegian: Delområde) refers to a collection of basic statistical units. Lastly, the term “urban district” (Norwegian: Bydel) refers to a

collection of statistical tracts. Oslo has 17 urban districts, Stavanger has 9, Bergen has 8 and Trondheim has 4.

The term “size category” refers to a set of categories describing how many square meters a home is. It consists of nine different home sizes, A to I, where size A homes are less than 30 square meters, and size I homes are more than 130 square meters, according to Appendix A. These definitions are based on the commonly used definitions by the National Federation of House Owners in Norway (Huseierne), the consumer association for homeowners. In this thesis, we have grouped together groups J and K with I. We have done this since such large homes are uncommon in urban areas, in particular in the rental market, and we wanted to keep as many submarkets as possible.

Inspired by Halket and di Custozza (2015), and Piazzesi, Schneider and Stroebel (2020), adapted to a Norwegian context, we define a “submarket” as all housing for rent or sale within an urban district and within a certain size category, e.g., Oslo-Marka-A or Bergen-Fana-D. A market, on the other hand, is defined as a collection of submarkets within the same city and size category, e.g., Oslo-A or Bergen-D. For rent-to-price ratios, we calculate the average listing price and the average sales price for a given market and submarket. We keep only those submarkets containing at least 10 unique rental listings and at least 10 sold homes.

2.1.2 Quantitative Methodology

First, we establish that there indeed are frictions in the rental market. We do this by calculating imputed discount rates by comparing the present value of a perpetuity of average rent income (based on listed rents on finn.no) with the average purchase price for each size category (data from 4CastGroup AS). We assume a rental income growth of 4.0% annually, which was the average growth between 2012 and 2023 in the four largest cities (Statistics Norway, n.d. b). Furthermore, we assume a high depreciation rate of 3.6% annually, inspired by the depreciation for rental property tax purposes in the United States (Internal Revenue Service, 2023), representing necessary refurbishments to maintain the rent level. The choice of this depreciation rate is based on two main reasons: We wanted a high depreciation rate for good measure, and the Norwegian Internal Revenue Service offers no fixed discount rate for tax purposes on rental property (please,

see footnote 2 for further discussion of the depreciation rate). We calculate the imputed discount rates for each size category according to the discounted cash flow model below:

$$\frac{CF-d*p}{r-g} = p, \text{ where:}$$

- CF is the average annual cash flows from renting out a home in each size category,
- d is the annual depreciation rate of the original purchase price (3.6%),
- p is the average purchase price of a home in the given size category,
- g is the annual growth rate of the rental market (4.0%),
- and r is the unknown annual discount rate which we back out.

In a frictionless housing market, we would expect the infinite stream of rents to have the same value as the purchase price of a home, since there would otherwise be an arbitrage opportunity. We observe that all imputed discount rates are relatively high², between 3.7% and 5.0% (please, see Appendix B), and have a negative relationship with size.

In a frictionless housing market with perfect information, no mortgage constraints, search costs, transaction costs, or vacancy hazard, it would be difficult to argue for such high discount rates since the risk would be minimal. This is particularly true for the smaller homes, which have the highest imputed discount rates according to this calculation. Under the mentioned theoretical circumstances, the discount rate would be close to the risk-free rate, which can be approximated with for instance the 10-year Norwegian government bond. The annual yield to maturity of such bonds have been on average less than 3% during the past 20 years (Federal Reserve Bank of St. Louis, n.d.).

In other words, we can assert from this simple calculation that there indeed are frictions in the rental market, and that these are more prominent for smaller homes.

Having established this, we continue with analyzing different kinds of frictions, starting with private information. To do this, we attempt to replicate the findings of Halket and di

² We would like to stress that we have chosen a very high depreciation rate, as not to exaggerate our results. The economic depreciation is likely to be much lower than 3.6% in perpetuity. As we analyze a frictionless benchmark, taxes are not included in the calculation. By choosing a lower depreciation rate, for instance 2%, the imputed discount rates would be between 5.4% and 6.6%.

Custoza (2015). We run two regression analyses, one on purchase prices and one on rental prices in each basic statistical unit, using the data from 4CastGroup AS on sold homes, the RSS feed of finn.no for rental listings, and public data from Statistics Norway.

The independent variables we use are average income per household (Statistics Norway, n.d. h), fraction of households with one or more individual being 35 years of age or older (Statistics Norway, n.d. i), persons per household (Statistics Norway, n.d. j) and duration of stay in current home for owner- occupier- and renter- households. The average person per household variable is given on an urban district level, while the average income variable is given on a statistical tract level. The average fraction-over-35 variable given on a basic statistical unit level. Our duration of stay variables for owners and renters are estimates by 4CastGroup AS on an urban district level. For the variables available only on an urban district- or a statistical tract level, we uniformly apply the respective data points across all basic statistical units within each urban district or statistical tract.

Next, we continue to analyze how frictions might be explained by the government-imposed regulatory changes in down payment requirements in the wake of the 2008 financial crisis. In March 2010, the Norwegian Government obliged all financial institutions to require a down payment for all future home mortgages equal to 10% of the home's value (The Financial Supervisory Authority of Norway, 2022). Subsequently, in December 2011, it increased the down payment requirement to 15% of the home's value (ibid., 2022). We will investigate how the national rent-to-price ratio Statistics Norway, n.d. k, n.d. l) responded to the 2011 regulatory change, controlling for average credit interest (Statistics Norway, n.d. e), change in GDP per capita (Statistics Norway, n.d. f), and unemployment (Statistics Norway, n.d. g). Controlling for GDP and unemployment is an attempt to capture the effect of general wealth changes which could contribute to the ratio. Similarly, we control for the mortgage interest rate as lower rates make mortgages less expensive, which can have a positive impact on home purchase prices.

Finally, we run a regression of homeownership on the income of different nationality-groups of immigrants. This is an attempt to investigate whether labor migrants, who on average are financially stronger than other immigrant groups (e.g., refugees), might be restricted by lacking credit histories to buy a home with a home mortgage. For this

analysis, we use data from Statistics Norway on homeownership and income for different nationalities in 2021 (Statistics Norway, n.d. c, n.d. d), and data from OECD (n.d.) on duration of stay for immigrants of different nationalities per 2021.

3. Results and Implications

3.1 Rent-to-Price Ratio Analysis

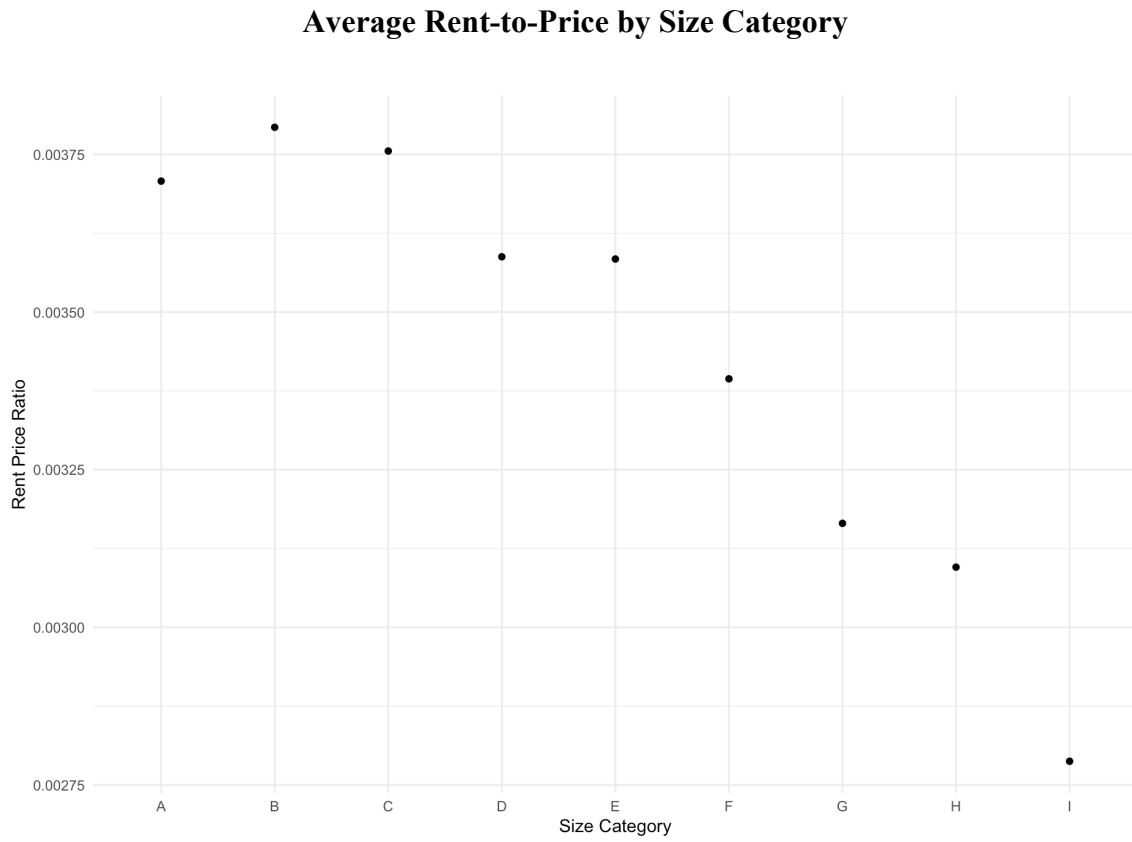


Figure 1: Average rent-to-price ratio by size category.

We have already established that smaller rental homes are more mispriced relative to the frictionless benchmark. We also observe that in those submarkets where purchase prices are high, the rent-to-price ratio is lower than in those submarkets where purchase prices are low (Figure 1), suggesting that rental and purchase prices are only weakly correlated overall. We can observe that, as the general prices of housing increase, the rent-to-price ratio decreases (Figure 2). This suggests that rents are less elastic than purchase prices. In other words, we find a clear relationship between the rent-to-price ratio and purchase

price. However, this relationship is much weaker between the rent-to-price ratio and rent (Figure 3). Thus, the relationship between purchase price and rent is much weaker than expected. Finally, Figure 4 shows how purchase price and home sizes are correlated, meaning that larger homes have a higher purchase price than smaller homes on average.



Figure 2 (to the left): Average rent-to-price ratio compared to the average purchase price within each submarket. **Figure 3** (to the right): Average rent-to-price ratio compared to the average rent within each submarket.

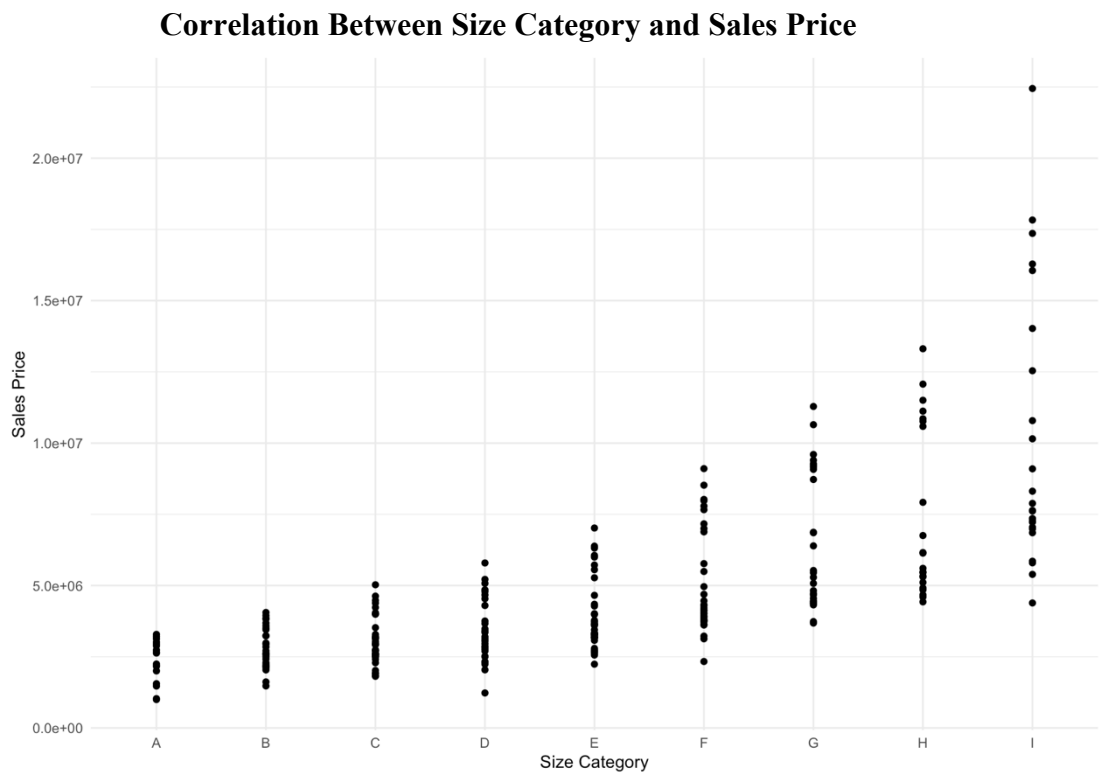


Figure 4: Purchase price distribution per size category.

3.2 Private Information Effects on Rents and Purchase Prices

The results from the regressions of private information variables on rents (Table 1) and purchase prices (Table 2) are mostly as expected. Most of them are strongly significant, in line with the findings of Halket and di Custozza (2015). However, in the case of rentals, we also observe that the R^2 value is very low. Therefore, variation in rent can only sub-optimally be explained by these variables. Interestingly, we do not observe any correlation between the duration of stay for renters in an area and the listed rents. This might be due to a range of explanations, one of which might be the strong incentives to purchase a home, as previously laid out. This might in turn lead to few households preferring to rent a home in the long run, and the data on duration of stay for this group would be rather arbitrary.

Regression of Private Information on Rents

Variable	Estimate
Average income	4.930×10^{-3} ‘***’
Duration of stay (rent)	-1.958×10
Fraction 35+	-3.546×10^3 ‘***’
Persons per household	-1.799×10^3 ‘***’
Adjusted R2	0.2416
N	891

Table 1: Regression of private information variables on rents. *, **, *** is equivalent to $p < 0.05$, $p < 0.01$ and $p < 0.001$ significance levels, respectively.

Another explanation for this can be that we have not been able to access as detailed data as have Halket and di Custozza (2015). While in their article, they had information about these variables on a submarket level and distinguish between renters and owner-occupiers, we have mostly been able to access data on a geographical level. For average income and fraction of individuals 35 year and older, we have accessed data on a basic statistical unit level. Our duration of stay variable is an estimate by 4CastGroup AS on a urban district level and is the only variable which is different for renters compared to owner-occupiers. The person per household variable is given only on an urban district level.

Regression of Private Information on Purchase Prices

Variable	Estimate
Average income	1.017×10^{-4} ‘***’
Duration of stay (own)	-6.169×10^{-4} ‘*’
Fraction 35+	-9.415×10^{-5} ‘*’
Persons per household	9.169×10^{-4}
Adjusted R2	0.7265
N	891

Table 2: Regression of private information variables on purchase prices. *, **, *** is equivalent to $p < 0.05$, $p < 0.01$ and $p < 0.001$ significance levels, respectively.

We can see for both regressions that income has a highly significant and positive effect on both purchase prices and rents. This is only natural, as more prosperous areas attract wealthier people which raises demand for housing and incentivizes construction of higher-quality housing. We can, however, see that the difference in how large the income effect is predicted to have on rental and purchase price respectively is vastly different. To allow for comparison between different scales of rent and purchase price, we standardize each estimate, by taking the estimate multiplied by the ratio between the standard deviation of income and the standard deviation of rent or purchase price. We find the standardized estimate of income on rent to be approximately 0.32 while the standardized estimate of income on purchase price becomes approximately 0.60. A one standard deviation increase in income thereby results in a larger fraction of a standard deviation increase in purchase price compared to rents. This suggests that, while income influences both rental price and purchase price, average purchase price is more sensitive to changes in average income than is average rent.

Moreover, the fraction of households with head of house at the age of 35 or older in a basic statistical unit is significantly and negatively correlated with rental price and with purchase price. This suggests that, on average, those households pay less than those younger than 35. This indicates some age-related frictions in the market.

For the variable on persons per household, we see significant results in the rental market but not in the owner-occupied market. There might be some multicollinearity issues here, as being over 35 can make it more likely that the household is occupied by more people.

Finally, we see no significant relationship between duration of stay in the rental market and the price of rentals, which may indicate that the landlords in Norway on average assumes most households are in the rental market short-term. In contrast, the duration of stay variable is significant and negatively correlated with purchase prices. This might be because purchase prices have increased historically, so those with long duration of stay purchased their homes when prices were on average lower than they were when our data was collected.

3.3 Tightening Mortgage Supply

Regression of Policy Change on Rent-to-Price Ratio

Variable	Estimate
Policy Change	7.385×10^{-3} ‘***’
GDP per Capita	-3.053×10^{-9}
Unemployment Rate	2.176×10^{-3}
Mortgage Rate	8.429×10^{-4}
Adjusted R2	0.7581
N	18

Table 3: 2011 policy change effect on rent-to-price ratios. ‘***’ corresponds to $p < 0.001$.

For the introduction of the new down payment requirements, we computed the average rent-to-price ratios for each year between 2006 and 2023 using data from Statistics Norway³. We created a dummy variable taking the value of one for any year 2012 or above, to capture the effect of the policy change on the rent-to-price ratio, as the down payment requirement was tightened in December 2011. We controlled for changes in GDP per capita growth, changes in unemployment and changes in mortgage interest rate, to mitigate the risk of other variables influencing our regression results. We found that the policy change dummy variable was positive and significant at the 0.1% level, while

³ For the purchase price levels, we could choose between three different price indicators in the data: “Single houses”, “row houses” and “apartments”. We calculated an average of these for the regression above. However, we can see in Appendix C that this relationship would be strongly significant regardless of the price indicator.

the unemployment rate, the GDP per capita and interest rate variables were not significant (Table 3).

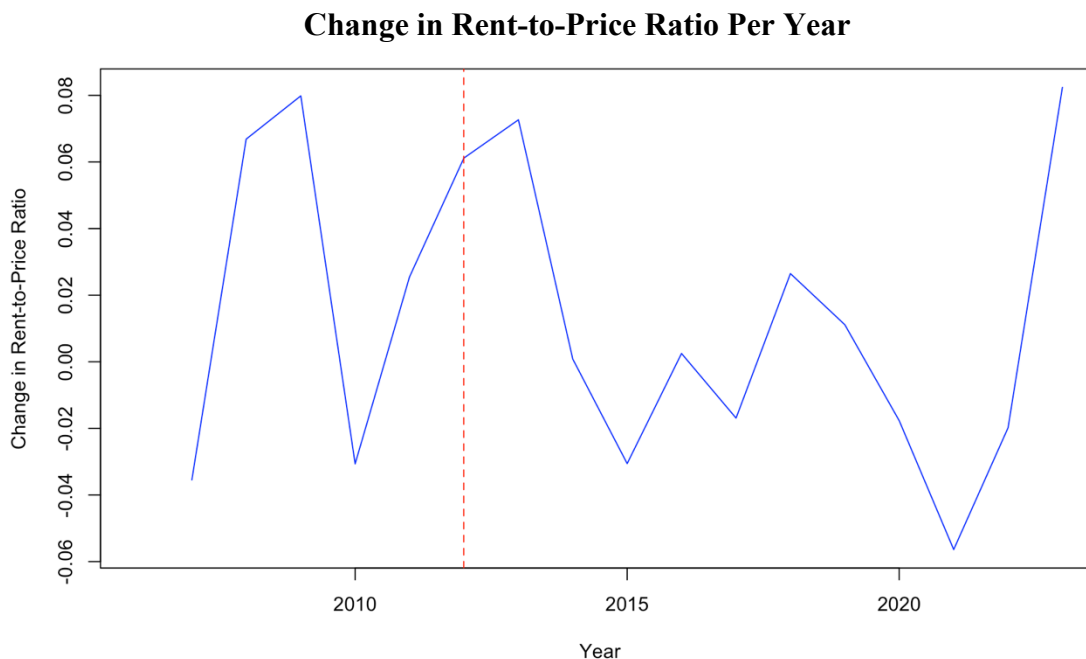


Figure 5: Graphical display of the rent-to-price ratio change where the red dotted line represents the date 2011-12-01, when the new down payment regulations were implemented.

At the one percent significance level, the regression results from the updated down payment requirements shows a clear and positive correlation between the policy change and the rent-to-price ratio. Simultaneously, the regression shows no significant effect from any of our control variables (unemployment rate, mortgage rate, GDP per capita). This allows us to conclude that the increase in the down payment requirement, from 10% to 15%, has a strong correlation vis-à-vis the rent-to-price ratio.

We could interpret this as households being close to fulfilling the previous down payment requirement at 10% could no longer afford the necessary down payment to purchase a home in their preferred size category. With no other option, those individuals had to look for homes in a cheaper submarket or the rental market. For the least wealthy individuals, predominantly those in the market for the first time, the only viable option might have been to search in the rental market. Consequently, therefore, this could explain why the rent-to-price ratio has subsequently increased, following a higher demand for rental

housing. (In Norway, restrictions on how much you can raise rental price of existing rentals. Suggests new rentals became available to the market)

This conclusion is supported by our finding that the rent-to-price ratio is decreasing with the size of the properties in a submarket, which are correlated with the price of properties (Figures 1, 4). Intuitively, there are more alternatives for wealthier households than to reside renting when the down payment requirements are raised. For instance, wealthier households in the market for owner-occupied housing could decide to purchase housing in markets with lower absolute capital requirements (i.e., smaller, less expensive homes). For the poorest households being in the market for category A housing, this is on the other hand not an option.

3.4 Effects for Immigrants

Regression of Income on Homeownership by Immigrant Groups

Variable	Estimate
Income	7.691×10^{-6} ‘*’
Adjusted R2	0,7639
N	5

Table 4: Regression of income of immigrants on rental rate. ‘*’ = $p < 0.05$.

From this regression, we see a clear positive relationship between the average income of immigrants from EU/EFTA and the UK, other European countries, North America, South America, Asia, Africa and Oceania, and the corresponding rental rate divided between immigrants from the developed and the undeveloped world. The developed world is for simplicity defined as EU/EFTA and the UK, North America and Oceania. In other words, immigrants from North America, Oceania and EU/EFTA and the UK own their own homes in Norway to a significantly lower extent than do immigrants from other parts of the world, although they on average have a much higher income (Statistics Norway, n.d. d). Interestingly, this trend seems to be completely opposite for the population in general,

as high-income households tend to own their own homes to a larger extent than do low-income households (Statistics Norway, 2018).

Since there are not many data points, the results are ambiguous. However, this relationship might indicate another friction in the rental market, namely that financially strong immigrants might struggle to buy their own home due to a lacking credit history. Even though they might prefer to buy their own home, and would afford it, all else equal, they might not have the opportunity to do so since Norwegian banks cannot access their previous credit history.

Simultaneously, it is not clear that higher-income immigrants necessarily want to purchase a home. For one, such immigrants might be more likely to move to Norway due to (temporary) work offers. Their duration of stay might therefore be uncertain, and they might prefer renting a home as to increase flexibility, avoid transaction costs related to purchasing property, etc. To a larger extent, such immigrants might also have their living expenses looked after by a foreign employer, thus being incentivized to rent. In contrast, immigrants from developing countries might migrate as refugees or permanent job seekers. Instead, they might therefore be in the market for buying a home. The permanency of stay also becomes clear based on OECD statistics (n.d.), showing that 64% of immigrants from developed countries have stayed in Norway for more than five years, while share number is 75% for immigrants from developing countries. In addition, cultural reasons might come into play as some developed countries have very low homeownership rates (Eurostat, 2021).

Regardless of whether high-income immigrants prefer to own their own homes, there seems to be a tendency showing that they oftentimes do not do so, which puts pressure on the rental market by increasing demand. The implication of this behavior is that the demand for rentals increases relative to the demand for buying homes, which contributes to the high rent-to-price ratio, which we previously have established.

The optimal behavior for an agent probing the Norwegian housing market is commonly seen as to buy housing. This is in line with our findings, constituting the relatively large difference between rent and purchase prices. However, the optimal behavior is naturally different for different agents due to the various restrictions and frictions and there are

several factors to take into consideration. Firstly, a poor agent might have no other choice but to rent their home. Having no initial or accumulated wealth will force a student, a newly arrived immigrant, or others incapable of accumulating wealth into the rental market. Similarly, a household moving from lower price-areas to areas with higher prices, will face a new, higher down payment requirement for a similarly sized property. This could lead to a transition period in the rental market before the down payment requirement can be met. Additionally, our results indicate that the relative cost of rentals decrease with increasing home prices, making rentals more attractive the more prosperous the area is.

Secondly, considering the expected duration of stay is important. Our results indicate that the discount rate necessary for rentals to appropriate purchased property is high because frictions make the purchase market less inclusive and more rigid. For instance, students knowing they will only stay in an area for a few years, labor immigrants on a project or as seasonal workers, can avoid the research and commitment necessary to purchase and similarly the uncertainty regarding price fluctuations by renting instead.

4. Discussion

4.1 External Validity

This study has been conducted using data on the Norwegian housing market, a market which is relatively free from government intervention and thereby relatively free from government induced frictions. The significant results from our test of the effects of the policy change introduction is therefore likely to be a valid indication of the effects of frictions in any economy where the market decides the prices and rental costs for housing. However, the magnitude of the effects might differ.

In Norway, as in most other countries, homes are an essential source of accumulation of wealth (OECD, 2022). What is unique in Norway, however, is that the government is actively encouraging homeownership, by having set policies in place with the aim to increase homeownership rates (Royal Norwegian Ministry of Local Government and Modernisation, 2020). This can in part explain the high homeownership rates in Norway. In other housing markets where homeownership is much lower than in Norway, the

market dynamics can be very different. Government incentives, homeownership rates, cultural factors and demographical factors should play a role in how the market responds to frictions.

4.2 Weaknesses and extensions

Although our study has been conducted with data sets of high quality, we would optimally have utilized even more precise data. For instance, the data from the RSS feed of finn.no does not capture the entire rental market in Norway. It is also not a random sample of actual rental homes nor a definite source of square meterage and prices. In the real world, paid rents and actual home sizes might differ from those advertised via the website.

When it comes to the regression of private information on rents and purchase prices in part 3.2, it is also worth mentioning that many other private information variables, and preferably more detailed ones, could have been included. For instance, we have, in contrast to Halket and di Custozza (2015), not been able to access as detailed demographics data, for instance distinguishing the income of renters from owner-occupiers. We have also not been able to access all population data on an equally small geographical level as have Halket and di Custozza (2015). By accessing such data, the explanatory value of our private information regressions could be greatly improved.

Furthermore, reflecting the homeownership rate in Norway, while data on the owner-occupied housing market are detailed and publicly available, data on the rental market are largely not available. For instance, the Rental Market Survey of Statistics Norway only focuses on rental prices, and in general, its statistics on households do generally not distinguish between households renting and owning their home.

A natural point of extension to our thesis, would be to compare the dynamics of the Norwegian housing market, which has been outlaid, to other housing markets. Although the rental market in Norway is highly unregulated compared to the case in many other countries, renting is not the chosen option by most Norwegians, perhaps due to strong government incentives to buy. It would be interesting to perform a similar analysis of home mortgage constraints in a country where such incentives are less prominent.

5. Conclusion

Having established that there are frictions in the housing market, two natural questions arise: What frictions exist in an otherwise unregulated market, and who are affected by them?

Similarly to previous literature, we find that parts of them can be explained by private information, especially in the owner-occupied part of the market, but that much of the variation cannot be explained by these factors alone.

Next, we analyze the 2011 policy change concerning down payment requirements and find that available data indicates a positive relationship between stricter mortgage supply and higher rent, likely due to less people being able to afford homeownership. Thus, demand for rentals increase relative to homes for sale, subsequently making rentals relatively more expensive. A similar increase in the rent-to-price ratio was observed during the financial crisis, perhaps due to banks independently increasing their down payment requirements.

Subsequently, we find that the rent-to-price ratio is decreasing in home size and in purchase price. This interestingly connects to the previous parts, since it explains how the rental market is more crowded for lower-end housing. Those in the market for such housing, intuitively we suggest low-income households, therefore seems to be most affected by the down-payment requirements.

Lastly, we observe the seemingly suboptimal behavior in the housing market by labor migrants with high incomes. We cannot be certain about the reason for this behavior, but one reason could be that they face difficulties related to obtaining a mortgage due to lacking credit history. This observation therefore makes for additional crowding of the rental market.

In conclusion, our findings point toward that private information details can explain some housing market frictions. Furthermore, stringent mortgage constraints and other credit regulations might contribute to increased housing market frictions and demand for rental homes, in particular for smaller and cheaper homes.

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7. Appendices

7.1 Appendix A

Definitions of size categories for homes in our analysis.

Size Category	Definition (square meters)
A	0-29
B	30-39
C	40-49
D	50-69
E	60-79
F	80-99
G	100-119
H	120-139
I	140 +

7.2 Appendix B

Imputed discount rates for each size category.

Size Category	p	CF	g	d	r
A	2,686,446	119,526	0.04	0.036	0.0485
B	3,124,267	142,206	0.04	0.036	0.0495
C	3,486,992	157,142	0.04	0.036	0.0491
D	4,011,265	172,696	0.04	0.036	0.0471
E	4,552,548	195,806	0.04	0.036	0.0470
F	5,688,226	231,680	0.04	0.036	0.0447
G	7,010,228	266,243	0.04	0.036	0.0420
H	7,783,026	289,109	0.04	0.036	0.0411
I	10,497,710	351,164	0.04	0.036	0.0375

7.3 Appendix C

Regression of policy change on rent-to-price ratio where price equals average prices for respectively “detached houses”, “row houses” and “multi-dwelling houses”. Clearly, regardless of the chosen variable, the results are strongly significant.

Residuals:

	Min	1Q	Median	3Q	Max
	-0.0044468	-0.0020680	-0.0001082	0.0023121	0.0045522

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	4.821e-02	1.297e-02	3.717	0.002584 **
policy_change_dummy	1.285e-02	2.531e-03	5.077	0.000212 ***
GDP_Capita	1.814e-09	6.840e-09	0.265	0.794965
Unemployment_rate	3.777e-03	2.125e-03	1.777	0.098882 .
Mortgage_Rate	9.186e-04	1.072e-03	0.857	0.406888

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.00308 on 13 degrees of freedom

Multiple R-squared: 0.8818, Adjusted R-squared: 0.8455

F-statistic: 24.26 on 4 and 13 DF, p-value: 6.298e-06

Residuals:

	Min	1Q	Median	3Q	Max
	-0.0022839	-0.0012052	-0.0004773	0.0015472	0.0028679

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	4.097e-02	8.199e-03	4.997	0.000244 ***
policy_change_dummy	7.769e-03	1.600e-03	4.854	0.000315 ***
GDP_Capita	-3.367e-10	4.324e-09	-0.078	0.939124
Unemployment_rate	2.523e-03	1.343e-03	1.878	0.082967 .
Mortgage_Rate	6.370e-04	6.775e-04	0.940	0.364277

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.001947 on 13 degrees of freedom

Multiple R-squared: 0.8695, Adjusted R-squared: 0.8294

F-statistic: 21.66 on 4 and 13 DF, p-value: 1.185e-05

Residuals:

	Min	1Q	Median	3Q	Max
	-0.0026003	-0.0010622	-0.0004687	0.0011089	0.0026153

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	2.819e-02	7.386e-03	3.816	0.00214	**
policy_change_dummy	4.850e-03	1.442e-03	3.364	0.00508	**
GDP_Capita	-4.756e-09	3.895e-09	-1.221	0.24372	
Unemployment_rate	1.385e-03	1.210e-03	1.144	0.27312	
Mortgage_Rate	8.136e-04	6.103e-04	1.333	0.20540	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.001754 on 13 degrees of freedom

Multiple R-squared: 0.6674, Adjusted R-squared: 0.565

F-statistic: 6.521 on 4 and 13 DF, p-value: 0.004169