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Master's Thesis

Buy-to-let investors on the Dutch residential market: a study on pricing and capitalization rates

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Abstract: The advent of the 'buy-to-let' (BTL) phenomenon in the Netherlands, apart from producing a new wave of private investment, has been widely argued to be a speculative and destabilizing force in the housing market. This thesis presents a detailed empirical investigation of private investment in the entire Dutch residential market. In order to study the relationship between house prices and BTL investment, a quantitative approach is used. Data provided by Dynamis B.V. serves as the main input for these analyses to assess the nature and scale of BTL. The quantitative analyses, however, are informed by a real estate agent interview that investigates the underlying motivations of BTL investors. An explicit and in-depth connection between pricing and how this is driven by BTL investment sentiment is made by analysing capitalization rates. The results provide evidence that in the Netherlands overall there is no case of structural price premium paid by investors, the price premium paid by investors does however largely occur in Amsterdam and The Hague. The results have implications for housing market policies, including those targeted at first-time-buyers (FTBs), who may compete for similar properties as BTL investors do.

Keywords: buy-to-let; first-time-buyers; capitalization rates; price premium

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1. INTRODUCTION

The number of private investors on the Dutch residential market has seen a steady increase since 2014. Using a buy-to-let (BTL) construction, these private investors buy houses with the intention of renting them out. Due to the current economic circumstances, these investors generate an above-average financial return on their investment. The steady increase in BTL investment since 2014 has been facilitated by macro-economic factors, such as low interest rates, returns on savings accounts and bonds, which increase the desirability of real estate investments relative to alternative investments. Moneylenders use this trend by coming up with special BTL mortgages, with the result that property investors often buy with a combination of private money and a loan. With low interest rates on debt, the return on private capital is even higher. Crucially, BTL investors are able to outbid other buyers, as BTL investors have superior financial means and can offer cash quicker, this partly explains the steady increase of the BTL sector since 2014.

The increase of BTL investment activity in recent years is depicted in Figure 1 below. This figure shows that in 2008 the BTL market amounted to 5% of all houses sold in the Netherlands. In 2017, approximately 11% of all housing transactions were bought for the purpose of BTL. Since 2015, the BTL market has gained in size more rapidly. The number of houses bought for the purpose of BTL increased from approximately 14.250 in 2015, to 25.500 in 2017. During that same period, the average household income-to-price ratio increased from 6 to 8. BTL investors do not show the same interest in all residential markets in the Netherlands. The G4 (Grote Vier, consisting of Amsterdam, Rotterdam, The Hague, and Utrecht) is the core of all BTL investments, and has average BTL market of 19% of all transactions.

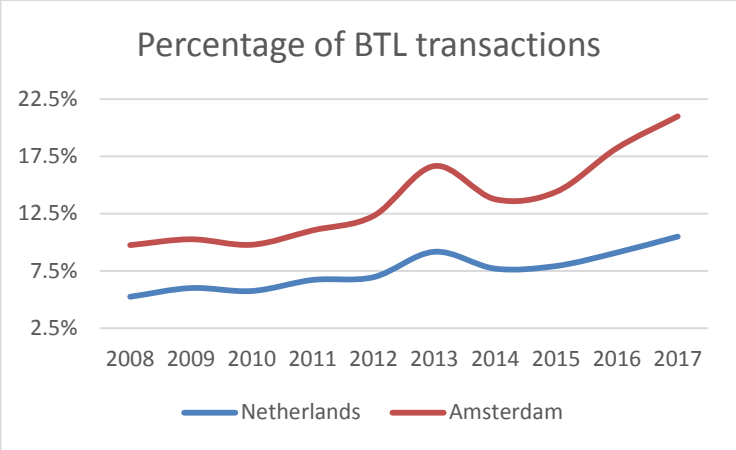

Figure 1: BTL in the Netherlands and Amsterdam. Source: Kadaster, edited by Dynamis B.V.

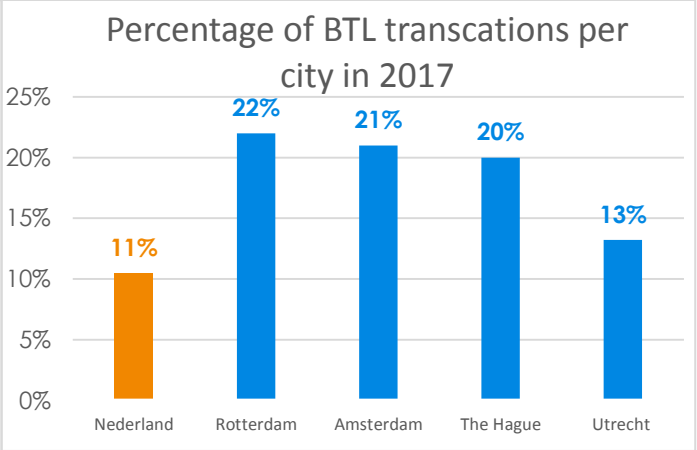

Figure 2: share BTL investors in the Netherlands and the G4 in 2017.

The rise of the BTL sector has not gone unnoticed by Dutch economists and other parties. Over the last few years, BTL landlords have received negative coverage in the press. It is argued that they are displacing first-time-buyers (FTBs) and causing house prices to increase. The BTL sector would change the housing market in such a way that the prices of houses will rise. Consequently, it would be difficult for FTBs to enter the housing market (Martens, 2016a, 2016b; RTL Nieuws, 2018 and Van den Eerenbeemt, 2018). However, these articles are based on the opinions and feelings of FTBs and the general public, not on rigorous empirical evidence. In a response to this public reaction, a new type of mortgage has been created especially for FTBs (ASR, 2019). This mortgage has a 40 year term instead of 30, lower monthly costs, and is only available to FTBs. These are drastic changes and implications; hence, this thesis investigates whether BTL investment actually leads to higher house prices.

A Review of the academic literature shows that the relationship between BTL and transaction prices has mostly been studied mostly in the UK (Ball, 2006; Gibb & Nygaard, 2005; Paccoud, 2016; Scanlon & Whitehead, 2016 and Sprigings, 2008). Gibb and Nygaard (2005) concluded that BTL impacts specific niches of the market on (i.e. the FTBs market for

apartments in Glasgow, Scotland). Sprigings (2008) provided evidence that suggests that the power of BTL investors has not only reduced the supply of housing that consumers want to purchase, but has had wider impacts on the housing supply. BTL in the UK is probably of a scale sufficient to erode levels of owner-occupation on the market. Sprigings (2008) reacted to Ball (2006), who writes for the Association of Residential Letting Agents (ARLA) and opposes these ideas. Ball (2006) claims that BTL is a phenomenon that has helped to stimulate the private rental sector and has had no major impact on the residential housing market overall. There is a gap in academic literature on the direct relation between BTL investments and prices paid for BTL properties. The gap is addressed in this thesis on the Dutch residential housing market.

Aalbers et al. (2018) examined the influence of BTL in the Netherlands. The authors claimed that BTL landlords are predominantly responsible for the increase in the private rental sectors of the Netherlands and conclude that the affordability and accessibility of owner-occupied homes and rental housing are under pressure due to a long period of general price increases. The research conducted by Aalbers et al. (2018) provides insight into the Dutch BTL market; however, it focuses primarily on potential measures in dealing with the perceived effects of BTL. No solid scientific analysis has been performed in order to prove the success of these policies or the link between BTL and transaction prices. For this reason, quantitative research on this link, especially on the Dutch market, is scientifically valuable. ING (2018) studied the effect of BTL on house prices in Amsterdam, concluding that BTL landlords might have an increasing effect on house prices because of the extra demand for properties. However, no statistics were used to determine the relationship between BTL and house prices. Capital Values (2018) wrote about their concerns for FTBs, because, due to the growth of

single-person households and urbanisation, it has become increasingly difficult for them to purchase a home. BTL is an increasingly popular topic among the press, and it has also become a subject for debate among governmental institutions (Ministerie van Algemene Zaken, 2017). Therefore, it is important to know, before policies are implemented, whether BTL is causing an increase in house prices and displacing FTBs. The position of FTBs is a topic of discussion in this research. Policies intended to protect FTBs, such as the obligation to live in newly bought properties or taxing BTL investors are discussed, adding to the societal relevance of this research. There is no empirical evidence to show whether investors structurally outbid other buyers; hence, the gap in academic literature which this thesis addresses is that of the direct relationship between BTL properties and prices paid on the Dutch residential market.

The central research question of this study is: '**What is the effect on transaction prices when properties are bought as BTL investments?'** This study's objective is to gain more insight into how BTL may influence the Dutch market. Therefore, the possible price-increasing effect that BTL investment may have is the main focus of this research. To provide information on what kind of properties are attractive to investors, an additional analysis is performed on capitalization rates (cap rates). A cap rate is the ratio of rental income divided by transaction price of a property, a useful ratio widely used in the commercial real estate industry to compare potential returns on investments in the real estate market. The research in this thesis utilises a uniquely rich dataset and takes a three stage approach in the empirical analysis:

1. *Conduct an interview with a local real estate professional involved in BTL*

Due to the lack of academic literature on the (Dutch) BTL market, conducting an interview contributes to understanding the BTL market, the motivations of BTL investors, and identifying

a research direction. The interview with a local real estate agent is in the form of an in-depth, semi-structured interview, in which a list of predetermined questions is used.

2. *Develop a quantitative picture of the BTL market and its effects*

To answer the central research question, a thorough analysis is performed on house prices using quantitative data. Descriptive and inferential statistics are applied to determine the size and effect of BTL on the Dutch residential market. The dataset used contains over half a million house transactions, obtained from several sources. Hedonic modelling is used in following the strategy formulated by Adair, Berry, and McGreal (1996). The model is built up from data points on the structural and locational characteristics of each unique transaction. The analysis assesses whether investors pay a price premium, everything else held constant. The period of study is 2015-2018 over the whole Dutch residential market, with special attention given to Amsterdam, as this is the largest and most dominant BTL market.

3. *Develop a quantitative picture of the drivers and performance of properties by dissecting capitalization rates.*

The goal of the additional analysis is to explain the variation in cap rates and to put a value on property characteristics, in order to better understand why and for which characteristics BTL investors are willing to pay more for. Cap rates are widely used in various investment analysis methodologies to derive a property's likely resale price and current investment value (Chichernea, Miller, Fisher, Sklarz, and White, 2008). Cap rates can be interpreted as the return or initial yield on assets for commercial real estate, which provides valuable information for investors. Rental and transaction prices are determined by numerous factors, such as property and locational characteristics. Similar sized and types of properties potentially have a wide

range of cap rates. In theory, if the fundamental characteristics of a property differ, but differences are appropriately priced, investors' return should be equal. By identifying properties with the greatest deviations (residuals) from the model and making the assumption that markets do eventually correct this mispricing in the long term, mispricing across regions can be transformed into profit opportunities. Using the market data of approximately 7500 transactions and econometric modelling, this analysis on cap rates determines the cape rates' most important drivers.

In addition to the use of an interview and quantitative data, relevant literature, which will also be useful to reflect on the results of this research, is studied to gain a deeper understanding of the BTL market. The concept of the model is visualized in the conceptual model presented in Figure 3[1].

Figure 3: Conceptual model

The remainder of this thesis is structured as follows: the next section reviews theory and existing literature regarding BTL, housing valuation and cap rates. Section 3 describes the study area, data, and methodology. Section 4 describes the results, while Section 5 discusses the results. Section 6 concludes the thesis.

[1] Location and property characteristics also have an effect on rent levels; however, the focus in this research is on transaction prices.

2. THEORY AND LITERATURE REVIEW

2.1 Impact of BTL on the housing market

Gibb and Nygaard (2005) studied the impact of BTL investment on local housing markets in Glasgow and concluded that BTL investors impact specific niches of the owner-occupied market; however, growth in the rental market can be acceptably explained by standard investment and occupier market economic drivers. Relatively cheap apartments represent the specific niche private landlords tend to invest.

Sprigings (2008) argued that a growing BTL sector results in possibly unsustainable increases in house prices. Furthermore, as house prices become less connected to fundamental drivers such as household income (as can be seen in Figure 4), they will become less predictable in the future. In addition, the author claimed that it is becoming harder for FTBs to become owner-occupiers due to rising house prices and a decline in housing supply. As BTL investors are likely to have superior financial means, they can outbid competitors, driving up the prices.

Aalbers et al. (2018) argued that mortgages are the fuel of the long-term price increases in real estate. Investors drive prices up even more by putting in private capital. The report also found that for decades, the rate of home-ownership has been increasing, while the rates of alternative options (social rent and private rent) have been decreasing. As a result, young people had to take on high levels of debt, less as a choice than a necessity. Since the crisis of 2008, stricter mortgage rules combined with an increased flexibility in the labour market, made it increasingly difficult and risky for young people to become an owner-occupier.

The Council of Mortgage Lenders (CML, 2004a, 2004b) argued that investors drive up the house prices in up markets and then exit the market when prices fall. ING (2017) shared this

concern and fears, that when other markets become more profitable, investors will leave the housing market. This means that, BTL investors may have a destabilizing effect on the housing market by increasing demand in good times and decreasing demand during bad times.

2.2 Pricing of Housing

An unexplored area of specific interest in this thesis is the direct link between housing prices and BTL investors, as opposed to owner-occupiers. To better understand whether investors are prepared to pay higher prices for houses, it is useful to look at the theory on house pricing. Haffner and de Vries (2009) write that the Dutch housing market is often considered to be similar to a stock market. What this means is that the price of a newly build property is primarily determined by the price of existing housing supply, as opposed to supply variables, such as construction costs.

Kain and Quigley (1975) used a theoretical framework where housing is not seen as a homogeneous service but as a factor of attributes comprising the property's structural, qualitative and quantitative features and neighbourhood characteristics. In comparison to earlier literature Adair, Berry, and McGreal (1996) concluded that housing markets are normally treated at an aggregate level. Factors which drive housing markets are differentiated in terms of physical attributes of properties such as house type, size, age, plot size, socio-economic characteristics of inhabitants, population mobility, economic constraints at macro- and micro-levels, local/neighbourhood characteristics, and segmentation arising from economic/income, ethnic/religious, or physical/locational related reasons. This list is however non-exhaustive and other factors may also play a role.

Knowledge of BTL investors' motive can assist to explaining the prices paid by investors. Scanlon and Whitehead (2016) studied the motives of British BTL investors. They found that the majority of the landlords see their investment as capital growth and a contribution to their pension. When BTL investors are investing for the long-term, paying an initially high transaction price might be seen as worthwhile.

Not all properties are equally interesting for investors, certain preferences for location and property characteristics have to be satisfied. In the UK, BTL investors are especially active in the southern region, particularly in London (Leyshon and French, 2009). BTL has a regional character in the Netherlands as well. Increases in house prices are far greater in the G4 and student cities as result of an increasing desirability attractiveness of living in cities (Hekwolter of Hekhuis, Nijskens and Heeringa, 2017). Since investors desire the highest returns on their investments, these markets are the most attractive.

BTL investors also tend to invest in relatively cheap apartments (Gibb and Nygaard, 2005). According to Paccoud (2017), the rent gap –the difference between potential and actual rent levels under present land use- can assist in explaining why BTL investments tend to target the lower end of the housing market, favouring properties likely to be in central locations. Another possible explanation for this could be that the initial investments costs for apartments are lower, so the purchase of lower end apartments is the cheapest way of becoming a BTL investor as well the cheapest way of diversifying holdings over different cities, thus spreading risk.

2.3 Capitalization rates

Cap rates provide information on rental income and transaction prices. The cap rate has a particularly important role in property valuation, because the income capitalization method converts the expected rental income from commercial properties into an estimate of the asset value by dividing the rental income by the cap rate (Brueggeman and Fisher, 1993). A high cap rate means high rental income relative to transaction price and vice versa. Cap rates are most useful as a comparison of the rate of return on similar real estate property investments. Furthermore, cap rates provide information on the connection between factors that influence the prices of BTL properties and investor sentiments, such as age, location, and property type.

Considering the wide use of cap rates, there is extensive empirical work using data on national and regional cap rates of housing markets. Sivitanidou and Sivitanides (1999) developed a comprehensive econometric model using panel data to estimate the determinants of cap rates both over time and across markets. Subsequent authors, including Geltner (1991), Hendershott and Kane (1995), and Judd and Winkler (1995) raise issues on pricing that is based on *appraisal*s as opposed to actual transaction data.

Chen, Hudson-Wilson and Nordby (2004); and Hendershott and MacGregor (2005a, 2005b) used the major theme of time-series analysis on the intertemporal relationship between cap rates and proxies for expected rental growth rates. Their theory (cap rate = net rent / price = rate of return – growth) predicts a one-on-one relation between these two variables. Wheaton and Nechayev (2005) find that in the Atlanta apartment market, there is considerable evidence of correct market pricing across locations. For apartments, the coefficient of average local rental growth rate on property yields is in the neighbourhood of -0.6, fairly close to the

theory's prediction of -1.0, providing evidence that variation in cap rates is partially corrected by growth rates. Most studies examine variations in cap rates across broad property types (Dokko, Edelstein, Pomer and Urdang, 1991; and Ambrose and Nourse, 1993). These articles show that differences across property types are essential in evaluating cap rates and that failing to account for these differences can lead to biased results.

Jud and Winkler (1995) developed a model of cap rates that draw upon the weighted average cost of capital (WACC) theory and the capital asset pricing model (CAPM). The model indicates that cap rates are determined by debt and equity spread of the risk-free rates.

The relationship between offer price, transaction price, and time-on-the-market (TOM) was widely researched in the 1990s. Asabere et al. (1993) investigated the relationship between price and optimal TOM. Their results indicate that both overpricing and underpricing result in sub-optimal sales prices. Kalra and Chan (1994) used TOM as the dependent variable and mortgage rate, employment level, and price concession as independent variables. High price concessions and high total employment decreases the TOM, while high mortgage rates increase it. The direct relationship between TOM and cap rates remains under-researched.

2.4 Hypothesis

Based on the theory discussed above (Aalbers et al., 2018; Gibb & Nygaard, 2005 and Sprigings, 2008), it might be the case that BTL has an effect on the housing market. As BTL investors are likely to have superior financial means, they can outbid competitors, thus driving up prices, especially in the lower segment of the market and cities where BTL investors are most active.

One of these effects is possibly an upward effect on transaction prices of properties. When

studying markets, it is important to take note of the regional character in the Dutch property market, as significant differences can occur among regions. Failing to account for these differences will result in biased results.

Based on the literature study, the following hypothesis has been formulated, in order to answer the central research question.

Hypothesis 1: *A property bought as a BTL investment has a higher transaction price than other similar properties.*

On the basis of the existing literature, it is expected that that the hypothesis will not be rejected. The expectations are that, in particular, the apartment markets in the G4 cities are affected by BTL and higher transaction prices are paid by investors. If this hypothesis cannot be rejected, it could mean that the news coverage (Martens, 2016a, 2016b; RTL Nieuws, 2018 and Van den Eerenbeemt, 2018) is correct and that BTL is harmful to the residential housing market of the Netherlands.

3. STUDY AREA, DATA, AND METHOD

3.1 Study area

In the following part on study area, the Dutch residential market and BTL sector will be studied in more detail. According to the data provided by Dynamis, the definition of a BTL investor is a (relatively) small investor, a natural person who owns between 3 and 50 residential properties, excluding his or her residence and holiday homes, as well as a juridical person who owns between 2 and 50 residential properties.

The BTL market has seen a growth in size from 2008 till 2017. This upward trend is caused by a growth in demand due to several factors. The European Commission (EC) imposed a new law in 2009 regarding the competition between social housing and private landlords. As the EC stated, housing associations received state aid, meaning that the competition is unfair. The new law imposed is that this state aid should only be available for social activities. What this meant for the Netherlands, is that housing associations had to focus 90% of their dwellings on their target group (Elsinga & Lind, 2013). Given that the target group is those with lower incomes, it becomes more challenging for people outside of the target group to find a home. Hence, more of the households in the target group look for private rental properties, and this increases the demand for BTL.

In 2013, the “verhuurderheffing” law or landlord levy was introduced, which states that landlords who own more than ten rental properties have to pay a levy (Overheid, 2013). In the year 2018, the number of rental properties was increased to 50 rental properties (Rijksoverheid, 2019). As this levy is for over 50 rental properties, it does not affect most landlords.

Figure 4 presents average household income and the ratio to the average house price. In the five years following 2013, the average household income increased only slightly, while the ratio of average house prices to average income rose from around 6 to 8.

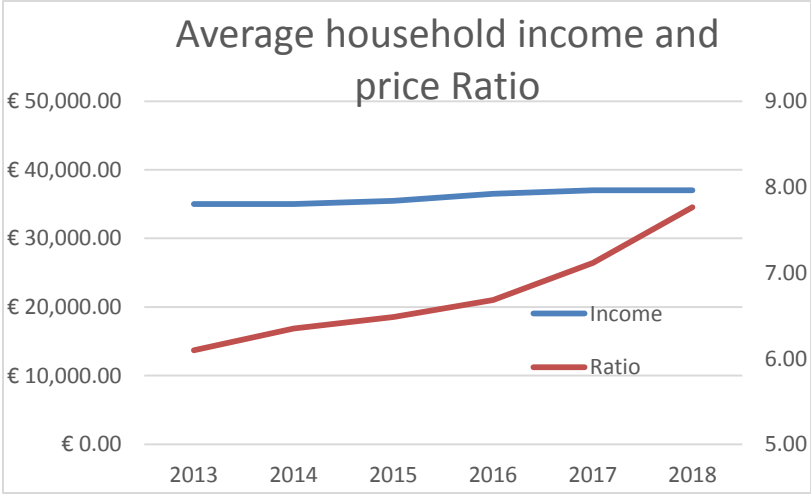

Figure 4: Average household income to price ratio over the years 2013-2018

The more stringent mortgage regulations have made it more difficult for FTBs to become owner-occupiers. With the combination of soaring house prices, lagging incomes, and increasingly tight mortgage rules, it can be expected that more households will look for a rental, which in turn increases the demand for BTL properties. To conclude, despite the introduction of the landlord levy, the growth in demand for rental properties is likely the main reason for the increase in the share of BTL.

The search profile of BTL investors is different from owner-occupiers. In 2017, of all properties bought by BTL investors, 77% are apartments. For owner-occupiers, transactions in apartments account for just 27% of all properties sold in the Netherlands. A similar pattern can be seen in the size of the properties. About 51% of the BTL properties sold have a surface area of below 80 square meters, while for owner-occupiers this is approximately 19% of all purchases. The different search profile of BTL investors is partly explained by the locations where the BTL markets are most active. Cities such as Amsterdam have a higher concentration of (small) apartments than the average in the Netherlands. Although this search-profile differs from the average buyer, similar preferences can be seen in FTBs.

In Figure 5 it can be seen that in the study period of this thesis (2015-2018), the supply of homes dropped significantly since the fourth quarter of 2015, contributing to the surge in housing prices. The rise of BTL further deepens this scarcity, howbeit; there is a side of BTL which is often overlooked. As BTL properties are taken off the market of properties for sale, they enter the supply of housing as rental properties. The supply of rental properties in the small- to middle- sized segment is therefore enlarged.

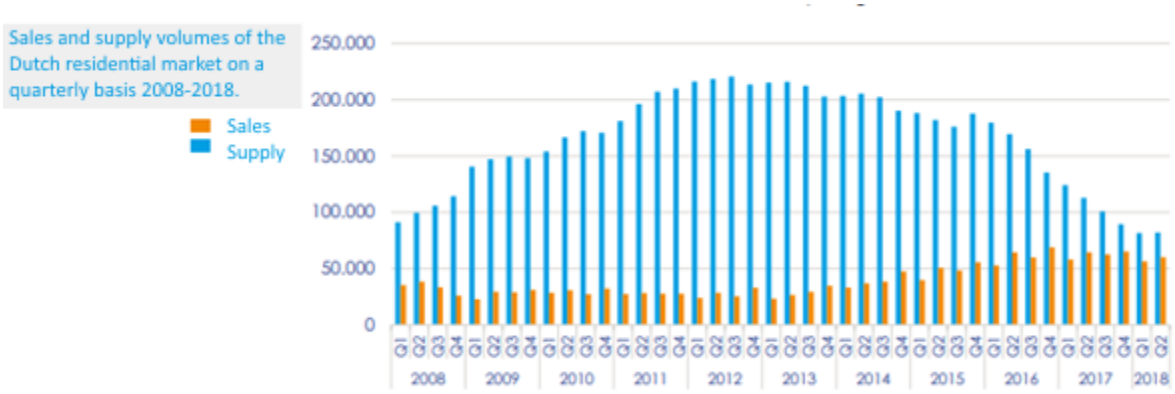

Figure 5: Quarterly sales and supply volume. Source: Dynamis B.V. Sprekende Cijfers Woningmarkt 2018 Q2.

3.2 Data

The data used in this research was obtained from Dynamis B.V., which combines transaction data from different sources. The total transaction market data was obtained from Tiara, a platform in which all realtors in the Netherlands insert their transaction data. By cross-checking this data set with a rental data set using zip codes and house numbers, properties which have gone into the rental market after they had been bought have been identified. The rental data set does not contain properties that are used for Airbnb, student housing or private contracts, only publicly posted rental offers.

The raw dataset contains 669,722 individual transactions, of which 7,531 are BTL transactions between the years 2015 to 2018. The data is screened to ensure that each transaction is both arm's-length and reflects a 100% interest of both sides. Table 1 below describes the distribution of the dataset of the years 2015 to 2018 in the G4 cities and the rest of the Netherlands, named 'Other'.

Table 1: Number of transactions per year and city.

	2015	2016	2017	2018	Total
Amsterdam	11570	11529	9973	1968	35040
Rotterdam	6117	7295	6487	1333	21232
The Hague	5999	6904	6641	1245	20789
Utrecht	4478	4744	4514	827	14563
Other	28164	30472	27615	5373	91624
Total	184268	220352	220906	44195	669721

The database of transactions includes information on the age of the property, type of property, size of the living space, number of rooms, lot size, TOM before sale, and both asking and transaction price. After filtering, all transactions had data within acceptable ranges for transaction prices, property characteristics, and age. All possible observations were filtered using the following set of rules: the bottom and top 5% of transaction prices, age > 175, number of rooms > 15, living surface < 10 and >= 999, lot > 999, TOM >= 999, and transactions with missing data are dropped. Additional filters to eliminate potential data errors were employed as follows: non-negative age, non-negative year built, positive number of rooms, living surface, and TOM. After filtering, there are 501,984 observations remaining. The descriptive statistics are found in table 2. The raw data consists of several categorical variables. In order to deal with

the discontinuous garage factor, garage is transformed into a dummy variable, coded with a 1 (present) or 0 (absent). Other than the type of buyer that was obtained by cross-checking the datasets, there is no further information on type of buyer (such as FTB).

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Price	238653	92548	108100	550000
Age	42	29.4	0	175
Living Surface	112.7	35.5	10	962
#Rooms	4.5	1.4	1	15
Time-on-market	178.8	182.6	0	999
Lot size	127.6	173.8	0	998
Garage	0.4	0.5	0	1
BTL	0.01	0.1	0	1
Observations	501,984			

Table 3: distribution of property types

Proptype	Frequency	%
Apartment	139,893	28%
Corner	63,219	13%
Town	163,194	33%
Semi	82,260	16%
Detached	53,418	11%
Total	501,984	100%

After the data trimming, the average selling price of the properties is 238,653 euros, with a range of 108,100 to 550,000 and an average age of 42 years. Lot size is defined as the amount of land surrounding the house, in which the minimum is 0, meaning the property takes up all the land or it is located on a higher level floor. The distribution of property types can be found in Table 3. The biggest share with one-in-three of all sold properties is townhouses, followed by apartments. A distinction has been made between townhouses and corner houses, as corner houses are typically higher priced.

Capitalization rates

The data includes entries for 7,375 BTL transactions for the years between 2015 and 2017. Table 4 shows the number of transactions by year with the G4 cities and the rest of the Netherlands combined.

For 2018, there are 156 entries over the first four months. This data could still be used to show trends; however, no results could be deduced from this data. All these transactions include information on gross property income in addition to the transaction price. Each transaction is matched by address, zipcode, and house number.

Table 4: Distribution of BTL transactions per city and year

	2015	2016	2017	Total
Amsterdam	252	329	235	816
Rotterdam	113	187	208	508
's-Gravenhage	260	354	222	836
Utrecht	76	101	114	291
Rest	1374	1903	1647	4924
Total	2075	2874	2426	7375

The cap rates in the following exhibits are calculated using the following formula: $\frac{(Average\ monthly\ rent*12)}{Transaction\ price}$. Aggregating across years 2015 -2018, the average cap rate can be computed in different markets across the Netherlands. The lowest average cap rate is found in Amsterdam (6.7%), where the BTL market is most developed. The average cap rate of the transactions is 7.6%. The range in average cap rates shown in exhibit 1 is 230 basis points, but this average masks differences that have occurred over time.

The average cap rate per year can be found in Exhibit 2. As the investment market has become of greater interest to BTL investors over the years, the numbers of BTL transactions have gone up (Figure 1), and the average cap rate has moved down (Exhibit 1). The average cap rate in 2015 was 7.9%, which moved down gradually to 6.9% in the first four months of 2018.

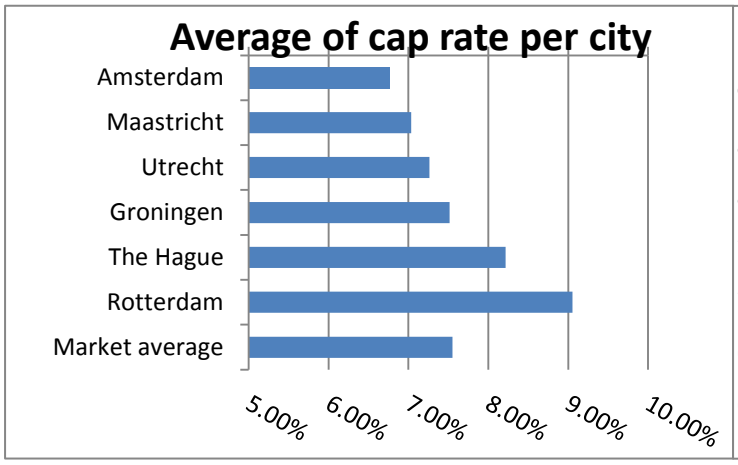

Exhibit 1: Average cap rate per city

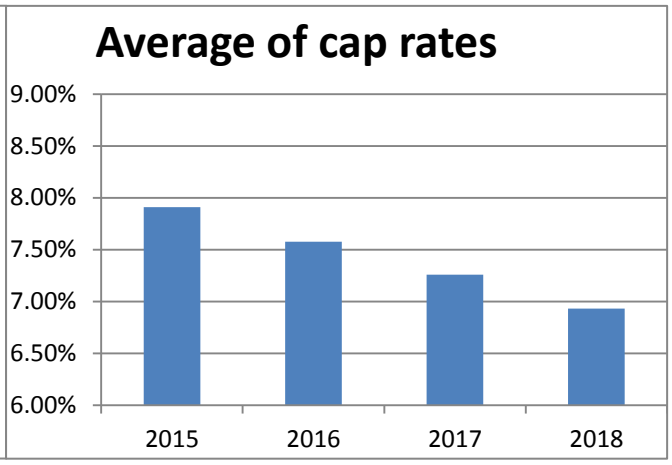

Exhibit 2: Average cap rate per year

The database of 7,531 transactions also includes information on the age of each property, type of property, size of the living surface, size of the lot, garage, TOM and the transaction price. No data indicating the makeup of the living space is available, such as the number of bathrooms, kitchens or other amenities such as pools, recreational facilities, or bordered by water. The data provided on risk-free rates in the Netherlands are from De Nederlandsche Bank.

Zip codes in the Netherlands consist of four numbers followed by two letters. The first two numbers denote the region, the latter two the district. The two letters denote the neighbourhood and street. Larger cities have a high number of different zip codes, Amsterdam has 97 unique 4-digit zip codes and 11 3-digit zip codes. In total, the dataset contains 577 different 3-digit zip codes (137 have just one observation) and 1,550 different 4-digit zip codes (567 have just one observation).

3.3 Qualitative methods

An in-depth, semi-structured interview was conducted with a local real estate agent, with the interviewer having prepared a list of predetermined questions, which unfolded in a

conversational manner while pursuing issues which seem important (Longhurst, 2009). The interview was with a local real estate agent to discover the behaviour and preferences of BTL investors, as well as to obtain information not contained in academic literature. The interview took around 45 minutes and was recorded (with consent). Motives, preferences, and potential policy measures were discussed. A list of the predetermined questions can be found in Appendix A1.

3.4 Quantitative methods

In this thesis, the hedonic modelling strategy, as formulated by Adair, Berry, and McGreal (1996) is employed. In the next part, the principles of the functional form, spatial dimension, and stratification are substantiated. The hedonic price model is based on the property's characteristics as a function of the following.

$$Pi = P(Si, Li, Oi) \quad (1)$$

where P_i is the property value of the *i*th observation, S_i are the structural characteristics of the property, L_i are the location-related fixed effects related variables and O_i are the market effects of the *i*th property.

The data used in this theis is on an individual property level over a period from 2015 to 2018. Therefore, macro-economic factors are not taken into account. Instead, numerous explanatory variables are used in order to determine the "research" explanatory variable, BTL. BTL is a dummy variable that denotes whether the property is a BTL property (1) or not (0). A non-stepwise routine is followed, which requires all available variables which may influence the price to be entered into the model, regardless of its statistical significance. The variables used

are based on the theory provided by Adair, Berry and McGreal (1996). Year dummies are added to capture the trend of price increases over time.

To capture liquidity, the TOM is taken into account. The intuition is that investments in less liquid markets will be on the market for longer (due of institutional investors) (Asabere et al., 1993). Properties that are on the market for a longer period are deemed as more risky or less desirable by investors, which reflects in a lower transaction price.

Functional Form

Multiple regression analysis assumes a strictly additive or linear model; the linear form can impose constraints on values responding to changes in attribute levels. For example, each additional square meter of floor space contributes the same amount to the house price, irrespective of the size of the house (Adair, Berry, and McGreal, 1996). Mis-specification of the functional form may cause a source of bias (Fleming and Nellis, 1984).

Transformation of data is suggested to overcome nonlinearity problems related to house size, and the use of interaction terms of size and age is recommended (Eckert, 1990). The effect of age on housing prices is likely to be non-linear (Chau, Wong, and Yiu, 2005). In theory, the effect of age on housing prices would be non-linear, due to more rapid depreciation rate in the earlier years of a building, the dependence of maintenance expenditure on age and functional obsolescence are all reasons mentioned. For this reason, Age and Age^2 is added to the model.

To satisfy the condition of normality, a log-transformation is performed on the dependent variable. In Appendix A2, two histograms can be found with the transaction price

and the natural log of the transaction price. The semi-log is used; however, the semi-log model can be conducted in two ways, namely, log to the base 10 and natural log transformation. The latter is preferred because it provides a means of handling and interpreting non-linear relations (Adair, Berry, and McGreal, 1996), hence it is used in this thesis.

Spatial Dimension

Hedonic modelling is prone to potential errors due to unobservable spatial attributes that may bias the estimates (Adair, Berry, and McGreal, 1996). The dataset contains data points scattered throughout the Netherlands. The approach used in this this is the inclusion of spatial fixed effects by adding zip code variables. The zip code fixed effects alone may not fully account for other unobservables that are bound to specific houses. However, the locational variables can be interpreted as surrogate measurements of neighbourhood quality. By using different levels of zip codes in the regressions, different meaningful sub-divisions can be identified. By adding additional digits to the zip codes, additional variables with fewer observations are added, which allows for tests of higher levels of statistical explanations as the market becomes increasingly disaggregated.

Stratification

By stratifying the dataset into different submarkets, the effects of the explanatory variables are identified more accurately. This notion is based upon the premise that a single model of the housing market is inappropriate, and models generated for housing submarkets or segments should yield greater explanatory power (Eckert, 1990). Following this reasoning, two types of

stratification are applied. The first will be the identification of properties located in the G4 cities of the Netherlands. This approach to stratification circumvents the difference in the market behaviour of larger cities and more peripheral locations. The second approach is to identify house groupings with respect to the property type. Stratification by property type is appealing because it involves the subdivision of consumers into subsets that display different behavioural characteristics (Eckert, 1990).

The empirical model relates to the transaction prices, to the following independent variables:[2]

$$Ln(Price) = \alpha_0 + \beta_1 Age + \beta_2 Age^2 + \beta_3 Size * Age + \beta_4 Size + \beta_5 Size^2 + \beta_6 \#Rooms + \beta_7 TOM + \beta_8 Garage + \beta_9 BTL + \beta_{10} Lot + \gamma_1 ProptypeFE + \gamma_2 YearFE + \gamma_3 LocationFE + \varepsilon \quad (2)$$

Where:

α	= the intercept term
β	= the coefficient of the following variable
γ	= the coefficient of the following categorical variable
#Rooms	= the number of rooms a property has
TOM	= the duration of the properties time-on-the-market in days
Garage	= dummy variable which denotes whether the property has a garage or not
BTL	= dummy variable which denotes if the property is bought by an investor or not
Lot	= the size of the lot surrounding the property in square metres
ProptypeFE	= categorical variables stating the property type fixed effects
YearFE	= categorical variables stating the year in which the property has been sold
LocationFE	= categorical variables stating the zipcodes of the property
ε	= the disturbance term

To obtain unbiased and valid results, the regression must meet the four assumptions for linear regression. The assumptions are audited and reported in Appendix A4.

[2] Environmental variables and social/macro-economic characteristics are not taken into account in this thesis, as the focus is on individual properties over a short time span.

Examination of capitalization rates

In this thesis, regressions are used at the individual property level on the cap rates, similar to the hedonic modelling of house prices. To correct for outliers, observations with a cap rate higher than 20% are dropped from the sample. This leaves the sample with 6,448 usable transactions. The analyses are conducted on cap rates in excess of the Dutch risk-free rate, as described in Jud and Winkler (1995). The 10-year Dutch treasury rate (corrected per year) is used as a proxy for the risk-free rate. The excess cap rates are used to match the characteristics of real estate as a long-term investment.

By using time variables, trends in the whole Dutch residential market are corrected for. By using the zip codes, the neighbourhood properties that are not captured in the data could be corrected for. Although these two types of variables capture unobservables to some extent, the do not capture developments over the years in the specific zip code areas. For this reason, another type of variable is added by concatenation of zip codes in which year the property it is sold. By adding these variables, neighbourhood trends are captured.

The empirical model of cap rate estimation takes the following form:

$$Cap_i - Rf = \alpha_0 + \beta_1 Age + \beta_2 \#Rooms + \beta_3 Size + \beta_4 Garage + \beta_5 TOM + \gamma_1 ProptypeFE + \gamma_2 YearFE + \gamma_3 LocationFE + \varepsilon \quad (3)$$

Where Cap_i – Rf is the cap rate of the *ith* property minus the corresponding risk-free interest rate. The other symbols and variables are the same as described in (2).

4. RESULTS

4.1 Qualitative results

In analysing the interview data, two themes emerged. These themes were: the motives and preferences of investors; and potential policy measurements. The interviewee was a local real estate agent based in Groningen, where the BTL market is highly active. Around 50% of the customers in his agency are investors, both private and companies.

According to the interviewee, the locations of properties of interest are not concentrated in one area in the city, but locations all over the city. In terms of property characteristics, BTL predominantly targets the one and two bedroom apartments at the lower price segment. In contrast to FTBs, BTL investors only consider the return on their investment. Properties that can be made ready for rental at low cost are the primary target. Aspects such as a nice view or proximity to a school are not taken into account. BTL investors are often much more liquid, which means that the entire process of a transaction can be much faster than is the case with owner-occupiers. The view of the interviewee was, however, that not only investors overbid; everyone in the current market is doing so. BTL investors primarily consider the level of profit, and at a certain point overbidding might simply not be worth it. The interviewee stated: 'FTB and investors do not necessarily interfere with each other, as lots of starters do not want to buy a property yet. Investors can buy the property for them, which then enters the market as a rental property for the starters'.

The next point of discussion was potential policies on BTL. The interviewee claimed that policies intended to make investments less attractive in order to help FTBs to start the climb up the property ladder as owners are dangerous, as they might impede the supply of rental

properties, claims the interviewee. Additional taxation policies for investors might help one group of FTBs, but obstruct other starters who wish to rent. However, there are financial policies intended to help FTBs, such as tax benefits. The danger of these policies is, however, that FTBs might use this freed up money to overbid even more. Non-financial policies such as 'residence requirement,' as already seen in housing corporations, form important alternative methods, as these simply make it not interesting for investors to buy these properties. However, even with these types of properties, and without the interference of investors, there is still overbidding done.

As a final statement, the interviewee said the following: 'The real problem at hand is the scarce supply of properties. There is simply not enough supply to suit everyone on the market. The only real solution is to build more housing. Unfortunately, this is not something that can be done on the short-term and takes years to complete.'

4.2 Quantitative results

To determine the level of fit of the regression models, the coefficient for the level of statistical explanation (R^2) is used, since the emphasis in this thesis is placed upon explanation. Table 5 presents the first set of results. At the macro level of this analysis, regressions are run over the entire Dutch residential market, the G4 cities combined, and the G4 cities in separate regressions. In each model the coefficients and standard deviation are presented. The significant variables are joined by one, two or three stars, indicating a significance level of 10, 5 and 1%, respectively. For models (1)-(6), the lowest R^2 values are associated with the analyses of the entire Dutch residential market and the highest value is associated with Utrecht, ranging

from 0.51 to 0.82. The R^2 values between the alternative markets in the model seem to go up the smaller the submarket is, most likely due to the decrease in the variation of these markets.

For the research variable, BTL, mixed results have been found; however, these results are not inexplicable. For the Netherlands as a whole, the G4 cities combined, Rotterdam, and Utrecht, whether or not a BTL investor has bought the property has no significant effect. However, for the regressions run on Amsterdam and The Hague separately, BTL has a positive value and a significance level of 1%. In Amsterdam, if a property is bought by an investor, the transaction price is 9,6% higher and in The Hague 8,9%.

Structural variables in models (1) - (6) are mostly highly significant and of the desired sign. Age and Age^2 are negative and positive, meaning that age has a negative impact on property value, however the effect is non-linear and decreases over time. As Eckert (1990) recommended, the interaction variable of Size and Age is significant at the 1% level, although signs flip between different regressions.

The number of rooms is not significant in all models, most likely due to the presence of the variables of size and the interaction variable, which are both significant at the 1% level since size and number of rooms are directly related. TOM is significant at the 1% level and has the appropriate sign according to the theory. Both having a garage and the lot size have a significant positive effect on the transaction price. There is, however, one exception, which is that lot size has a negative effect on transaction price in Amsterdam. This might be due to some model misspecification because the market in Amsterdam consists mostly of apartments which have a lot size of 0.

Table 5: Regression Results

	Netherlands	G4	Amsterdam	Rotterdam	The Hague	Utrecht
	(1)	(2)	(3)	(4)	(5)	(6)
	LnPrice	LnPrice	LnPrice	LnPrice	LnPrice	LnPrice
Constant	11.64***	11.85***	11.96***	11.53***	11.53***	11.48***
	(0.01)	(0.03)	(0.03)	(0.05)	(0.05)	(0.04)
BTL	0.001	-0.011	0.096***	0.01295	0.089***	-0.031
	(0.00)	(0.01)	(0.01)	(0.012)	(0.02)	(0.02)
Age	-0.003***	-0.006***	-0.008***	-0.006***	-0.008***	-0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age^2	0.0001***	0.0001***	0.00006***	0.0001***	0.0001***	0.00004***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size*Age	-0.00003***	-0.00002***	0.00004***	-0.00002***	0.00001***	0.00002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size	0.007***	0.007***	0.007***	0.008***	0.007***	0.00708***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
#Rooms	-0.002***	-0.008***	0.017***	-0.004	0.002	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
TOM	-0.0002***	-0.0005***	-0.0005***	-0.0002***	-0.0003***	-0.0003***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Garage	0.066***	0.090***	0.032***	0.128***	0.099***	0.085***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Lot	0.0002***	0.0001***	-0.0004***	0.0002***	0.0004***	0.0001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2016	0.053***	0.065***	0.109***	0.085***	0.095***	0.08***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
2017	0.117***	0.149***	0.237***	0.229***	0.147***	0.191***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
2018	0.140***	0.217***	0.309***	0.247***	0.228***	0.221***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Spatial FE	ZIP 4	ZIP 4	ZIP 4	ZIP 4	ZIP 4	ZIP 4
Structural FE	Proptype	Proptype	Proptype	Proptype	Proptype	Proptype
Observations	501,984	60,533	19.467	15,967	13,301	11,798
R^2	0.51	0.54	0.63	0.73	0.77	0.82

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The year in which a property was sold has a vast impact on the transaction price. As the models' base property is sold in 2015, properties sold in the following years have increased transaction prices of 5.2%, 11.7% and 14.0% for 2016, 2017 and 2018, respectively, on the Dutch market as a whole. Even higher values can be found in the G4 cities; Amsterdam tops the list with values of 10.9%, 23.7% and 30.9% for 2016, 2017 and 2018.

4.3 A closer look at Amsterdam

At this level of analysis, the focus is on one city in the Netherlands, namely Amsterdam. The city of Amsterdam is the largest in spatial terms and number of (BTL) transactions. The data set is further stratified by taking different property types and year sold in the property market of Amsterdam, which can be found in the top row(s) of Table 6. The property types analysed are apartments in a separate regression, as well as all the other property types combined in one regression. No further analysis has been done on the other property types separately, as the number of BTL transactions in other property types is too few to create credible results. Results for apartments (model (1)) are similar to those in the Amsterdam market as a whole which is not surprising, as apartments account for 88% of all transactions in Amsterdam. Lot size does not have a value since apartments have a lot size of 0. BTL for apartments has a slightly lower effect of 9.1% than modelled in Amsterdam as a whole, but continues to be highly significant at the 1% level. For model (2), taking all but apartments into account, BTL is not significant.

Table 6: Regression Results

	Apartments	All but Apartments	Apartments 2015	Apartments 2016	Apartments 2017
	(1)	(2)	(3)	(4)	(5)
	LnPrice	LnPrice	LnPrice	LnPrice	LnPrice
Constant	11.592***	11.980***	11.663***	11.639***	11.819***
	(0.04)	(0.194)	(0.07)	(0.08)	(0.07)
BTL	0.091***	-0.315	0.108***	0.085***	0.062**
	(0.01)	(0.24)	(0.03)	(0.02)	(0.03)
Age	-0.007***	-0.004***	-0.008***	-0.006***	-0.007***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age^2	0.0001***	0.00004***	0.00006***	0.00006***	0.00006***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size*Age	0.00003***	0.0000	0.00003***	0.00003***	0.00002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size	0.016***	0.011***	0.016***	0.018***	0.015***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size^2	-0.00010***	-0.00002***	-0.00005***	-0.00006***	-0.00005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
#Rooms	0.0057*	-0.0002	0.0007	0.0012	0.0147**
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
TOM	-0.0006***	-0.0002***	-0.0004***	-0.0006***	-0.0007***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Garage	0.020***	0.071***	0.045***	0.016	0.014
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Lot		0.0004***			
		(0.00)			
2016	0.109***	0.098*			
	(0.01)	(0.06)			
2017	0.231***	0.189***			
	(0.01)	(0.07)			
2018	0.308***	0.210***			
	(0.01)	(0.07)			
Spatial FE	ZIP4	ZIP4	ZIP4	ZIP4	ZIP4
Observations	17,192	2,275	5,538	5,721	5,019
R^2	0.64	0.78	0.71	0.69	0.66

Property types other than apartments do not have separate regressions,
as the other property types have too few BTL observations.
Standard errors in parentheses,*** p<0.01, ** p<0.05, * p<0.1

To understand the recent developments of the BTL market, three additional regressions, (4) - (6), are run. The regressions contain subsets of apartments sold in Amsterdam in the years 2015, 2016 and 2017. It becomes evident that the price premium BTL investors pay decreased in the study period, as the coefficients drop from 10,8%, 8,5% to 6,2% during the years 2015, 2016 and 2017, respectively. A Chow-test is performed on the stability of the BTL variable. The null hypothesis that the coefficients between subsets are identical is rejected, meaning that the BTL and non-BTL group are significantly different. Details of the Chow test can be found in Appendix A3[3].

Overall, it can be stated that the results do not support the hypothesis that '*A property bought as BTL investment has a higher transaction price than other similar properties*' in the Netherlands from 2015 to 2018. However, the results differ per sub-market. The empirical evidence obtained supports the hypothesis that properties bought as BTL investments in Amsterdam and The Hague do have a higher transaction price than other similar properties during the period of study.

4.4 Capitalization rates

Exhibit 3 presents the cap rates of all properties. On the x-axis the cap rate is shown, while on the y-axis the density is shown, portraying the frequency of cap rates in that range bin. The sample shows similar properties to that of a normal distribution, with the peak in the frequency of cap rates in the 6-7% range, and is slightly right-skewed.

[3] Furthermore, regressions were run, with and without the BTL variable. The residuals are plotted against several variables; however, no significant differences between the models' residuals occurred.

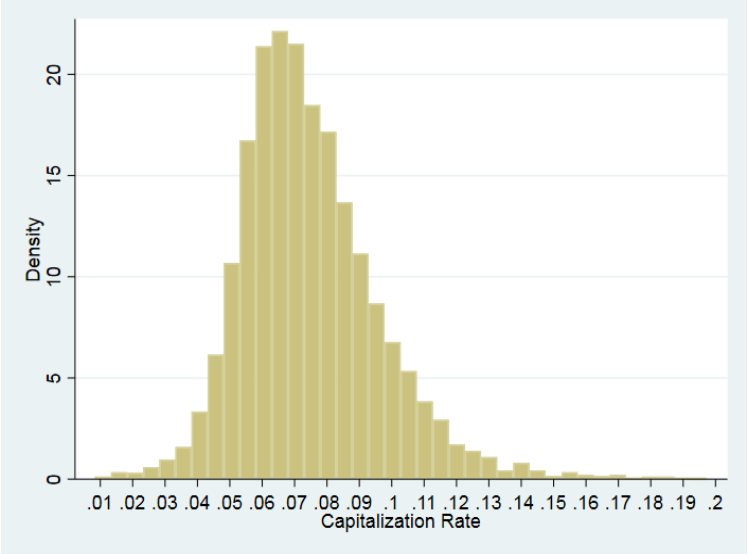

Exhibit 3: Histogram of cap rates

As shown in Exhibit 4, cap rates for all the G4 cities declined from the first quarter of 2015 until at least the second quarter of 2018. Cap rates are the highest in Rotterdam, followed by The Hague. Exhibit 5 shows cap rates for all property types over the period 2015 to 2017. Cap rates for the three most popular property types have all fell during this period. Semi-detached and detached houses enjoyed an increase in cap rate, however, the amount of transactions for these property types are significantly lower, and the results should thus not be taken for granted. Cap rates for apartments were highest over the entire period.

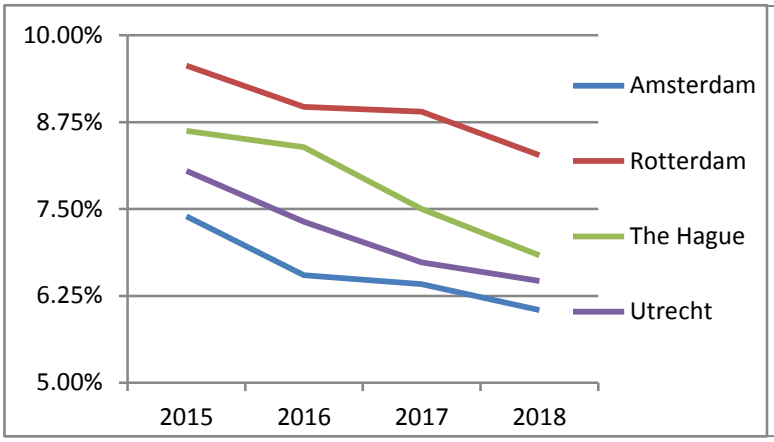

Exhibit 4: Cap rate per city and year

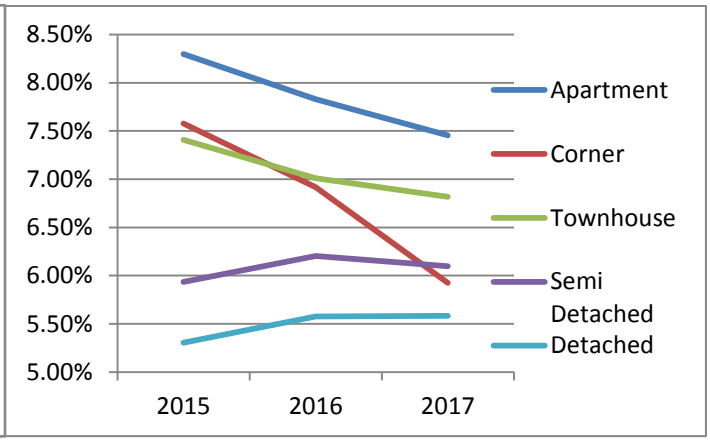

Exhibit 5: Cap rate per property type and year

The empirical results are presented in Tables 7 and 8. The tables present the results of 10 different regressions. The base transaction is an apartment for regressions (1) - (4) (sold in the year 2015) and (10). In regression (1), the cap rate is used as the dependent variable. Regressions (2)-(10) use the excess return as the dependent variable. Models (2) - (4) are similar regressions; however, use different spatial fixed effects, zip codes on the 3, 4 and 5 digit levels, respectively. Using smaller areas (so higher zip code digits) significantly improves the model, increasing the R^2 from 0.54 to 0.87. By adding this amount of extra spatial variables, increases the likelihood that the new variables enhance the model purely by probability. For this reason, the adjusted R^2 is taken into consideration. The adjusted R^2 is remarkably lower than the R^2, however, increases from 0.49 to 0.67, which proves that the extra spatial variables increase explanation power. Regressions (5) - (9) run a separate regression for all five property types in the data sample on the 4-digit zip code level. Lastly, regression (10) uses a concatenation of year sold and 4-digit zip codes, in order to capture the effects of local developments over time.

Comparing models (1) and (3) which use cap rates and excess return respectively, identical coefficients for explanatory variables can be identified. The sole difference can be found in the constant, which is almost 0.7%. The R^2 is slightly improved by using Excess Return, hence this dependent variable is used in every other regression.

In models (2) - (4), every variable other than location dummies is highly significant at least at the 5% level, except the detached variable in model (4), likely due to the low number of observations of that property type. The following coefficients described in this paragraph are taken from model (4), since this model has the best fit. Age has been multiplied by a factor of 100, to gain a larger coefficient that is easier to interpret. Age affects the excess return in a

positive way, likely due to the fact that older properties generally have central locations, which is desirable for rental properties. TOM (in days) has a slight positive effect on excess returns as well. This is in line with the theory that properties that remain on the market for longer are deemed as riskier or less desirable, and therefore need to be compensated for with higher cap rates (Asabere et al, 1993).

As the base property is sold in 2015, year coefficients have highly significant negative values, up to -1.85% for 2018. This result is consistent with the initial intuition and proves a strong downward trend. Property types other than apartments (the base property) all have a negative impact on excess returns. What this finding shows is that apartments are the most desirable properties for an investor, since they provide the highest cap rates. Other property building characteristics (#Rooms, living surface, and garage) all affect cap rate in a negative manner, which is a logical result if apartments are the most desirable properties. Apartments are likely to have a low number of rooms, a small livings surface; in addition, they are unlikely to possess a garage.

In models (5) - (9), regressions are run for each type of property, in order to identify differences in coefficients for each type. With the highest number of observations, the regression for apartments (5) does seem to behave differently to model (4), the most significant difference being the increase in the constant, which is in line with our expectations and data that suggests that apartments have the highest cap rates. For the Cornerhouse, Semi-Detached and Detached regressions, all the regressions have a number of observations below 250, making statistical inferences less credible. Almost none of the variables are significant; most likely, there are too many unobservables not captured in the data for these property types to

make a functional model. Model (7) has a higher number of observations and does better than the previously mentioned three property types; however, it suffers from similar symptoms.

Model (10) uses a concatenation of 4-digit zip codes and the year sold as fixed effects for time and location. The base explanatory variables behave well and are all significant at the 1% level and possess similar signs as to model (4). The concatenated fixed effects are not significant at all. It is likely the case that there are simply not enough observations per zipcode and year in order to catch neighbourhood trends. Furthermore, it is possible that the period from 2015 to 2018 is not long enough in order to produce reliable results on neighbourhood developments. The results shown in Tables 7 and 8 strongly indicate that numerous factors influence residential real estate cap rates. Showing the coefficient by property type provides a measure of how cap rates are affected differently. The evidence in this thesis is in line with expectations and consistent with previous findings of Chichernea (2008) and Wheaton (2005).

Table 7: Regression results (1)-(4)

	(1) BAR	(2) ExcessReturn	(3) ExcessReturn	(4) ExcessReturn
Constant	0.0752***	0.0677***	0.0683***	0.0516***
	(0.004)	(0.002)	(0.004)	(0.012)
Age*100	0.00003***	0.00003***	0.00003***	0.00003***
	(0.000)	(0.000)	(0.000)	(0.000)
#Rooms	-0.0008***	-0.0007***	-0.0008***	-0.0004**
	(0.000)	(0.000)	(0.000)	(0.000)
Living Surface	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)
Garage	-0.005***	-0.006***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
TOM	0.000003***	0.000003***	0.000003***	0.000003***
	(0.000)	(0.000)	(0.000)	(0.000)
Corner	-0.0043***	-0.0031***	-0.0043***	-0.0078***
	(0.001)	(0.001)	(0.001)	(0.002)
Town	-0.0039***	-0.0034***	-0.0039***	-0.0061***
	(0.001)	(0.001)	(0.001)	(0.002)
Semi	-0.0070***	-0.0071***	-0.0070***	-0.0103***
	(0.001)	(0.001)	(0.001)	(0.002)
Detached	-0.0086***	-0.0064***	-0.0086***	-0.0072
	(0.002)	(0.002)	(0.002)	(0.005)
2016	-0.0059***	-0.0015***	-0.0019***	-0.0029***
	(0.001)	(0.0001)	(0.001)	(0.001)
2017	-0.0122***	-0.0091***	-0.0106***	-0.0126***
	(0.001)	(0.001)	(0.001)	(0.001)
2018	-0.0171***	-0.0130***	-0.0159***	-0.018***
	(0.001)	(0.001)	(0.001)	(0.002)
Spatial FE	PC4	PC3	PC4	PC5
Observations	6,448	6,448	6,448	6,448
Adjusted R^2	0.57	0.49	0.57	0.67
R^2	0.67	0.54	0.67	0.87

Note: The dependent variable can be found in the 3rd row. Standard errors in parentheses, *** p<0.01, **p<0.05, * p<0.1.

Table 8: Regression results (5)-(10)

	Apartments	Corner	Town	Semi	Detached	
	(5)	(6)	(7)	(8)	(9)	(10)
	ExcessReturn	ExcessReturn	ExcessReturn	ExcessReturn	ExcessReturn	ExcessReturn
Constant	0.0727***	0.0955***	0.0665***	0.0767***	-0.0630	0.0714***
	(0.004)	(0.025)	(0.015)	(0.022)	(0.148)	(0.008)
Age*100	0.00003***	0.0003**	0.00001	0.0002*	0.0002	0.00002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
#Rooms	-0.00017	0.00004	-0.00082	-0.00174	-0.01800	-0.00073***
	(0.000)	(0.003)	(0.001)	(0.002)	(0.014)	(0.000)
Living Surface	-0.0002***	-0.0002**	-0.0001**	-0.00003	0.0004	-0.00012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Garage	-0.0044***	-0.00007	0.0036	-0.0022	-0.0620	-0.0052***
	(0.001)	(0.005)	(0.002)	(0.005)	(0.041)	(0.000)
TOM	0.000003***	-0.00002	0.000004*	0.0000001	0.00001	0.000003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Corner						-0.0054***
						(0.002)
Town						-0.0033***
						(0.001)
Semi						-0.0058***
						(0.002)
Detached						-0.011***
						(0.003)
2016	-0.0020***	0.0002	-0.0017	0.0005	0.0589	
	(0.001)	(0.006)	(0.002)	(0.006)	(0.042)	
2017	-0.0112***	-0.0146**	-0.0085***	-0.0115	0.0514	
	(0.001)	(0.001)	(0.002)	(0.007)	(0.034)	
2018	-0.0170***	-0.0041	-0.0109**	-0.019	0.013	
	(0.001)	(0.017)	(0.005)	(0.023)	(0.033)	
Spatial FE	PC4	PC4	PC4	PC4	PC4	PC4*Year
Observations	4,919	248	883	235	163	6,448
Adjusted R^2	0.56	0.68	0.52	0.81	0.49	0.58
R^2	0.66	0.96	0.81	0.98	0.98	0.77

Note: The Tables 7 and 8 give the estimation results for 10 different regressions. The dependent variable can be found in the 3rd row. For model (5)-(9) the subsamples for different property types are denoted in the top row. Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

5. DISCUSSION

Earlier literature on BTL studied mostly the UK and provides evidence that BTL investors do impact specific niches in the market (such as cheap apartments) (Gibb and Nygaard, 2005). This impact could result in a possibly unsustainable increase in house prices (Sprigings, 2008). The results in this research suggest that in Amsterdam and The Hague, BTL has an upward effect on transaction prices of properties. As Chichernea, Miller, Fisher, Sklarz and White (2008) wrote, when there is a general economic uptrend, capital should first flow into larger markets, and, once these are saturated, it should gradually flow to the second and third tier markets. The capital city will always be a first tier market, while The Hague is a highly popular city among expats (Eerenbeemt, 2018). This might be part of the reason why these premia can be seen in Amsterdam and The Hague, if this research is continued in the future, a significant positive coefficient for the second and third tier markets might be found as well. Furthermore, if this hypothesis is correct, large markets should lead smaller markets in terms of cap rate behaviour. This could explain why the cap rates are lowest in Amsterdam, the Netherlands' most popular and largest city. As investors moved here first, it puts upward pressure on the transaction prices, which in turn results in lower cap rates (if there is no increase in risk). The Dutch Central Bureau of Statistics (CBS) data shows that the house prices in Amsterdam increased long before those in other cities. Since 2005, prices in Amsterdam have increased by over 25% in 2015 to almost 82% in 2018. As opposed to Rotterdam, house prices in 2015 were almost similar to 2005, however, surged by 40% in 2018. This is translated in Exhibit 4 by the fact that Amsterdam has the lowest cap rates over the whole period and diminishing cap rates over the entire sample from 7.4% to 6.4%. Interestingly, the price premium paid by investors for BTL

properties has been decreasing over the period of study. The willingness to pay additional premia is decreasing, as it becomes more difficult to maintain a profitable investment. As claimed by the interviewee, BTL investors primarily look at the level of profit, at a certain point overbidding might simply not be worth it. The market in Amsterdam shows signs of market saturation, where investors might look for properties elsewhere to reach higher cap rates, even at the cost of increased risk. As transaction prices press on cap rates, the lower cap rates may not outweigh the low risk of Amsterdam, where the level of vacancy is minimal. As Weck (2018) concluded, the price increase in Amsterdam is flattening out. Prices in Amsterdam started increasing far earlier than other cities, so much so that the price level is already far above the rest of the Netherlands. Price flattening is not yet visible in the other Dutch cities. With lower prospects in growth and initial yields, any investor who is investing for the long-term is less willing to pay a price premium.

The effect BTL has on the wider housing market is difficult to quantify, and this presents a challenge for the growing empirical literature on housing markets. As for the question of whether BTL investors displace FTBs out of the market, it can be argued that the results presented in this thesis partly support this. Investors have fewer financial constraints than FTBs, are able to come up with money faster, and can outbid others. BTL investors and FTBs are interested in similar properties, which increase the competition for these homes, driving up prices and reducing the supply. This could result in a situation where FTBs have to adjust their wants and buy a cheaper home in one of the neighbourhoods around the centre, instead of in the more expensive city centre. As BTL investors typically have superior financial means than FTBs, they can postpone the ‘tipping point’ at which buying a property becomes too expensive

for an increasing number of households. Postponing the tipping point means that prices are in danger of increasing further and dispersing from household income; therefore, an increasingly large share of potential buyers cannot obtain a mortgage since their income is too low in relation to the selling price. However, BTL investors are not the sole reason why FTBs are having difficulties climbing up the property ladder. Factors such as stagnating wages, scarce supply, low rates of construction, and stricter mortgage rules can also have a significant impact.

The pressure on the Dutch government to make changes to the residential market is increasing (Ministerie van Algemene Zaken, 2017). However, the perception that BTL investors are the problem is an alarming one, as the far majority of properties are still bought by owner-occupiers. Policies such as taxing investors more heavily could mean a loss of landlords, which will drive up the cost for those who want to access decent rental accommodations. In contrast, these policies could help FTBs, as they may reduce the competition between FTBs and BTL investors. Assisting one group of households could potentially hurt a different group. Rental properties and a BTL market are needed. A thriving private rental sector need not be seen as something necessarily harmful; it could rather be seen as offering choice and opportunities as well. Measures intended to support those who want to buy a home might only increase demand even further, and with an increase in demand comes an increase in prices. During the summer of 2019, the Minister of the Interior of the Netherlands researched plans to abolish transfer tax for FTBs, effectively reducing the tax from 2% to 0%, meaning that FTBs would have to bring in less private capital (Taxlive, 2019).

Independent researchers from different institutions oppose to abolishing the transfer tax for FTBs. De Hypotheker (2019) wrote that abolishing the transfer tax will not lead to a

decrease in the problems FTBs face on the market. Based on the results of a poll completed by over 400 FTBs, De Hypotheker claims that the majority does not consider this measure to be a solution to the housing problem. Weck (2019) claimed that abolishing the transfer tax for FTBs will only increase the prices of available homes. The number of FTBs looking for a home far exceeds the number of available first-time homes, a situation that will not benefit from the introduction of a demand-boosting measure such as the abolishment of the transfer tax. In order to benefit from the tax benefit, more FTBs will enter the market and use their private capital during the bidding process. In other words, competition for starter homes will increase even further. De Hypotheker (2019), Weck (2019) and the interviewee all agree that the root of the problem, which is a too low supply of homes and rate of construction, needs to be addressed. In the opinion of the author, municipalities should focus on expanding their housing stock, as that could have a dampening effect on house prices over time. Municipalities should monitor the housing availability, quality and price of the existing and newly build housing stock and intervene when deemed necessary by housing market experts.

6. Conclusion

In this study, the Dutch BTL market and its possible impact was examined. The results of the hedonic model provide empirical evidence that in The Hague and Amsterdam it is normal for investors to pay a price premium, which exerts an upward pressure on transaction prices. Based on the results of the interview and empirical analyses, it is still difficult to draw a firm conclusion to the central research question, namely: '**What is the effect on transaction prices when properties are bought as BTL investments?'**, as the results are regional and not

applicable throughout in the Netherlands. Nevertheless, the analysis does provide valuable insights into this relationship. To date, there has been no academic study focussed on estimating the price premium paid by investors through hedonic analysis. BTL is a topic of discussion to this day and is perceived as something negative to the general public. From the qualitative evidence it can be concluded that this is not necessarily the case, as BTL is a relatively small part of the market, and there is also overbidding from non-BTL investors. The outcomes can provide useful implications for policymakers on how to tackle the problems FTBs face on the market, especially in light of the recent scarcity and increased prices of homes.

Furthermore, in this thesis a model of real estate cap rates was built upon earlier literature and extended. The model provides insight into the factors that drives cap rates in the Dutch real estate market. Results of the model reveal that cap rates are strongly related to timing, location, and property type, comparable to what earlier literature suggests (Ambrose and Nourse, 1993; Chichernea et al., 2008; and Dokko et al., 1991). As expected from the theory and the interviewee, apartments are favoured by BTL investors. This thesis' novel approach has provided new insights beyond simply identifying factors that drive cap rates. By identifying properties with the greatest deviations (residuals) from the model, and the assumption is made that markets do eventually correct the mispricing in the long term, mispricing across regions can be transformed into profit opportunities. Moreover, it can be concluded that investors do not only prioritise maximizing cap rates, as Amsterdam is the most popular BTL market while simultaneously having the lowest average cap rate, but also take potential growth rates into consideration. Although not the focus of this research, the results of

the research on cap rates could be used to argue for Wheaton and Nechayev's (2005) theory that variation in cap rates is partly corrected by rental growth rates.

Limitations and recommendations for future research

One limitation of the data is that, for all of the transactions, no data is available on the state of the house or on the state of the neighbourhood. These unobservables are captured in neighbourhood fixed effects; however, using the hedonic model as used in this thesis; it could measure whether BTL investors buy properties which are of a higher quality than other properties. Furthermore, the types of buyers, other than BTL investors, are unknown. It would be interesting to research the behaviour of FTBs and to compare this with the behaviour of BTL investors. A different kind of quantitative study using house price indexing instead of focusing on the individual property level to examine the effects of macro-economic factors on BTL could deliver insightful results.

A limitation of the results is that these cannot be generalised, as only Amsterdam has been analysed in detail. Cities may differ in terms of size, social-economic, and demographic characteristics, all of which influence house prices. Consequently, the results would be different for other cities. Furthermore, the period of study is the years 2015 to 2018, a relatively short period, which saw an upward market. Hence, studies over a longer time horizon that include different stages of the real estate economic cycle are needed to further understand the development of the residential market and cap rates. When longer time horizons are considered, it might be worthwhile to discover where capital flows next after the top tier markets (which, in the Netherlands, is Amsterdam) become saturated and higher cap rates can

be obtained in other regions. Crucially, BTL is relatively new in the Netherlands, which makes it an unknown territory for government officials and policy-makers. The unbeknownst brings new risks, and, in order to better identify those risks, data collection that goes beyond what the official authorities have used to date to assess the situation on the housing market is necessary. Therefore, a similar study in 10 years' time is needed, as a decade is enough time for a housing market to see the effects of imposed policies. However, consistent data on rental and house prices over a long period of time is extremely scarce, which make the dataset used and this study very unique.

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Appendix

A1: Interview questions

- What are investors looking for? (What kind of property characteristics are they looking for?)
- Do investors naturally overbid? Do they behave differently to owner-occupiers?
- Which factors are most important for investors?
- Do you believe that investors impact the residential market?
- Do you believe that mortgage requirements influence the position of investors and FTBs?
- Do you believe measures should be taken against BTL investors?
- What do you think the future of BTL will looks like?

A2: Histograms of transaction prices

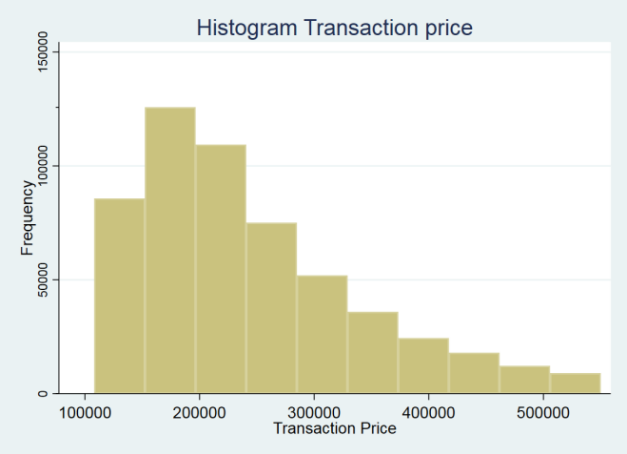

Exhibit A2$_1$: Histogram of Transaction Price

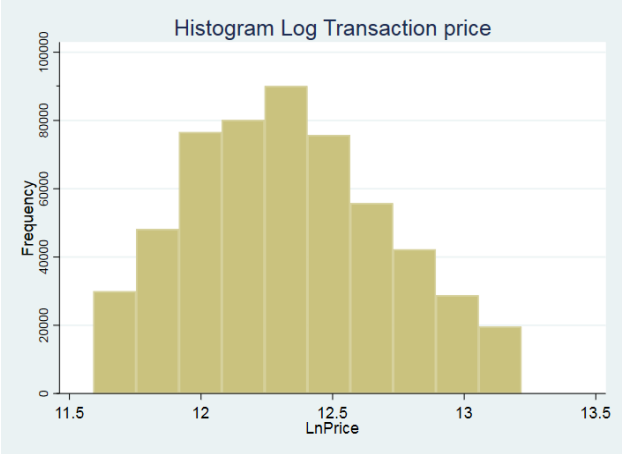

Exhibit A2$_2$: Histogram of log Transaction Price

A3: Chow test

Table A3: Chow Test

	Observations	RSS	Variables
Pooled	17192	1278	11
Non BTL	16697	1240	11
BTL	495	35	11

$$F = ((RSS-(RSS_1+RSS_2))/ (RSS_1+RSS_2)) \times (T - 2k)/k \qquad (4)$$

In order to test the stability of the research parameter, a Chow-test was conducted. For this purpose, the data was split into two sub-samples; one sample contained only contained BTL

transactions, and the other only contained non-BTL transactions. The regression was conducted over the whole sample, followed by the two sub-samples separately.

The results can be found in Table A3, and the calculations for the F-statistic can be found in equation (3), where F is distributed by F~(2k-k, n - 2k).

RSS_{1+2} = 1,239.98+34.92 = 1274.9
RSS = 1,278.26
N = 1,7192 = number of observations
2k = 22 = number of regressors in the unrestricted regression
k = 11 = number of regressors in the restricted regression

The value of the F-statistic is 4.11, which is greater than the critical value which lies between 2.185 and 2.31 for the 1% level. Hence, the null hypothesis that BTL is stable over the whole sample is rejected, since there are significant differences in the model between BTL and non-BTL[4].

A4. Multiple linear regression assumptions

To perform a multiple linear regression, the data used must meet the following assumptions:
(1) The relationship between the dependent variable and the independent variables must be linear;
(2) The average value of the errors is zero;
(3) The variance of the errors is constant;
(4) The independent variables are not strongly correlated with each other.

The histogram of the residuals can be found in Table $A4_1$. Although the residuals have a normal distribution, the average value of the errors is non-zero at -0.56. This non-zero average error indicates that the model systematically over predicts the observed values, meaning that on average the prediction is not correct.

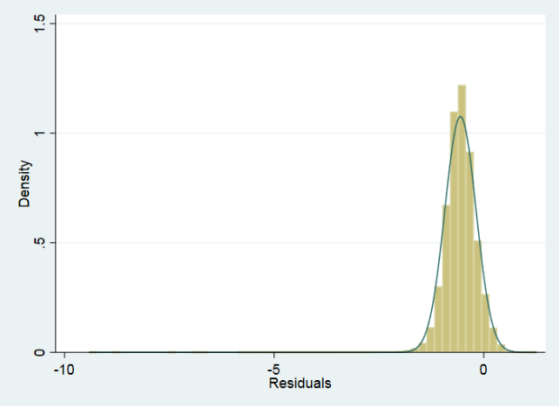

Figure $A4_1$: Histogram of residuals

[4] The fixed effects are not included in the Chow tests due to a varying number of FE variables between subsets

The Shapiro-Wilk W test for normal data also suggests that with a p-value of 0.00, the error terms are not normally distributed. Since the model sample size is sufficiently large, it is not expected that the violation of the zero mean assumption will have any real consequences.

To test for assumption (3), in $A4_2$, the residual-vs-fitted plot is presented. Here the relationship between the predicted values and how they differ from the reality, the residuals, can be found. The plot experiences two clear 'tilts' with a slope of -1. The tilt to the configuration of the data points on the plot is a collective pattern of numerous diagonal lines. No clear distribution pattern can be identified in the plot; however, this is not enough evidence to conclude that the errors have a constant variance. For that reason, a Breusch-Pagan/Cook-Weisberg test was performed. This test tests for the null-hypothesis of a constant variance. With a chi-squared test statistic of 1.62, the null of constant variance is not rejected, and it is concluded that the residuals in the model are homoscedastic.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance
Variables: fitted values of LnPrice

chi2(1) = 1.62
Prob > chi2 = 0.2029

If the same regression is run without removing the upper and lower 5% percent of transaction price as done so in the models, then, ceteris paribus, the residuals-vs-fitted plot in $A4_3$ follows a distribution without the -1 slope cut-off (although with some hefty outliers). If the same heteroskedasticity test is run, the null hypothesis of constant variance is however rejected. For this reason, the -1 slope lines as seen in figure $A4_2$ are not seen as problematic and removing the upper and lower 5% of transaction price is necessary.

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

chi2(1) = 1032.80
Prob > chi2 = 0.0000

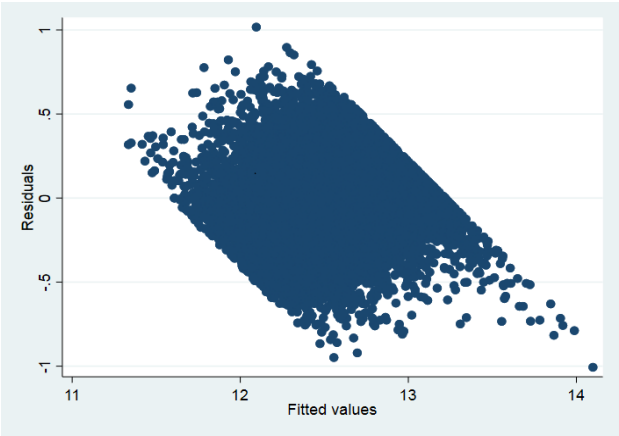

Figure $A4_2$: Residual-vs-fitted plot

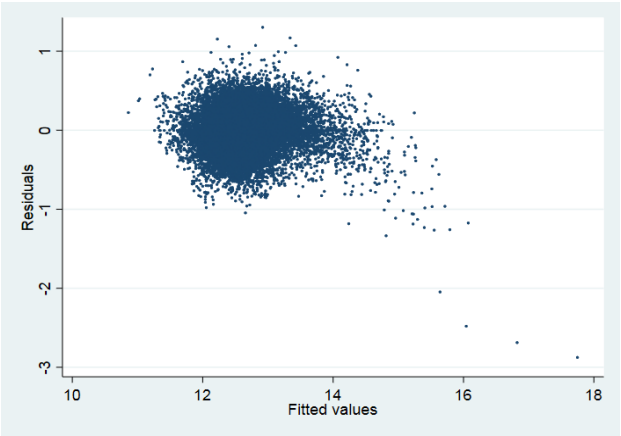

Figure $A4_3$: Residual-vs-fitted plot

To check for assumption (4), namely that the independent variables are not strongly correlated with each other, Tables $A4_1$ and $A4_2$ are presented. In the correlation matrix in Table $A4_1$, it is shown that there are fairly low correlation numbers overall, except for correlations with size. As size is directly related to the number of rooms and indirectly with lot size, this does not come as a surprise. To determine whether or not the model suffers from multicollinearity, the variance inflation factors were calculated, which presents the extent the standard error of the coefficient of interest has inflated upwards. As a rule of thumb, variables with VIF coefficient higher than four are considered problematic. The results in table $A4_2$ show that the VIF is higher than four for four of the variables, namely Age; Age^2, Size*Age, and Size, which are all interconnected. Since the model is otherwise adequate (statistically and each coefficients being of plausible magnitude with the appropriate sign), this problem is ignored.

Table $A4_1$: Correlation matrix

Variable	Age	Size	#Rooms	BTL	TOM	Garage	Lot
Age	1						
Size	-0.1501	1					
#Rooms	0.0028	0.681	1				
BTL	0.0053	-0.0753	-0.0764	1			
TOM	-0.0452	0.1223	0.058	-0.0133	1		
Garage	-0.2248	0.3416	0.2055	-0.0324	0.1207	1	
Lot	0.0398	0.5485	0.4844	-0.0742	0.1515	0.3938	1

Table $A4_2$: Variance Inflation Factor

Variable	VIF	1/VIF
Age	17.97	0.056
Age^2	10.31	0.097
Size*Age	8.64	0.116
Size	4.19	0.239
TOM	1.08	0.929
#Rooms	2.33	0.430
Garage	1.42	0.703
BTL	1.01	0.987
Lot	3.81	0.263
2016	1.5	0.665
2017	1.54	0.651
2018	1.18	0.849
Corner	1.93	0.519
Townhouse	2.45	0.409
Semi	2.89	0.346
Detached	4.07	0.246
Mean VIF	4.14	