Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences

Graduation Plan: All tracks

The graduation plan consists of at least the following data/segments:

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Argumentation of choice of the studio	

Graduation project	
Title of the graduation project	Rent premium for high-rise office floors
Goal	
Location:	Amsterdam, Rotterdam, The Hague
The posed problem,	See below!
research questions and	See below!
design assignment in which these result.	
The Dutch office market is coping with high vacancy levels, which have significantly increased since the beginning of the financial crisis in 2008. The Dutch market is not functioning according to the	

theoretical equilibrium model (DiPasquale & Wheaton, 1996). The asset market is not appropriately responding to current conditions, where lowering yields under influence of the low cost of capital, induces new developments. This changes the market towards a substitution market in which the qualitative aspects are more important than the quantitative (Koppels & Soeter, 2006). This has influenced the office market significantly, as newly built developments are now only considered within prime locations, like Amsterdam South Axis and Schiphol (Dynamis, 2015). These prime locations tend to have agglomeration effects for firms, leading to higher land prices for development and are subsequently reflected in the prevailing rents (Koster, 2013, 2015).

Rent determinants have been extensively researched among scholars and the influences factors are unambiguously acknowledged (Fuerst, 2007). However, the body of knowledge concerning office rents is still limited in numbers (Nitsch, 2006). Furthermore, contemporary office clusters are often characterized by their skyline. These clusters consist of many high-rise structures, representing large capital values. One would this would be a extensively researched sector due to the importance and values of these building. However, there is a lack of empirical evidence towards what extend taller buildings receive rent premiums (Koster, 2013). Rent premiums for higher office floors are considered a plausible effect to offset higher construction costs. Taking cause and effect in consideration, one would logically expect that due the higher construction cost for high-rise structures would be offset by higher office rents. However, within the building practice there is no general acknowledgement of these price premiums. Within the building valuation process, rents are generalized and ought the same for al office floors, neglecting the higher building costs.

Within the commercial real estate sector, it is very usual to base market value on comparable real estate assets within this market. Investors, appraisers and market analyse not only consider local market conditions, but also incorporate local comparables within their valuation or market (Chegut, Eichholtz, & Rodrigues, 2015). As this method is widely uses within the sector, one could argue that transaction prices are both derived from market conditions and comparable transactions. These transaction rents are used within the hedonic regression analyses of a large extent of previous studies in conjunction with the correlation of building characteristics in space, leading spatial correlation in prices. When spatial dependence in omitted, results may misrepresent the extend of correlation between transaction prices.

There is still a gap within the literature concerning the rent premiums for higher office space and their determining factors. There are no significant prevailing factors that determine differences between floor rental levels for high-rise structures. However, Koster researched rent premiums for high-rise office buildings (2014). Figure 1 presents a graphical overview of the problem field and proposed solution. The prevailing theory concerning supply and demand is not functioning with the Dutch office market. This graduation thesis would build upon previous research, and extend it considering spatial dependence within the hedonic analysis to analyse rent premiums for high-rise office floors. The empirical results will hopefully add to the currently lacking body of knowledge, and provide useful insight for investors, brokers, appraisers and policy makers.

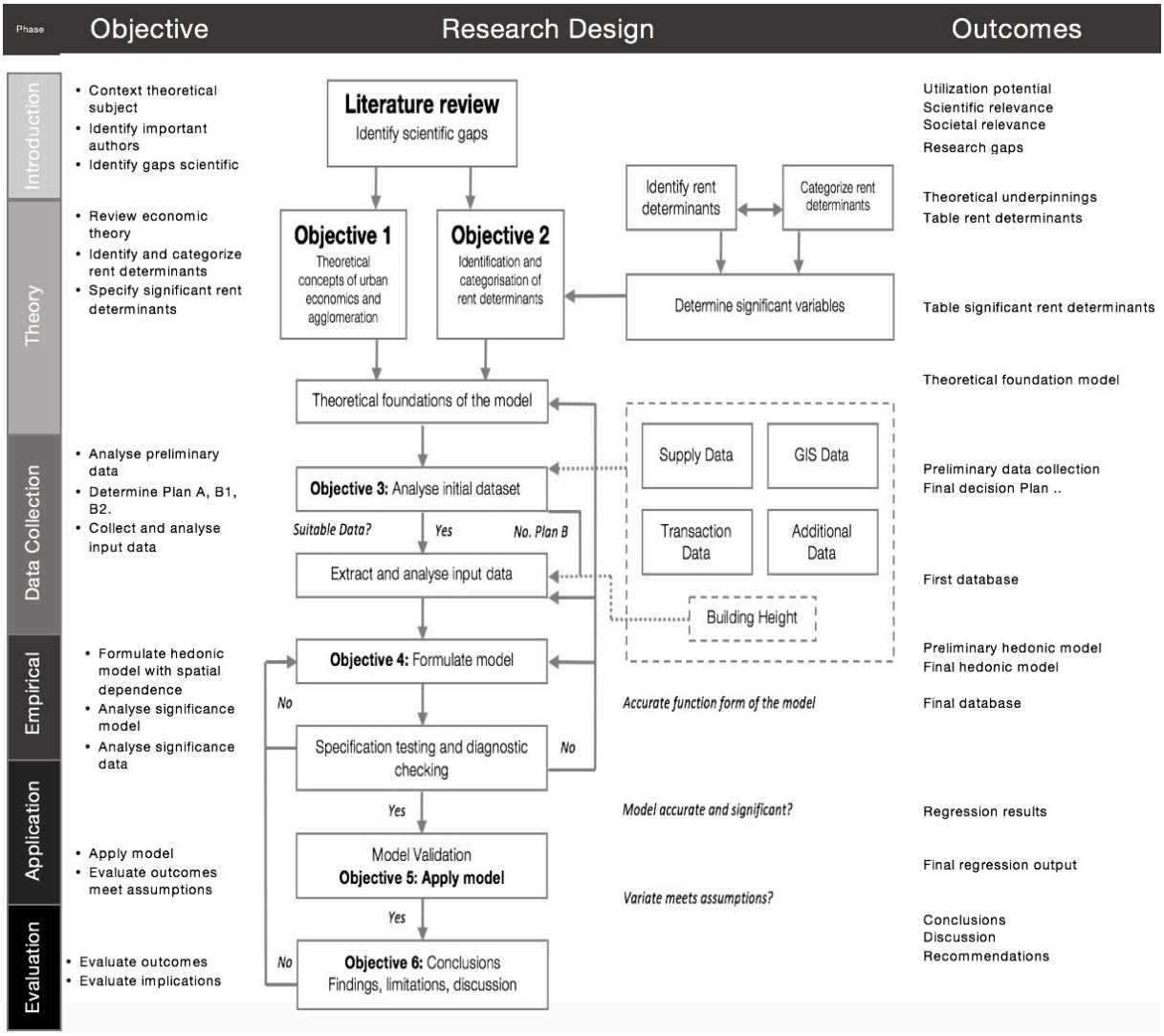
Process

Method description

The research will deploy a quantitative research strategy throughout the process. Researcher within the built environment field emphasize empirical research rather than that of theoretical research. However, there is a strong connection between theory and investigations that conducts the use of data of which application has been occurred in the studies of economics (Knight & Ruddock, 2009). There are several concepts of quantitative analyses being used within the built environment research. This research goes far beyond the descriptive statistics and hypothesis testing and compromises also the field of econometric modelling or regression analysis (Knight & Ruddock, 2009).

Quantitative research is employed to analyse data to generate inferential statistics, which could subsequently make the relationship clear between characteristics of the building and location to the influence it has on the rent level. Quantitative analysis undertaken within the econometric perspective has to be based on economic theory, statistical data, a method that allows for the expression of economic theory and a methodology (Knight & Ruddock, 2009).

The first phases, namely introduction and theory are elaborated on within this research proposal. During the subsequent phase, data will be collected and analysed in accordance to its suitability for the research. During this point a choice can be made towards the final research design, in the name of plan A, B1 or B2. During this phase, several databases will be used to construct a personal database for this research. The data collection will be elaborated on in section 3.4. Within the empirical phase of the research, the hedonic regression model will be formulated in conjunction with a plan of approach for the incorporation of the spatial dependence. From the empirical phase onwards, there will be several feedback loops that take the validity of the model into consideration. The final two phases are to apply the model and obtain the outcomes. The final steps consist of formulating the conclusion and discussion and provide recommendation for future research.



Research methods

Literature Review

An extensive desk research study provides the empirical, economical and theoretical framework for this thesis. The content of the literature study is based on findings and figures acquired from secondary resources of both scientific research and current market reports. These sources include:

Relevant academic publications and books

Market reports or documents by private sources

Press and media, like Vastgoedmarkt and Property NL

hedonic pricing framework

The main conceptual difference between descriptive and inferential statistical analysis is the use of models, which are a simplification of, or abstraction from, the reality in which the significant aspects or relationships are ought to be researched (Knight & Ruddock, 2009). The quantitative part of this

research will deploy a hedonic regression. There is some discussion among scholars concerning the origin of the hedonic regression analysis. A significant amount of these scholars proclaim that Court was the first to develop a hedonic regression model within the auto industry. The hedonic proposal of Court provided the basic principles of hedonic regression, which is the measurement of the relation of price to time, holding usefulness constant (1939). However, Colwell and Dilmore argue that Haas produced a hedonic theory fifteen years prior to the analyses of Court (1999). Within this research, Haas utilised the hedonic principle without the use of computational machinery on agricultural land prices with a primary focus on distance to the city centre and size (1922).

Regardless of who theorized the hedonic principle first (apparently a very important point of discussion among scholars), numerous studies since have utilised the hedonic pricing method to analyses the influence of attribute value on price properties (Chau & Chin, 2003). The foundation of the theoretical principles concerning hedonic pricing as partitioned today is based on two main approaches, consumer theory by Lancaster (1966) and the hedonic price model developed by Rosen (1974). Lancaster developed the consumer behaviour theory, and proposed a paradigm shift which determined that properties or characteristics of goods account for the utility value, rather than the traditional approach which argues that 'goods' are direct objects of utility (1966). According to Lancaster, this application leads to the assumption that goods are comprised of several characteristics in fixed proportions and that these characteristics influence consumer behaviour. The consumer-centred theory elaborates on user satisfaction for certain goods, and emphasizes utility theory to examine consumer behaviour trough which defines value as a function of demand (Nase, Berry, & Adair, 2015). Nase et all, justly argue the contradiction between general goods and real estate property and underset the theory of Lancaster, which excludes the one-to-one relationship between general goods and utility. Both Griliches (1961) and Rosen (1974) developed the hedonic theory, in which the economic problem of spatial equilibrium is set within the implicit prices for consumer and producer locational decisions in characteristics space. Rosen further developed its model on the works of Lancaster concerning differentiated goods, formulating the hedonic analysis on a micro-economic basis. Dunse and Jones (1998) state that office buildings consist of several attributes, which are the characteristics. These characteristics make office building heterogeneous goods, which is on conjunction with the differentiated goods as elaborated on by Rosen and Lancaster.

The market consists of both consumers and producers for which Rosen determined supply and demand function for the individual characteristics of a certain good. The analysis showed that the price of characteristics is the result from individual supply and demand functions. The presented model makes it theoretically possible to identify supply and demand function for individual characteristics of goods (Nappi-Choulet et al., 2007). Rosen furthermore concludes that the characteristics of differentiated products could be treated as tied packages, which represent a comparable market value for that specific package of characteristics and the economic relationship becomes evident when the occurred price differences are seen as equalizing for the alternative package (1974, p. 54). These packages are often referred to as amenities which derive utility for the consumer, like size, location, presence of view etc. (Nase et al., 2015).

The models developed by Lancaster and Rosen have some fundamental differences. Lancaster distinguishes goods as members of a certain group, and some or all of these are consumed in combination. Whereas Rosen elaborates on a range of certain goods, on which an individual good

is chosen from the spectrum of goods and consumed discretely (Chau & Chin, 2003). Furthermore, Rosen (1974) describes that individual characteristic packages of a certain good cannot be combined. Therefore one could argue that the model of Lancaster is appropriate for consumer goods, while the model of Rosen is appropriate for durable goods, like real estate property. Therefore, the results of a hedonic regression can describe the influence of the different characteristics on the overall rent level or sales price.

The application of the hedonic regression analysis has been increasing during the past two decades. Several authors deployed the methods, to determine the significant of determinants for the variation in office rents. An extensive overview of these studies are elaborated on in section 2.3. There are several functional forms within these studies. Slade (2000) argues that within these studies, the log-linear model is most common and preferred function form for the analysis of rent variation. This is also argues by lBrennan, Cannaday, and Colwell (1984), who researched 5 function forms separately, namely linear, reciprocal, logarithmic, semi-log and log-linear, of which they determined by the Box-Cox test that the latter was the most appropriate form.

Main concerns of the hedonic pricing approach

The hedonic pricing approach is not a purely statistical approach, but finds its main principles and theoretical foundation based on the consumer theory by Lancaster (1966). It can be argued that the hedonic pricing approach is a very useful scientific tool, however also comes with its limitations. The main empirical issue is the determination of the appropriate functional form. There are several functional forms, like linear, semi-log and log-log forms, and choosing the incorrect one could lead to an inappropriate analyses of the data (Chau & Chin, 2003). Another limitation is that the approach is very data consuming, meaning that the input of the model consists of a comprehensive amount of data. Field argues that the correct data is imperative, as the data is fitted to the model and used to predict the value of the dependent variable from one or more independent variables (2009, p. 198). This is one of the reasons the hedonic pricing approach is very useful within the residential markets, as these properties are frequently traded and information (throughout brokers, internet, news adds etc.) is widely available. Deploying the method within the commercial sector has its implications, as transactions occur les often and the market is considered non-transparent (Lusht, 1997). The latter concerns also the possible misinterpretation of the function form, as missing variables can bias the estimates (Chau & Chin, 2003). They furthermore argue the difficulty of choosing the function form with no prior knowledge of the effect of the independent variables. Moreover, the increase of independent variables increases chances on misinterpreting the hedonic model. They conclude that however statistical theories can partially solve these problems, deploying the method still requires not only technical skills but also experience and judgement from the researcher. Dunse and Jones (1998) argue the limitation of the hedonic model, as they state that attributes are valued differently when combined with other attributes.

A spatial statistic approach within the real estate sector

Real estate is all about location, location location and this metaphor is a key principle within the real estate sector and the importance of space is agreed upon by all. Furthermore, within the commercial real estate sector is is very common to base market value not only on current market conditions and the location, but also on comparable sales of comparable real estate assets. Investors, appraisers and

market analysts do not only consider local conditions, but also incorporate local comparables within their valuation or market (Chegut et al., 2015). The application of this method is very common, as it is one of the three appraisal approaches, the direct sales comparison. Within this approach, pricing information of comparable sales and their value-determining characteristics are analysed (Lusht, 1997).

Researchers have deployed rather space less statistical tools (Pace, Barry, & Sirmans, 1998). The regularly deployed statistical tools which are designed for independent observations are experiencing violations by clustering of same sign residuals like neighbourhoods, infrastructure and facilities and underlying the optimality of these tools. These transaction rents, which are partially based on comparable sales, are used within the hedonic regression analyses of a large extent of previous studies in conjunction with the correlation of building characteristics in space, leading spatial correlation in prices. When spatial dependence in omitted, results may misrepresent the extend of correlation between transaction prices. These violations occur within OLS method, one of the most frequently deployed hedonic regression tools. However, within the field of spatial statistics, these dependencies are taking into account. This has a major influence on the outcome of basic OLS models, as including spatial dependencies provides more inference, which results in a better prediction and more efficient parameter estimates (Pace et al., 1998).

The past decade has seen a substantial rise in the application of spatial models, which have matured from primary application in regional science and analytical geography towards formal economic theories (Anselin, 2002). The path of spatial econometrics has been paved by Tobler, who theorized the “First Law of Geography”, which stated that “All places are related but nearby places are more related than distant places’ (1970). This could be considered the foundation of spatial dependence and spatial autocorrelation. The main application of this theory is within urban economics, and the application within real estate and hedonic models is considered a subdomain of urban economic theory (Nase et al., 2015).

Literature and general practical preference

Rent determinants on micro-economic level

The importance of rent determinants on the micro-level has been extensively researched among scholars. Within this section, several studies concerning the influences on rental variation by hedonic analysis will be discussed. Table 2 presents an overview of the studies which are examined within the next section.

Table 2: Overview hedonic office rent studies (Source: Own fig.)

Author	Study area	Study period	Dependent variable	R2	Observations	Model
Clapp. (1980)	Los Angeles	1973-1974	Rent	0,52-0,66	105	log-linear
Mills. (1992)	Chicago	1990	Rent	-	543	log-linear
Wheaton & Torto. (1994)	Various	1979-1991	Rent	0,37-0,75	60000	-
Sivitanidou. (1995)	Los Angeles	1990	Property value	0,06-0,59	1462	log-linear
Bolinger et al. (1998)	Atlanta	1990-1996	Rent	0,62-0,68	658-907	OLS, log-linear
Dunse and Jones (1998)	Glasgow	1994-1995	Rent	0,61-0,79	477	linear, non-linear
Slade. (2000)	Phoenix	1991-1996	Rent	0,25-0,30	Unknown (483	log-linear
Nitsch. (2006)	Munich	-	Rent	0,45-0,86	Unknown (46 properties)	Parsimonious, non-logarithmic
Fuerst et al. (2007)	Manhatten	1999-2004	Rent	0,28-0,49	870-950	OLS, Arellano-Bond model
Nappi-Choulet et al. (2007)	Paris	1991-2005	Price	0,89	2587	OLS, WLS
Ozus. (2009)	Istanbul	2007	Rent	0,51	94	OLS
Jennen & Brounen. (2009)	Amsterdam	2000-2005	Rent	0,53-0,56	1465	log-linear
Koster et al. (2011)	Amsterdam, Rotterdam, Utrecht and The Hague	1990-2010	Rent	0,68-0,70	4792	OLS

The rent determinant variables can be subdivided within neighbourhood, building-specific and accessibility/location variables (Des Rosiers, Thériault, & Villeneuve, 2000). This research focussed on the importance of cross influences between neighbourhood and accessibility variables to achieve an optimal model with a minimum of information loss. Previous studies provided empirical evidence of the location as rent determinants. However, Mills (1992) and Wheaton and Torto (1994) only apply dummy variables for submarket locations thus not providing actual evidence on variation on rent among different locations. Within the study of Des Rosiers, the residential cottage market of Quebec was analysed and showed, not surprisingly that the proximity to regional activity nodes, impacted household decisions to locate their which subsequently leads to higher demand and higher rents. The results show that appropriate neighbourhood factors could also be incorporated within the regression analysis of office markets to improve these models.

Clapp (1980) was among the first to develop a hedonic regression model for the purpose of explaining the influence of location on the variation in rents for the office market of Los Angeles. The hedonic model used the annual rental rate of 1974 as dependent variable, to determine the variation of the building characteristics and three location variables, distance to CBD, average commute time of building employees and square footage of office space within a specific radius of the location. Within the study a straight-line distance is used for distance to the CBD as well as the distance to the freeway. Data on average commute time by bus and car is gathered by interviews with building employees, which were indicators for accessibility. Empirical results show these location variables are all significant, although the importance of the distance to CBD was significantly higher. These outcomes resulted in the argumentation of Clapp that firms are willing to pay a rent premium for face-to-face contacts within the CBD (1980).

The study of Mills (1992) researched rent determinants, mostly focussed on amenities, within the Chicago office market. He analysed the dependent variable for the hedonic regression, which consisted of all present valued expected payments by tenants compared to the first-year asking rate. Analysing the empirical results and apply the goodness of fit measure, first year asking rents were proven to be more significant. Furthermore, the study contained a larger set of explanatory variables compared to previous studies. Mills argues that the empirical results of social facilities variables show a significant impact on the variation in office rents, and focussed on the proximity of banks and restaurants. He argues that firms are willing to pay a premium to be in proximity of these facilities, as

they reduce lunchbreaks. Empirical results showed furthermore that building size and location and nearby amenities were significant. However, Bollinger et al. (1998) argue the use of dummy variables for location which could not lead to significant factors that determine the variation in office rents. M^2

Within the research of Wheaton and Torto (1994) an extensive dataset was utilized with covered rental date of 50 metropolitan area's from 1979 to 1991. The main objective of the study is to develop a set office rent market indices and subsequently examine these to evaluate the relationship between vacancy and rental inflations. Empirical results show that lease lengths have a significant influence on office rents, as an increase of 2% per additional lease term year is visible within several metropolitan areas. The results on floor size variables show contra dictionary results, as they are both positive and negative significant depending on the specific metropolitan market. The main objective of the study was to construct a rental index and not an extensive analysis of rent determinants between markets. This is show by the use of mostly dummy variables for both building and location characteristics. Therefore, one could argue the utilization potential of the empirical results of rent determinants within this study.

Sivitanidou (1995) analysed the Greater Los Angeles area within her research to specify locational determinants of office rents. The main objective of the study is to evaluate the role of main and secondary service centres for firms. The research especially argues the inadequacy of traditional bid rent modelling, and develops a general equilibrium framework in which location demand and supply-side influences evaluate the impact of transportation nodes on the value of properties. To analyse the substitutability of sub centres in comparison to the CBD, she specifies several hedonic models to measure different assumption of substitutability. Empirical results show that the prestige of the office location is a significant variable, something that is also argued by Clapp (1980). To measure the accessibility, this concept is divided in two variables. The first is distance to the closest major airport, which was also included by Nitsch (2006). Empirical results show this variable is highly significant for the increase in property value. These estimates are in line with current market conditions in the Netherlands, as office rental rate within the Schiphol Area are around €400 per sq m, highest rates in the Netherlands (DTZ Zadelhoff, 2015). The second variable consists of the distance to the closest highway exit, which tend to be statistically insignificant. She argues this is due to small variations in highway distance within the data set, as well as the negative impact of traffic congestions nearby these locations. Another aspect which distinguishes this study among other is how amenity variables in relation to workers are included. These are operationalized as variables for crime rate, distance from the ocean, ratio retail employment and educational expenditure per student as well as zoning constraints. Empirical results show that all these variables are statistically significant.

Bollinget et al. (1998) study the Atlanta office region to determine the locational determinants of the rental level at various points in time. Their research distinguished itself by implementing multi-period data to determine direct measures of face-to-face contact and location of office employees. There is a growing interest to determine these locational factors and express the role transportation, access to labour and the face-to-face agglomeration affects have on the variation in rents. Clapp (1980) was among the first to research agglomeration effects as face-to-face contacts within the context of determinants of office rent. The distinction between the two studies is based on the assumption that these meetings could occur with no restriction in the urban area, while Clapp assumes these meetings only occur within the CBD and a suburban office market. Bollinget et al. particularly determine within their study that agglomeration effect do have an effect on the variation on rental

levels. They are among the first to provide actual evidence that face-to-face contact are in fact a significant determinant of office rents and furthermore provide evidence that agglomeration effects are indeed maximized within the CBD. By controlling for typical building-specific characteristics and contract terms within the hedonic model, they furthermore show that locational differences in wage rates, transport rates and proximity to services and office workers are all significant factors in the variation of office rents. The empirical results determine a positive impact on rents considering distance to the highway, but do show a converse reaction concerning proximity to railway station. Bollinger argues this discrepancy due to the adverse effect of crime and unsafe environments associated with the railway stations, although lacks the necessary data to underpin these arguments.

Dunse and Jones (1998) aim to identify rent determinants within the office market of Glasgow. Within the study, 12 dummy variables measure specific building amenities, like air conditioning, acoustic tiling, cellular layout, double layout, double glazing, indoor parking, security etc. Although regression coefficients and significance is not determined for all variables, empirical results show that double layout, security systems and reception area are insignificant. The results furthermore show that age and location are significant determinants of office rents. Empirical particularly show the importance of the CBD, in which they conclude that in spite of technological advances in IT, firms are still willing to pay a rent premium to be situated in modern building within the CBD.

Within the study of Slade (2000), office rent determinants are empirically research within several phases of the property market cycle. By deploying a time-varying parameter rent index, several periods within the property market cycle have been recognized, namely decline, trough and recovery. One of the analysed determinants is the load factor, which is the rentable floor to usable area ratio. Slade (2000) argues the positive correlation between office rents and the load factor due to the assumption that building with higher ratios have more amenities and elegant designs. This determinants has also been proven significant by Bollinger et al. (1998). Slade (2000) furthermore argues the high correlation between building height and building area, which could introduce multicollinearity within the regression. This results in the frequently used average building area or footprint instead of the aforementioned variables. The hedonic regression focusses on five important rent determinants during these different market phases. These determinants are all significant during the all phases. However, the empirical results show they are valued differently in specific market phases.

A parsimonious hedonic price analysis model is developed by Nitsch (2006), to analyse the impact of location on office rents within the office markets of Munich. The main objective of the study is to translate location towards a measurable concept Nitsch argues that location is modelled in two distinct methods. The first method concerns monocentric models and the rent gradient, which is estimated on Euclidean distance or travel time to the CBD. The second is accessibility, concerning public transport and cars. According to Nitsch, the concept of location can be reduced to three parameters, on which the model is particularly evolved, namely distance to city centre Marienplatz, distance to Munich airport and access to public transportation. These variables are highly significant, although variations in rents are mostly an outcome of the varying locations. One could argue the limitations of the minor dataset, which contained a set of 46 homogenous high quality buildings. Furthermore, as hedonic prices are suitable for a certain point in time, the current dataset is not taking time aspects into consideration. The dataset should therefore be adjusted to current market conditions. Finally, a larger dataset would be preferable, which could lead to a more precise analyses

and could furthermore provide the possibility to check current results for robustness.

Fuerst (2007) analysed rent determinants within the context of their variability across 15 submarkets of Manhattan and over time, in which three phases of the property cycle have been analysed. Commercial real estate markets are characterized by spatial constraints, product differentiation and information asymmetries which leads to economically segmented markets. Results show that rent determinants differ significantly across submarkets. Furthermore, the building-specific variables varied more in comparison to the location variables. The study also determines the weight or influence of individual rent determinants differs significantly over time in accordance to its position within the real estate cycle. These property cycle related findings match those of Slade (2000). Fuerst deployed a hedonic regression separately for each time period and submarket, which are subsequently analysed by full panel data models.

Within the study of Nappi‐Choulet, Maleyre and Maury the office market of Paris is examined (2007). The main objective was to determine the impact of spatial and building characteristics on the transaction prices of office properties. Using the transaction price as dependent variable in the regression analysis, rather than the transaction rent differentiates this study among the rest. In the second part of the study, a property price index is proposed which is the reason for using transaction prices rather than transaction rents. The research determined that the Parisian office submarkets are characterized by relatively contrasting behaviours. Compared to the submarkets, transaction prices within the Golden Triangle and La Défence are respectively 51% and 62% higher. The study furthermore estimates that building age is not significant, however significant difference is observed between transaction prices in accordance to their age. The authors argue that the use of a new/second hand variable, which is implemented to to French taxation rules, could remove some of the explanatory power concerning building age as many Haussmann style building were renovated during the 1990s.

Ozus (2009) applied a hedonic model to analyse that office rental prices are not solely reflected by their physical characteristics, but that also its socio-economic environment as well as surrounding amenities are significant factors within the office market of Istanbul. This city is experiencing an increasing demand for large modern office space, due to its strategical location and growing importance in world business. However, the former CBD could not provide sufficient space for new developments, which led to a multi-centre development. These sub centres contain a different set of characteristics with respect to its location, urban quality, density and amenities. The results show that the number of floors is one of the most determining factors of office rent but shows contradicting results in comparison to the proposition of this thesis research as results show while the number of floor increases the office rent declines. However, there are several studies that contradict these results and determine a positive relationship between rent and office floors (Bollinger et al., 1998; Koster et al., 2014; Slade, 2000). Other important factors are the vacancy rate, social facilities in the building (conference halls, sport facilities, clubs which increase marketability of the building), building aesthetics and architectural quality, floor space, nearby banks and restaurants and accessibility. There are several factors which are not significant within the study, like management costs, sea view, age, distance to CBD and highways. However, the latter is could be caused by the location of the office sub centres which are located along major highways. With respect to age, the author argues the presence of a large sample of relative recently constructed A class office buildings which could subvert the

significance of this variable.

Jennen and Brounen (2009) examine the office market of Amsterdam between 2000 and 2005. Their main objective is to analyse the effects of clustering on office rents. Clusters density and location quality over the geographic pane are controlled by GIS methodology and building characteristics are controlled within the cross-sectional hedonic model. Several dummy variables are included for the different sub centres of Amsterdam. Empirical results show that clusters are highly significant and have a positive effect on the rental level, regardless of prevailing market conditions. They argue that this effect is caused by location externalities and agglomeration effects. The results show that despite technology advances in telecommunications, firms are still willing to pay more to be situated within office locations and are in conjunction with the previous results of Bollinger et al. (1998). They furthermore determine that within the Amsterdam market, location and size characteristics are significant as well as the age of buildings. The proximity to train stations have a positive effect on the rent level, while the proximity to highways has a negative effects, which is in conjunction with the results of Sivitanidou (1995).

Within the study of Koster et al. (2014), the effect of building height on variation in office rent is researched. They furthermore differentiate between additional office rent premiums for reputation as well as within building agglomeration effects, as proposed by Helsey and Strange (Helsley & Strange, 2008). Empirical results show a rental increase of approximately 4% for a building height increase of 10 m. However, one could argue the use of building height as a variable, as office building contain different floor to floor heights. While the study focusses on high-rise structures, one could argue a difference of 20-30 cm of floor to floor height could lead to an additional level if the building is higher than 20 floors.

To conclude, previous studies all incorporated various variables as rent determinants to examine the change in office rents. These variables are included in Appendix B. Previous studies deployed various variables to analyse specific effects, like vacancy, location or forms of transportation. Office markets are highly segmented, meaning that specific rent determinants act differently in different markets. However, the most significant, and mostly deployed rent determinants within previous studies are age of the building, floor size and accessibility by various transportation methods (Fuerst, 2007).

Reflection

Relevance

Academic relevance

This thesis could add to the currently lacking academic body of knowledge concerning premiums for high-rise buildings. Most of the current literature is towards the investigation of developments of high rise buildings, underutilizing the building economics. Koster et al. did extensive research towards agglomeration within cities and office rents. More specific, they researched rent premiums and

argued that tall buildings also facilitate both internal and externals returns to scale and induce reputation effects which resulted in a rent premium (2014). Deploying a follow up research into rent premiums in the office markets of Amsterdam, Rotterdam and The Hague, where analysing this aspect on object and unit level could lead to a more comprehensive understanding of significant building and neighbourhood characteristics. The analysis on floor unit level could lead to a more comprehensive understanding of rent determinants for office buildings and specific office floors. These aspects would all be valuable attributes to the excising body of knowledge.

Societal relevance

Cities are designed for people. The increasing urbanisation could have a significant impact on the contemporary urban fabric and quality of life. Glaeser argues that cities magnify the human strengths (2011). Jacobs argues that people are most productive and innovative within cities (1970). But whereas Jacobs looks to the virtues of small scale neighbourhoods and mixed functions, Gleaser envisions high-rise. He proclaims that greater density is the goal, as denser cities are more sustainable and waste less of the hinterland. However, greater density within cities should always be balanced and should concern the many socio-economic issues regarding the society (Ng, 2009). He states there is no coherent view on high-density living among scholars. This research could provide more insights within the economic and qualitative aspects of high-rise office buildings within the existing and future urban fabric.

Utilization potential

The empirical results of this research could prove to be beneficial for a large variety of stakeholder participating in the real estate sectors, like investors, brokers, appraisers and policy makers. These respective stakeholders have vested interest in understanding the office markets and its dynamics (Slade, 2000). It could provide an immediate practical application, concerning the price attribute as benchmark within the valuation process. One could argue that the precision of the final value estimate would increase significantly with more accurate income forecasts. If rent premiums are incorporated within the forecasts of the valuation process, the Net Operating Income could increase by y%, which results in a y% increase in the final value estimate, thus having a more precise estimation of the real estate asset. These estimates would also be beneficial for both investors and developers, as the empirical results could provide more precise within the feasibility analysis for new developments. It would provide empirical results on which policy makers could base taxes for commercial rents. Koster determined that regulatory tax is independent concerning the height of the building (Koster, 2013). Therefore, one could argue that municipalities would benefit from empirical results which determine the extent of the rental premiums on which they could base taxation. It could furthermore provide an overview of both building and neighbourhood characteristics which positively influence the rent and subsequent rent premiums of (high rise) office buildings within the Netherlands. This overview could be beneficial for property developers, architects and urban planners. Finally, it would be beneficial to end user of commercial office space, as it would increase transparency concerning office rents. These firms could be provided with more information on rental prices, on which they could analyse the cost-benefits analyses for moving and opportunity costs.

Main objective

This thesis tries to further extend the research into rent premiums for higher office floors in Amsterdam, Rotterdam and The Hague, determining the specific premium and the significant

influences. The main goal is to achieve a more comprehensive understanding of the specific building and locational rent determinants for higher office floors. Furthermore, this research will build upon previous research and tries to extend its analysis from a building high perspective to the specific floor unit analysis. This could lead to a more comprehensive understanding of rent premiums for specific floors and the building and neighbourhood rent determinants that specify this premium.

Time planning

The figure below shows the planning of the research up until P5. The left part of the figure shows the phases of the thesis, reaching from theory to evaluation and finally an overview of proposed presentation dates. The second columns describe the proposed objectives, also describe in the research design. My aim is to graduate before December, however I keep in mind that the research could be extend up with three months. This is also in conjunction with my graduation internship, which is flexibly planned between November and January. The orange part of the figure shows the time I spend with the BOSS studytrip, in which I am not able to work on my thesis.

The planning starts right after P2, in which the subsequent week is for feedback revisions, and discussing the starting point of the hedonic model. The subsequent 4 weeks are BOSS studytrip. I start with DTZ on the 7th of August, in which this time period will be used to examine and evaluate the data as well as getting familiarized with the company and workload. The analyses of data will determine which plan is being utilized, and will be clear before September. Afterwards, time divided in formulating the model as well as applying it. P3 is a determinant of the functioning of the model, in which revisions could be made within the model itself. The subsequent weeks are to apply the model, get results and categorize these results and analyse the data to form preliminary conclusions. The last part of the thesis is towards finalizing the thesis report and P5 presentation.