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Impact of consumption amenities on house prices

Martijn Visser
m.j2.visser@student.vu.nl – 2647931
Supervisor: J. Rouwendal
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Abstract

This study explores the capitalization of local amenities into house prices using the hedonic pricing method, which allows the decomposition of property values into their constituent characteristics. The primary research question investigates the extent to which local amenities influence house prices, with specific sub questions examining the predictive power of housing characteristics, of retail and horeca amenities, lifecycle preferences and city level variations. Overall, the study highlight the nuanced and context dependent nature of amenity capitalization into house prices.

1. Introduction

Traditionally, most research in urban economics and economic geography on why some cities are more attractive than others has focused on the production side of the economy (Rosenthal & Strange., 2004). This focus primarily considers different internal and external economies of scale. Several researchers have shown which types and on what scale determined the city's population and economic growth (Glaeser, Kolko & Saiz., 2001). Classical theories by Alonso (1964), Mills (1967), and Muth (1969) predict a decline in land prices and density of land use with distance from the city centre. However, the reality is often more complex due to secondary and tertiary employment centres, scattered spatial amenities and disamenities, and neighbourhood characteristics. These factors can create neighbourhoods that deviate from general trends (Redfearn., 2009).

Modern urban economics research, initiated by Roback (1982) and Graves (1982), views cities as consumer cities. Consumer cities that are more attractive to live and work in are more successful (Glaeser et al., 2001). Attractive cities are usually determined by natural and constructed urban amenities to understand why people prefer some cities over others. People usually do not follow jobs, rather their settlement is created by amenity-rich cities (Glaeser & Gottlieb, 2009). Recently, there has been a debate on the importance of urban amenities compared to more standard agglomeration effects. Due to a lack of data, especially on constructed urban amenities there is less studies done on the effect of constructed amenities on attractiveness.

Agglomeration forces are also related to demographic factors. This refers to population growth and housing composition. Households are decreasing in average size, especially in Europe (Kabisch & Haase, 2011). The consequence of this trend is an increase in land demand for housing on top of the population growth (Liu et al., 2003). Smaller households are one of the reasons why even when the population shrinks, urban areas can still expand (Haase et al., 2013).

Another force influencing urban dynamics is related to locational dwelling preferences. Suburbanization was the dominant process during the 20th century. However, more recent evidence shows a countertrend with re-urbanization. Most of this trend is caused by housing-led population growth and new dwellers, i.e., expats or young adults. Urban amenities seem to attract young urban people seeking close cultural and leisure activities accessible by public transport (Thomas et al., 2015). Moreover, different age groups have different attitudes towards the urban centre, fuelling spatial sorting processes within the neighbourhoods . Recently, the growing importance of urban amenities has received substantial attention in recent urban economic thinking regarding the factors that make some cities more attractive than others (Glaeser et al., 2001; Storper & Scott, 2009).

1.1 Amenities

Amenities define as location-specific goods and services that make locations more attractive for living and working. The definition of an amenity is often broad those that relate to urban qualities and those that relate to natural assets. In the most broad sense urban amenities are defined as 'the externalities generated from agglomeration of people, firms, private and public goods and services transportation facilities and physical infrastructure' (Andersson & Andersson., 2006).

Natural amenities are grouped as climate, topography and water resources, those amenities are often treated as exogenous amenities as they tend to be untied according to by current literature (Nilsson., 2015). There has been an emerging literature on amenities and their relation to growth and development (Roback., 1982). Brueckner et al. (1999) argues that amenity rich areas are able to attract high incomes and creative people. Other studies have also shown that amenities affect job growth (Deller et al., 2001) and generate compensating differentials in labour as well as housing markets (Schmidt & Courant., 2006).

Urban amenities are a crucial determinant of the urban economic growth of many contemporary cities (Bruckner et al., 1999). Roback (1982) was one of the first to argue that differences in amenities or the quality of life may cause substantial wage and house price differential among cities. Urban amenities may not only be crucial for the growth of cities but may also impact the urban spatial structure and critically determines in location choices of households within the city.

Different literature has discussed the relative importance of amenities on residential property for different countries. Most literature focuses on the amenity literature for the United States (Glaeser et al., 2001;). Only recently studies with amenity on the housing market in other countries started to appear (Song et al; 2022; Garretsen & Marlet., 2017). For the Dutch case people can easily switch jobs as most cities appear in acceptable travel distances. For estimating amenity under US literature pop growth is determined as dependent variable. Yet this variable is not applicable in the Netherlands due to a combination of stricter planning policies, low housing supply elasticity and limited regional wage differences. In line with Garretsen & Marlet (2017) result into higher house prices in cities with better amenities or job opportunities.

In this thesis the relationship between housing prices and amenities for 8 Dutch cities is further investigated. It is of importance to measure the capitalization of local amenities. Capitalization is commonly estimated in assessing how market price proximity to locational amenities and disamenities alike. We opt for 8 different cities within the Netherlands with the use of NVM Data. Overall, the capitalization of urban amenities into house prices across these eight Dutch cities underscores the diverse factors at play, from economic opportunities and cultural assets to historical significance and urban development strategies. This comparison highlights how local amenities can significantly influence real estate markets, reflecting the unique allure and practical benefits of each city.

1.2 Intertwining Amenities and house price dynamics.

It has been well documented that house prices have varied substantially across different metropolitan areas over the past few decades. Recent studies have concluded that this variation is not only explained by housing characteristics commonly described in literature. Therefore further research is warranted to explore and include microeconomic factors that can explain house price dynamics. Locational attributes have been an important factor on the house prices as Kiel & Zabel (2008) describes.

Most recent literature explores the relationship between local amenities and house price dynamics separately, we know very little about the intersection of these topics. Due to this reasoning the symmetry in the relation between house price dynamics and amenities should be explored (Beracha et al., 2018). Beracha et al. (2018) argue that recently only separate studies on house price dynamics or land supply constraint literature have emerged where high house price are correlated within high amenity areas and vice versa. However to what extent these amenities affect the house prices should be explored into more detail.

First land supply constraint literature as argued by Glaeser & Gyourko (2005) find that land supply constraints amplify house prices and volatility by creating scarcity, decreasing responsiveness to demand shocks and increasing time to develop and adding costs of supplying new houses. Secondly, land share literature where Davis and Palumbo (2008) show that house price appreciation and volatility are higher in areas where land comprises a larger share of total house value. This is however a straightforward theory where land comprises a larger share of total house value.

In the paper by Beracha et al., 2018) two important points regarding the price dynamics. Structure appreciations is bound by the net effect of changes in construction costs and depreciation. Land appreciation is effectively unbound as supply and demand shocks in local economy are capitalized into land values, not structure values.

Therefore, demand shocks for amenities specifically are correlated with demand for housing and amenities are local public goods that are quasi fixed from the households perspective. Hence, the willingness to pay for amenities will be capitalized into house prices and will be a key component of the observed relationship between land share and house price dynamics (Beracha et al., 2018).

1.3 Household and firm location preference literature

Why amenities might be significant determinant of house price dynamics. Of these studies, Glaeser & Saiz (2003) suggest that educated cities have higher growth rates than comparable cities with less human capital, and that skilled cities are growing because they are more economically productive and more adaptable to economic shocks. The hypothesis is in line with Beracha et al (2018) and Peng & Thibodeau (2017) where property level attributes and locational attributes such as amenities contribute to higher house prices. House price volatility is therefore also composed of these two sources of variation: fluctuations in market’s valuation of property specific attributes and fluctuations in market capitalized valuation of amenities into house prices and the covariance between one another (Beracha et al., 2018).

Amenities are often shown to be more capitalised into housing prices than into wages and are shown to become increasingly important in households location decisions (Rappaport., 2009). Most of those studies focus on the housing prices using the hedonic price approach introduced by Rosen (1974). Hedonic price analysis is presumed to choose their place of residence based on the bundle of local amenities offered at that location based upon microeconomic theory founded by Tiebout (1956). Empirical examples have shown that accessibility to urban areas and their amenities are significant in explaining local variation in house prices (Adair et al., 2000). Well established studies concern the proximity to natural resources who adds premiums to housing prices (Anderson & West., 2006). Another interesting perspective is given by Gaigné & Thisse (2009) where spatial heterogeneity in amenity affect is determined by demographical factors. They show that location preference for seniors is significantly different from those of workers. Therefore the demand for amenities is influenced when non-earning incomes are introduced and when households become less associated with job accessibility.

1.4 Urban hierarchy and amenities hypothesis

In our research we follow the hypothesis by Nilsson (2015) that households expect to pay a premium in locations that are rich in amenities if these amenities have economic value. In this manner there is increased competition to live in locations that are rich in amenities and that the demand is large relative to the supply at those locations. Amenities are location-specific and compensating differentials in house and labour market vary significantly across space. Thus, the effect of natural amenities are expected to vary spatially due to a range of different factors in growth mechanisms and resource policy.

There is some form of hierarchy where the market size and transportation networks drives the locational patterns. Partridge et al. (2009) show that variety and magnitude of consumer amenities can be places in an urban hierarchy. They argue that large and denser urban areas (thus bigger cities) are associated with higher agglomeration economies. Moreover denser cities have a more complex industry structure and able to provide all the services of smaller urban regions plus new ones for which demand is first met at that urban size (Partridge et al. 2009).

Within our dataset we observe different data upon retail and Hotel Restaurants or Café spots (see next section). Literature of those amenities affecting house prices is however limited. Earlier studies done by Ossokina et al. (2024) and Koster et al. (2019) found that shopping centres affect the shopping rents due to vacancy and footfall. Yet not much research has been done on what the effect of retail shops can have on residential properties. Koster et al (2019) however argued that shops experience positive externalities from locating close to one another, yet if and to what extent these effects could be exacerbated to households is the central point of this study.

2. Research Question

The primary research question is: To what extent do Retail and Horeca amenities capitalize into house prices?

Specific sub-questions include:

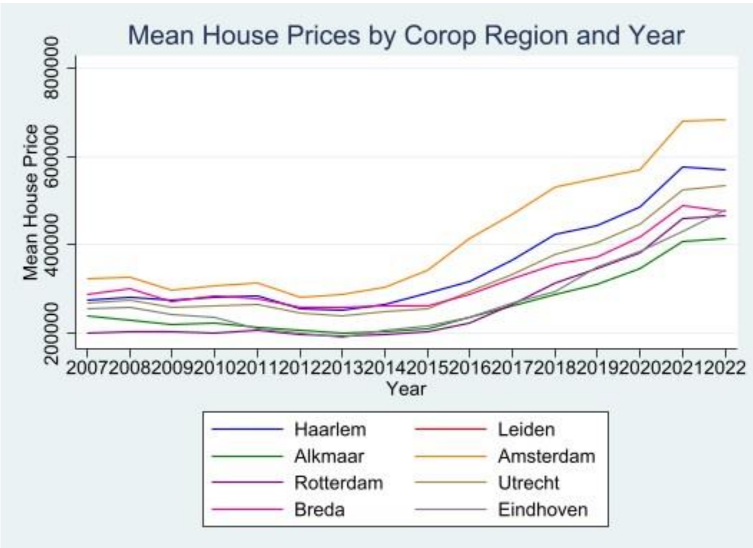
1. To what extent do housing characteristics predict the house prices?
2. What amenities are most relevant in determining house price?
3. Is there a difference in home buyers' preferences between property types due to lifecycle preferences?
4. Do the estimated amenities differ per city?

3. Interregional Comparison

A spatial analysis on the Dutch most dense cities brought us with a more denser development in the most inner city area. My hypothesis is to compare a dataset with 8 cities in total. Different high demand regions in terms of labour market opportunities, social amenities or education opportunities have a distinctive characteristic compared to smaller cities. In the following paragraphs will we describe the amenity rich and regular cities, respectively.

Amsterdam, the capital city, leads with its vibrant cultural scene, extensive public transportation network, and proximity to international businesses, which collectively drive house prices to premium levels. Similarly, Utrecht benefits from its central location and historical charm, contributing to a competitive housing market. Rotterdam, with its modern architecture and major port, also sees higher house prices due to its economic opportunities and urban renewal projects. Eindhoven, the technology and innovation hub, experiences rising house prices stimulated by its strong job market and influx of highly skilled workers.

In contrast, cities like Leiden, Alkmaar, Haarlem, and Breda, while not as large, still exhibit significant house price increases due to their unique amenities. Leiden, with its prestigious university and historic canals, attracts both students and professionals, pushing property values upward. Alkmaar has their cheese market and picturesque old town contributing to a steady housing market. Haarlem, close to Amsterdam, benefits from its charming city centre and quality of life while located relatively close to the beach. Breda, with its strategic location and vibrant cultural scene, also shows robust house price growth.



Graph 1 source NVM

On the graph the average household price with the average household for 2007-2022 for all 8 cities is provided. Moreover the density in terms of amenities of every city within a 1km reach on a national level and city specific level is given based on information publicly available by CBS Statline.

Category	Netherlands	Alkmaar	Amsterdam	Breda	Eindhoven	Haarlem	Leiden	Rotterdam	Utrecht
Supermarkets	2,0	1,9	5,6	2,3	2,6	3,3	2,7	4,5	3,3
Other stores	8,5	9,9	29,8	9,4	6,5	16,1	15,8	25,0	11,7
Warehouses	2,5	3,5	7,4	3,2	5,4	5,0	5,4	6,4	7,0
Cafes	4,1	4,5	17,0	7,0	6,3	8,7	9,8	12,9	5,3
Cafeterias	6,8	7,7	23,2	9,4	10,4	14,6	12,1	20,3	12,4
Restaurant	10,1	12,3	54,6	11,0	11,9	23,7	25,1	20,2	20,6
Hotel	18,3	8,3	211,0	11,2	18,3	20,6	20,2	32,5	24,7

Table 1: Density of amenities on national and city specific level

4. Data management

We base our empirical analyses on various datasets. The first dataset in originated from the association from real estate brokers. It compromises transactions of all residential properties from 2007-2022. The dataset contains geocoded data for spatial analyses but more interestingly for this paper, data on house prices. For simplicity which has also been done by another study by Garretsen & Marlet (2017) we used the house price as dependent variable for our regression. Other dependent variables are the price per square meter, listing price and listing price adjusted, those variables are interesting but beyond the scope of this study for considering a more detailed view. Other relevant variables include the housing characteristics such as rooms, size, lot size, size other i.e. balcony or roof terrace and year of construction included as dummy.

The other dataset for our empirical analyses concern the publicly available data by the Central Bureau of Statistics. On their website if database portal we extracted the relevant data of proximity to amenities and demographic and socioeconomic variables. For proximity to amenities dataset contains data on a neighbourhood level for all different sorts of amenities. Their dataset contains information on education, health, social and cultural amenities. For this paper cultural Amenities such as their 'retail' and 'horeca variables (Hotels, Restaurants & Café) were used. The last dataset contain information on income and demographic factors. The 'Kerncijfers' dataset contains relevant demographic and socioeconomic factors including household type, average income per household and civil status. Those factors are largely included for interaction variables and the change in household preferences.

We merged all three dataset into Stata where Neighbourhood identifier is used as similar variable within each dataset. With the command **Merge** and **Tostring** 'Nid' in the statistical software all other variables were merged into one dataset. More importantly we have excluded the outliers and named the variables correctly to one another. The finalized version of the three dataset contained information about the consecutive years 2018 until 2021. Due to missing data on a neighbourhood level for amenity and socioeconomic variables we could not extent the data to earlier years.

4.1 Descriptives

In this section we describe the descriptive statistics for the main variables that we include in our analysis. The second table we make use of the descriptives of the NVM data. In the period 2018 there were 97.089 transactions within all cities were analysed. The average price within the '18-'21 is 468.882 for a household. We analysed those 4 years because of the additional datasets which were only available for those years. Other household characteristics are distinguished by number of rooms, size, size other, lot size, year of construction, garden and type of property. As every household has their own preference in terms of living. All of these household characteristics should be taken into account. The average household contains 4 rooms without any dissertation between living room, kitchen, bathrooms or sleeping rooms. Moreover the average household contain a mean of 104 square meters, the size deviates substantially with a 52 standard deviation.

The type of property is further distinguished into apartment, terraced, semidetached and detached. All of these variables function as a dummy variable. The largest share of residential properties is an apartment whereafter terraced, semidetached and detached follows. Another important variable is the year of construction, the mean construction year is 1957. Whereafter the year of construction in deviated into different time periods. Most remarkable about the dummy variable is that the largest share sold within the 2018-2021 period is originated from dummies with construction year before 1960.

Table 2 Descriptive Statistics NVM Data

Variable	Obs	Mean	Std. Dev.	Min	Max
price	97089	468882.89	320755.56	52500	9950000
daysonmarket	97089	43.247	88.944	0	3842
size	97089	103.915	51.359	25	1954
size other	97089	17.502	322.016	0	100032
lotsize	39399	747.054	100762.12	1	19999998
rooms	97089	4.051	1.634	1	24
apartment	97089	.586	.493	0	1
terraced	97089	.27	.444	0	1
semidetached	97089	.115	.32	0	1
detached	97089	.029	.167	0	1
garden	97089	.688	.463	0	1
constryear	89069	1957.303	49.594	1005	2022
constrlt1905	97089	.12	.325	0	1
constr19061930	97089	.177	.382	0	1
constr19311944	97089	.111	.314	0	1
constr19451959	97089	.071	.257	0	1
constr19601970	97089	.106	.308	0	1
constr19711980	97089	.068	.251	0	1
constr19811990	97089	.091	.287	0	1
constr19912000	97089	.078	.267	0	1
constr20012010	97089	.12	.326	0	1
constr20112020	97089	.058	.233	0	1
constr20212030	97089	.001	.032	0	1

The second dataset contains information about proximity to amenities on an neighbourhood level originated from the Central Bureau of Statistics. Here the data is measured as 'average distance of all citizens in a particular neighbourhood to the nearest amenity calculated via an official road' (Central Bureau of Statistics., 2024). Besides the average distance from amenity, different presence variables measure the inclusion of another amenity on a neighbourhood level. The presence of a certain shop is defined as the average numbers of shops (within retail or horeca sector) within a 1km or 5km calculated via an official road. In CBS a variety of radiused can be found ranging from 1 to 10 kilometre. In this study the most near variables are concerned as insightful, we excluded broader radius variables as their impact would not affect the direct environment for the neighbourhood.

The second descriptive statistics table provide an overview of the various amenities and facilities included in the study, with each category representing a broader group of establishments. For example the category 'Ovlevensmiddelen' meaning 'other stores' includes a diverse range of food-related amenities such as bakeries, grocers, fishmongers, butchers, delicatessen stores, liquor stores, nuts stores, and wine stores (CBS., 2024). These establishments collectively contribute to the local food retail environment. Other groups are supermarkets, warehouses, café(taria), restaurants and hotels whom are categorised into a broader labelled name. The last amenity is grouped as accessibility amenity, most of these amenity are determined as pure exogenous and therefore included in the analyses.

Table 3 Descriptive Statistics CBS proximity to amenities

Variable	Obs	Mean	Std. Dev.	Min	Max
grotesupermarktafs~d	97085	.549	.369	0	6.6
grotesupermarkt1km	97085	4.286	3.498	0	18.7
ovlevensmiddelenaf~d	97085	.442	.38	0	6.7
ovlevensmiddelen1km	97085	23.237	26.499	0	178
warenhuisafstand	97085	1.534	1.02	.1	12.4
warenhuis5km	97085	7.391	4.073	0	17.2
cafeafstand	97085	.743	.755	0	7.1
cafe1km	97085	14.014	24.464	0	230.7
cafetariaafstand	97085	.421	.342	0	6.6
cafetaria1km	97085	20.882	28.639	0	261.1
restaurantafstand	97085	.421	.346	0	3.9
restaurant1km	97085	35.829	56.824	0	375.3
hotelafstand	97085	1.399	1.168	0	7.1
hotel5km	97085	102.267	141.868	0	396
hoofdverkeerswegaf~d	97085	2.015	.915	.1	5.6
treinstationafstand	97085	2.469	1.819	.2	18.1
overstapafstand	97085	3.889	2.591	.3	20

The last dataset contains information about the demographic and socioeconomic variables on neighbourhood level. Some important information is about the household demographic factors. Some of these factors are the civic status, household family status and income. In our last research question we want to delve deeper into what type of households prefer to live nearer or further away for certain amenities. Moreover we used the standardized income per household as income control variable. For the income variable 'geminhh' give a mean of 33608 with a deviation of 10.218.

Table 4 Descriptive Statistics Socioeconomic and demographic factors

Variables	Obs	Mean	Std. Dev.	Min	Max
ongehuwd	97089	2856.921	2403.079	0	14760
gehuwd	97089	1408.752	1468.634	0	9700
gescheiden	97089	402.364	451.013	0	3090
verweduwd	97089	182.773	283.991	0	2215
huishoudenstotaal	97089	2471.306	2197.556	0	14040
eenpersoonshuishou~n	97089	1200.182	1119.502	0	6455
huishoudenzonderki~n	97089	584.577	530.163	0	3485
huishoudenmetkinde~n	97089	686.571	690.693	0	4490
gemidhuishoudensgr~e	97086	1.955	.358	1.1	3.6
bevolkingsdichtheid	97085	11068.769	7059.398	12	36770
woningvoorraad	21550	2430.13	2253.22	0	14234
eengezinswoning	21531	33.857	30.994	0	100
meergezinswoning	21531	66.15	30.987	0	100
gemiddeldinkomenpe~r	96899	32.154	9.569	12.7	134.4
geminhh	96749	33.608	10.218	8.4	143
huishoudensmetlaag~n	96862	43.867	13.971	2.6	95.9
huishoudensmethoog~n	96862	21.28	11.995	.5	72.5
mediaanvermogenvan	96862	78.076	128.118	-8.5	2688.8

5. Methodology

5.1 Literature review on hedonic pricing

First work dates back to 1939 where Court (1939) model automobiles as a function of their characteristics. According to several scholars Bartik (1987), Goodman (1998) verify Court as the frontrunner on hedonic pricing analysis. According to Goodman (1998) is serves as fundamental on hedonic pricing due to coping with nonlinearity and underlying good bundles. Most important theoretical foundations for the HPM are the Lancaster's consumer theory and Rosen's model. Lancaster (1966) published micro economic foundations for analysing utility-bearing characteristics and applies into housing market, labour leisure trade-off and demand for money. In his model (Housing) characteristics are connected to fixed relationship called household production function. Lancaster's consumer theory argues that the good itself does not create additional utility but the individual characteristics do.

Rosen (1974) further extended the model with clarifying the relationship with conventional supply and demand analysis, providing the link with standard micro economic theory. He showed that the marginal price characteristics with respect to that characteristic is the marginal willingness to pay. In Rosen's model a nonlinear relationship between heterogenous good and their inherent attributes. Implicit price is in respect not general but a function of the quantity and of other attributes associated with the good i.e. amenities (Rosen 1974). Earlier study investigating the relationship between amenity attributes and residential property prices date back to 1957. Where Hayes (1957) studied the effect of amenities on land value. Nelson extended this idea through emphasizing the Willingness to Pay for amenities. While Brigham (1965) suggested to measure each amenity separately that might impact residential land values.

A hedonic analysis approach 'measures the implicit price of goods that are not explicitly traded In markets, but are characteristics of the traded goods' (Freeman, 1981). Price of the house is a function of the physical, amenity, accessibility and quality attributes.

Housing preferences might differ by stage in a person's life cycle. Michelson (1968) suggested that single and married couples without children prefer apartment to homes, but families prefer homes over apartments. It is however natural to think that different types of households have different types of consumption amenities, and firms providing such amenities anticipate to this heterogeneity. i.e. Gentrifying neighbourhoods the increase of young urban professionals provide an typically accompanied by an increase in the presence of cultural amenities and reduction in family stores.

5.2 Hedonic framework

For our theoretical framework a review of the Hedonic Price Method literature done by Herath & Maier (2010). A regression analysis is the most popular estimation approach among scholars. A multiple regression approach is utilised as OLS regression or a maximum likelihood function. Both techniques estimates the bundle of vector of parameters that best matches the values of explanatory variables of observations with the respective observed price. The explanatory variables may be the characteristics values or mathematical transformations thereof, dummy variables or panel variables making it possible to allow for non-linearity. Altogether the information can be used to construct a price index that can be used to compare the price of constant quality housing in different cities (spatial aspects) or a longer period within one city (temporal aspects).

In practice a more general formula of the classical hedonic equation is applied

$$R = f(P, N, L, C, t)$$

Here R is determined as the house price. P specifies the property related attributes, N is neighbourhood characteristics, L is locational variables, C is contract conditions, t indicates time. In practice, most variables are applied to scholar's preference or the availability of data.

Functional form of the hedonic price regression equation can be linear, log-linear (semi-log) or log-log form. Most commonly used in literature is the log linear model due to it most suited interpretability. The heterogeneity of houses, buildings and other real estate property justifies the use of HPM for estimating by their demand or value. Therefore the HPM takes into account the properties of real estate separately and estimates prices based on the assumption could be separated into characteristics such as housing, infrastructural and locational attributes.

According to Dubin (1998), hedonic modelling presents two primary challenges, particularly concerning the omission of spatial effects (LeSaga & Pace, 2009). One of these challenges includes spatial autocorrelation and spatial heterogeneity (Helbich et al., 2013). Spatial autocorrelation arises when houses are situated in close proximity to one another, as values observed at a specific location tend to be influenced by the values of nearby locations (Tobler, 1970). Spatial heterogeneity refers to the variation in relationships across different locations, implying that the impact of certain factors may differ depending on the spatial context in which they occur.

Within the house price modelling, the omitted variable bias is a well-documented problem (Abbott & Klaiber., 2010). Although we included a variety of retail and horeca amenities. The following additional measures further eliminate any remaining influence of omitted variable bias. Since differences between districts are considerable, the strategy used in this inquiry is incorporating fixed effects for yearly house prices as they might be influenced by other macro-economic conditions and control effects for income reducing the effect were high income households lives in high amenity areas and vice versa.

Initial studies have estimated the impact of amenity accessibility on residential property prices have treated housing as homogenous good. Initiated by economic researcher Tiebout (1956) the impact of housing characteristics on residential location decisions and demand for housing is of considerable interest to economic researchers. Sale price of a housing is the sum of the values of numerous site, structural and locational attributes (Li & Brown, 1980). Li & Brown indicate site and structural attributes as number of rooms, construction year and other housing attributes whom are quantifiable. Other authors noted that a housing market can be differentiated by their property type, structural characteristics and neighbourhoods characteristics (Goodman & Thibodeau 2009).

On the other hand, locational attributes such as accessibility, provision of public goods and amenities overall are more difficult to observe and quantify. For locational attributes we estimated different the proximity for amenities for every year. There is importance of differentiating the housing submarkets when estimating the impact of amenity accessibility on sale price variations (Redfearn., 2009). In the results section an overview is made based upon the different views on described by Li & Brown, Goodman & Thibodeau and Redfearn. Relevance in terms of urban policy-makers and real estate developers can use these results to inform land use and planning in metropolitan areas.

5.3 Illustrative examples and other studies

Great impacts in the environment have always impacted the property prices. This follows the simple reasoning where households prices are directly related to the living preferences of people (Droes & Koster., 2016). For illustration: there are two identical household in terms of household characteristics however one household is adjacent to a high density of cultural amenities and the other households is situated far away from cultural amenities. Due to macroeconomic conditions the household closer to the high density area gain with 15.000 euro while the similar household without many amenities increases only with 10.000. Here a relative incline in property value has occurred, attributable to the locational attributes surrounded in the amenity rich household.

In the field of urban economics we quantify the preferences and quantify the Marginal Willingness to pay of people for location and housing characteristics (Koster & Rouwendal., 2020). Here they also argued that the willingness to pay for housing not only compasses these housing characteristics but also benefits of thus public goods and amenities. The hedonic price analysis is in essence a 'description of the equilibrium prices of varieties of a heterogenous good, which is influenced by supply and demand' (Koster & Rouwendal., 2020, p2).

Existing literature on hedonic price analysis have focused on a variety of locational attributes to measure the impact on property value. Some earlier studies focused on the impact of environmental pollution (Bajari et al., 2012; Greenstone & Gallagher., 2008), cultural heritage (Ahlfeldt & Maennig., 2010; Koster & Rouwendal., 2017; van Duijn et al., 2016), open space (Anderson & West., 2006) education (Bayer et.al., 2007; Black., 1999; Gibbons et al., 2013), urban renewal (Koster & Van Ommeren., 2019), proximity to windmills (Droes & Koster., 2016) on residential properties. Most of the studies cited above have used the Dutch data NVM for their analysis (Droes & Koster., 2016; Koster & Rouwendal., 2017; Koster & Van Ommeren., 2019; Van Duijn et al., 2016).

Yet quite contradictorily, few studies estimating the impact of amenity accessibility on housing prices have viewed housing as a heterogenous good (de Arajou & Cheng, 2017). Goodman & Thibodeau (2009) noted that a housing market can be differentiated by their property type, structural characteristics and neighbourhoods characteristics. More importantly, Tu et al. (2007) found that submarket structure by categorising can significantly improve the precision of price prediction compared to predicting the entire housing market. Moreover due to the price of urban residential land depends largely on neighbouring amenities, the marginal value of amenity accessibility is potentially reflected in residential property sale prices (Diamond., 1981). Therefore in this study we will mainly focus on structural or housing characteristics, subsequently we will incorporate neighbourhoods characteristics determining the house prices. In the last different subsamples by property type, household type and city level are incorporated to give a more concrete answer on the overall impact on amenities on a residents willingness to pay.

5.4 Alternative clarifications

Despite the extensive volume of existing research shows differing and mixed pricing effect of proximity to neighbourhood amenities and house prices, and perhaps more pertinently this research has tended to consider the mean effects only, assuming that on a percentage basis all equally affected by neighbourhood characteristics and amenities. Indeed, a study by Bayer et al. (2007) found that the willingness to pay housing characteristics and locational attributes, including socio economic factors and proximity to amenities, increases with income.

A critical concern within this study is the potential of omitted variable bias which occurs when explanatory variables are left out (Abbot & Klaiber., 2010). This eventually leads to biased and inconsistent estimates of the effect of amenities affecting the house price. Other amenities such as job employment, education or healthcare could influence the estimates of the dependent as well as independent variables. As is done in other studies fixed effects for specific location using pc4 is used for discerning any spatial heterogeneity in locational attributes. However as this study is particularly interested in the different neighbourhood characteristics affecting the house price, fixed effect on zip code level is rather ignored. To absorb some of the effect overtime, time invariant fixed effect were included to absorb any differences due to macroeconomic influences or inflation together with control variables on income level for a standardised mean on neighbourhood level.

Despite the fact that in this current literature amenities affect house prices, there are also studies who found reversed causality. For this reason the regression is rather bi directional instead of unidirectional. In the study by Garretsen & Marlet (2017) reasoned that for constructed amenities (in this case for retail and horeca) amenities there is the issue of causality in the sense that fast growing or dense cities may simply attract these amenities as byproduct. Therefore those cultural amenities reflects that the high housing prices attract higher and more dense cultural amenities. The presence of households sorting into a particular neighbourhood could endorse some effects. Where households incorporate into certain neighbourhoods and thus amplify or shadows certain (dis)amenity estimations.

De Groot et al. (2015) argue that when an amenity has their economic basis, there is also a basis for various other amenities at the same time, irrespective of what kind of amenity. Therefore we argue that the following amenities variables within the following results are not truly exogenous. This is supported by other studies where income as control variable has been included. A study by Clapp et al (2018) found that high income neighbourhoods can significantly influence property value and not per se the relevant amenities.

The last reason for concern is that not only do high amenities lead to higher house prices, but income and density also contribute to this increase. Following the argument by McCord et al. (2018), regular OLS coefficients tend to overestimate or underestimate the marginal willingness to pay when focused on the conditional mean of the dependent variable, namely house prices. Furthermore, the effects of high density and high income correlate with higher house prices, which in turn enhances the richness of amenities in a particular neighbourhood. This implies that the explanatory regressor in our regression may suffer from model misspecification. While the inclusion of the income variable as a control mitigates this to some extent, we did not find a suitable control variable for density, which could slightly skew the results. Nevertheless, after performing the regression, we believe this issue does not entirely mislead the results, but it is important to acknowledge.

Ignoring the income as control variable can have several consequences. Primarily the effect of amenities may be over- or underestimated. This may incur when effect of the amenities may be actually due to the higher income levels of the residents. To circumvent most of these over- or underestimation controlling for income, subsampling on different levels and incorporating independent proximity variables in this paper we believe this is sufficient to isolate the different amenities on house prices. The inclusion of ‘truly’ exogenous variables such as accessibility for train stations and highways are relevant for estimating their true effect on house prices.

Despite the above hiccups, we provided a wide variety of the effect of the variables of interest on the house prices. With bringing different views for proximity to amenities in terms of city level, household characteristics, amenities and property type determines the attractiveness or willingness to pay for that particular amenity. Yet keeping in mind that the variables may emphasize the current amenity variables with over- or underestimating their coefficient rather than the model in which it is utilised (de Groot et al., 2015).

6. Estimation of Results

The result section is structured as follows. We first discuss the effects of the household characteristics on our log house price. In the second section we focus on the effect of adjacent amenities within the neighbourhood upon the dependent variable. We eventually close the section by discussing the effect of income and family status upon the preference for certain amenities. Consequently, the effects are further discerned on city level whereafter the regression is computed. All percentual changes for changes hold if ceteris paribus. At last, detailed output tables are presented in the appendix, only more convenient tables can be found within the section below. All the coefficient can be interpreter as the approximate percentual change in property prices for a one-unit change in the explanatory variable, assuming ceteris paribus.

6.1 Results on housing characteristics

Appendix A presents the results of our regression analyses incorporating household characteristics, with control effects for year and postal code (pc4). The models include a baseline OLS regression (column 1), a fixed effects model (column 2). Especially for a hedonic price model including year fixed effects control for macroeconomic conditions that affect all household similarly in a given year. For postal code fixed effects control for neighbourhood specific characteristics that do not change over time but might influence the dependent variable. In a modified model addressing multicollinearity introducing a more general dummy for construction years before 1960 (column 3), and a robustness check (column 4). Here is the econometric interpretation where Y is dependent variable of ln house price:

$$Y = \beta * 100\% \; for\ continuous\ variables\ in\ log - linear\ model$$

$$(e\beta - 1) \times 100\% \text{ for dummy variables}$$

For interpretation of the variables we used the days on the market, if the sale of the house is extended by one day then the house price will raise by -0.0296%, holding other variables constant. For the coefficient of size, if size increases by one unit then the house price will increase by 0.56%, ceteris paribus. If size_other increases with one unit, house prices will increase by 0.09047%. When there is one room added to the household, this would increase the house price by 2.87% given this sample, while other explanatory variables are constant.

In column (2), which includes fixed effects, the coefficient for daysonmarket reduces slightly from -0.0296% to -0.0188% compared to the baseline model (column 1). This indicates that some of the variation was due to unobserved, time-invariant neighbourhood characteristics. The impact of size also decreases from 0.56% to 0.50%, suggesting that part of the size effect was previously confounded. When addressing multicollinearity in column (3), the coefficient for size_other drops significantly from 0.0905% in the baseline model to 0.08%, indicating that the initial relationship was likely due to multicollinearity. The property type coefficients for terraced and semi-detached also change notably: terraced changes from -2.59% to 11.74%, and semi-detached from 1,66% to 19.47% (column 1-2). For detached with introduction of FE the change is 14.56% to 39.42%, yet after the interaction variable the term is used as reference category. This results into negative values for terraced and semidetached properties.

In the baseline model, the coefficients for the construction year variables show negative correlations, with properties built between 1945 and 1959 experiencing a 23.89% decrease in house prices, and those built between 1960 and 1970 seeing a 34.03% decrease. When applying fixed effects in the second model, these negative impacts are slightly reduced, with properties from 1945 to 1959 showing a 9.79% decrease, and those from 1960 to 1970 showing a 16.14% decrease. However, in the modified model addressing multicollinearity, more recent construction years exhibit positive coefficients, indicating a reversal of the earlier trend. For instance, properties built between 1991 and 2000 show a 7.44% increase in house prices, reflecting a significant shift in the impact of construction years on property values..

For the coefficient for variable rooms remains very significant across all models, with a slight reduction from 2,9% in the baseline model to 2.60 in the modified and robustness models, indicating a stable positive impact on house prices. The regression results indicate that maintenance variables significantly impact house prices. For external maintenance (maintoutside), the effect remains significant across all columns, with the highest impact observed in the OLS regression and the robust model. Internal maintenance (maintinside) consistently shows a significant positive effect on house prices, with the highest impact in the fixed effects model. The positive influence of internal maintenance remains stable in the interaction variable and robust models. General maintenance quality (maintgood) also significantly affects house prices, with a slightly lower impact in the fixed effects model and a higher impact in the column 1, 3 and 4. These results demonstrate the positive and significant effect of both internal and external maintenance on house prices, with the impact being more pronounced for internal maintenance.

For the listed dummy variable, the coefficient in the OLS regression is 0.0978, implying a 10.27% increase in house prices. This effect decreases to 3.21% in the fixed effects model, increases to 8.77% with the interaction variable, and remains at 8.77% in the robust model. For the newbuilt dummy variable, the OLS regression shows a coefficient of 0.0348, indicating a 3.54% increase in house prices. The fixed effects model shows a slightly higher coefficient of 0.0393, translating to a 4.01% increase. However, in column 3 and 4 reveal a non-significant negative effect.

In the modified model (column 3), the interaction term for properties that are both listed and constructed before 1960 shows a significant negative impact, resulting in a 2.85% decrease in house prices. This highlights the compounded effect of age and historical status on property values. For more recent construction years, the modified model indicates significant positive impacts on house prices, with properties built between 1991 and 2000 showing a 7.44% increase and those built between 2001 and 2010 showing a 10.95% increase. These positive impacts remain stable in the robustness check (column 4), confirming the beneficial effect of more recent construction on house prices. Despite this, the inclusion of the interaction term reveals that the impact of being listed is more significant compared to the effect of new buildings.

6.2 Results of property type on Amenities

In the following table 5 will we find the hedonic regression approach using the nearby amenities as additional explanatory variables . Every variable has a proxy to amenity variable and the presence variable. Table 4 reports the model with and without housing characteristics (column 1-2), FE for years and in column 2 robustness checks. Furthermore we isolated all property types including amenities and housing characteristics. In the following paragraphs we will discuss different amenities in explaining the property price.

Table 5: OLS with amenities	(1)	(2)	(3)	(4)
VARIABLES	OLS 1	OLS 2	FE	All Robust
grotesupermarktafstand	0.0673***	0.00499	0.0140***	0.0140***
	(0.00684)	(0.00379)	(0.00448)	(0.00502)
grotesupermarkt1km	-0.0297***	-0.00749***	-0.00367***	-0.00367***
	(0.000909)	(0.000532)	(0.000727)	(0.000828)
ovlevensmiddelenafstand	0.0902***	0.0447***	0.0446***	0.0446***
	(0.00787)	(0.00433)	(0.00516)	(0.00544)
ovlevensmiddelen1km	-0.00137***	-0.00278***	0.000701***	0.000701***
	(0.000188)	(0.000111)	(0.000165)	(0.000185)
warenhuisafstand	-0.0243***	-0.00996***	-0.00841***	-0.00841***
	(0.00167)	(0.000921)	(0.00206)	(0.00190)
warenhuis5km	0.00818***	0.0101***	0.00451***	0.00451***
	(0.000753)	(0.000422)	(0.000889)	(0.000924)
cafeafstand	0.0772***	0.0338***	-0.00878***	-0.00878***
	(0.00255)	(0.00141)	(0.00272)	(0.00255)
cafe1km	-0.00394***	-0.00407***	-0.00117***	-0.00117***
	(0.000194)	(0.000112)	(0.000182)	(0.000220)
cafetariaafstand	0.151***	0.00698	-0.0260***	-0.0260***
	(0.00832)	(0.00461)	(0.00586)	(0.00606)
cafetaria1km	-0.00119***	0.00103***	0.00117***	0.00117***
	(0.000220)	(0.000128)	(0.000174)	(0.000236)
restaurantafstand	-0.145***	-0.133***	-0.0720***	-0.0720***
	(0.00737)	(0.00407)	(0.00508)	(0.00499)
restaurant1km	0.00485***	0.00288***	0.000191**	0.000191
	(8.33e-05)	(4.98e-05)	(8.84e-05)	(0.000117)
hotelafstand	-0.0279***	-0.0258***	0.00524**	0.00524**
	(0.00195)	(0.00106)	(0.00227)	(0.00209)
hotel5km	0.000874***	0.000901***	0.000197***	0.000197***
	(2.27e-05)	(1.29e-05)	(4.78e-05)	(4.85e-05)
hoofdverkeerswegafstand	0.00863***	0.0154***	0.0242***	0.0242***
	(0.00175)	(0.000990)	(0.00221)	(0.00231)
treinstationafstand	0.00223**	-0.00852***	-0.0110***	-0.0110***
	(0.00113)	(0.000616)	(0.00200)	(0.00190)
overstapafstand	-0.0253***	-0.0155***	-0.00641***	-0.00641***
	(0.000923)	(0.000507)	(0.00131)	(0.00111)
Constant	-171.1***	-174.3***	11.65***	11.65***
	(2.627)	(1.472)	(0.0389)	(0.0566)
Control variable	No	No	Yes	Yes
Housing characteristics	No	Yes	Yes	Yes
Fixed effects	No	No	Yes	Yes
Observations	97,085	89,065	88,792	88,792
R-squared	0.266	0.785	0.875	0.875

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

In the first regression we compute the amenities on the house prices, while in column 2 housing characteristics were included. Despite the significance of all explanatory variables the model suffers from omitted variable bias in column 1. When housing characteristics are added, the model is fitted more appropriate causing a substantial higher R2. Most proxy to amenities in column 1 might suffer from upwardly biasness, after adding explanatory variables in column 2, the impact of proxy to amenities diminishes. For the presence of amenities the outcome vary, while for cafeteria the coefficient becomes insignificant other presence variables have a weakened effect overall. Especially the effect of an restaurantafstand in terms of a 1km distance decreases the property value by 14.5% and 13.3% in column 1 and 2, respectively.

In column 3 we observed that with the inclusion of fixed effects 12 out of 14 amenities variables remained highly significant except presence to restaurant and proxy to hotel. Even after conducting a robustness check most variables remained very significant (column 4). For the proxy variables if distance increases this resulted in a negative outcome for warehouses, cafetaria, restaurants and cafes. While for the other variables (hotel, supermarket and other stores) when distance increases, property value increases. The presence of an additional amenity in retail and horeca remained to less than a 1% change in property value, holding other variables constant. It is worth mentioning even after including zipcode fixed effects the outcome of all 'proxy to' amenities still have a significant large effect.

Table 6: OLS per Property type	(1)	(2)	(3)	(4)
VARIABLES Dep:lnhousepirce	Apartment	Terraced	Semidetached	Detached
grotesupermarktafstand	0.0323***	0.0160**	-0.0140*	0.0274**
	(0.00485)	(0.00717)	(0.00823)	(0.0129)
grotesupermarkt1km	0.00387***	0.0109***	0.00373	0.0143**
	(0.000524)	(0.00126)	(0.00230)	(0.00706)
ovlevensmiddelenafstand	0.0433***	-0.00862	0.00776	-0.0373**
	(0.00597)	(0.00764)	(0.00899)	(0.0160)
ovlevensmiddelen1km	-0.00270***	-0.00213***	-0.000795	-0.00326
	(0.000105)	(0.000254)	(0.000540)	(0.00212)
warenhuisafstand	0.00122	0.00707***	-0.00565***	-0.0358***
	(0.00132)	(0.00150)	(0.00197)	(0.00384)
warenhuis5km	0.00467***	0.0210***	0.0151***	0.0135***
	(0.000459)	(0.000832)	(0.00134)	(0.00369)
cafeafstand	0.0353***	0.0177***	-0.00138	-0.0160**
	(0.00184)	(0.00217)	(0.00324)	(0.00692)
cafe1km	-0.00230***	-0.00489***	-0.00294***	-0.00913***
	(0.000104)	(0.000294)	(0.000595)	(0.00210)
cafetariaafstand	-0.0361***	-0.0420***	0.00689	0.00718
	(0.00696)	(0.00809)	(0.00925)	(0.0144)
cafetaria1km	0.00105***	0.00132***	-0.00494***	-0.00453*
	(0.000118)	(0.000341)	(0.000703)	(0.00248)
restaurantafstand	-0.111***	-0.0902***	-0.0805***	-0.0287*
	(0.00607)	(0.00670)	(0.00842)	(0.0151)
restaurant1km	0.00178***	0.00213***	0.00422***	0.00566***
	(4.68e-05)	(0.000134)	(0.000303)	(0.00127)
hotelafstand	-0.0250***	-0.0254***	-0.0138***	-0.00375
	(0.00148)	(0.00156)	(0.00229)	(0.00518)
hotel5km	0.000936***	0.000269***	0.000375***	0.00170***
	(1.36e-05)	(3.82e-05)	(7.71e-05)	(0.000231)
hoofdverkeerswegafstand	0.00494***	0.0122***	0.0350***	0.0645***
	(0.00104)	(0.00182)	(0.00290)	(0.00719)
treinstationafstand	-0.00664***	-0.0150***	-0.0142***	0.00266
	(0.000787)	(0.000965)	(0.00137)	(0.00377)
overstapafstand	-0.0205***	-0.00416***	-0.00164	0.00353
	(0.000658)	(0.000782)	(0.00110)	(0.00277)
Constant	11.21***	11.67***	12.60***	11.82***
	(0.0407)	(0.0770)	(0.137)	(0.274)
Control variable	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Housing Characteristics	Yes	Yes	Yes	Yes
Observations	50,842	24,700	10,717	2,533
R-squared	0.855	0.800	0.769	0.688

In the 6th table we performed a subsample regression of every property type. With each subsample we further regressed the housing characteristics and locational attributes on the transaction price. In the regression we omitted the zip code fixed effects as we were particularly interested into the variation into which amenities varies across districts. Including zip code fixed effects would simply eliminate the variation this paper aims to study. Here income variable is included as control variable. For interpretation if distance increases with 1 unit an additional kilometre is meant. For presence variables if one amenity is added, the effect of another supermarket within the bandwidth of 1km or 5km within the neighbourhood is meant.

The effect of distance to and presence of different retail and horeca amenities seem to notify some important trends. For distance to a supermarket is positively correlated with property values for *apartment, terraced* and *detached* properties yet negatively for *semidetached*. For *apartments* the increase in distance to the supermarketwill further increase the house value by 3.2%. For *terraced* (column 2) an increase in proxy results in a 1.6% increase and 2.7% for *detached* households, while semidetached showed a 1.4% decrease. If the distance to a restaurant increases with 1km the average property value will decrease by 11.1%, 9.0%, 8.1% and 2.9% for *apartments, terraced, semidetached* and *detached*, respectively. The difference in property value could be argued due to household preferences and clustering effects (see discussion). Furthermore proxy to café seem to differ among property types, while the first two property groups observe an increase in property prices the further away from a café this assumption does not truly hold for (semi)detached households. Yet semidetached is insignificant.

The presence of amenities variables within the property distinction varies under cafeteria while apartments and terraced observe a positive effect, (semi) detached follow a negative outcome by a small margin. For hotels, restaurant and warehouse their effects is more positively related with additional facilities in the neighbourhood.

Besides the cultural and social amenities we also added the accessibility variables, here the further away from a highway gives a positive value on households, especially for (semi) detached properties. For accessibility for public transport most property types gives a small decrease in property value except for detached properties. At last, an increase to an hub station effects all types of properties. The apartment group is mostly affected by an increase in distance from a hub in public transport.

In terms of household characteristics (see Appendix C) rooms and size do have an impact on property valuation across all types. After taken into consideration that an additional square meter gives 0.8%, 0.39%, 0.49% and 0.25% increase for the respective properties types. Adding another room to the property may increase their rate by a 1.0 – 2.9% margin in property value. Even for maintenance on inside, outside or good scores all variables increases the property value tremendously. Other housing characteristics seem to be highly significant for new built apartments, resulting in an increase of 12.64% in property value. For listed properties, there is an 8.77% increase in value for terraced houses and a 3.77% increase for semi-detached houses, holding other factors constant.

6.3 Results on housing preferences

In the results for housing preferences see Appendix D, where the proximity to various amenities influenced properties for three distinct household types: *single, couple and family* is analysed. Also here we used the log linear model.

6.3.1 Housing characteristics

In the hedonic price model, several housing characteristics significantly influence property prices for different household types (*Single, Couple, and Family)*. For instance, property size and the number of rooms are positively associated with property values across all groups. Each additional square meter increases prices by approximately 0.47% to 0.56%, while each additional room results in a 2.8% to 6.3% increase, indicating that larger and more spacious homes are highly valued especially for single households. Conversely, the number of days (daysonmarket) a property remains on the market negatively impacts prices, with longer durations leading to a 0.0144% to 0.0256% decrease, reflecting potential buyer perceptions of lower demand or hidden flaws.

Maintenance quality also plays a crucial role in determining property values. High-quality exterior maintenance increases prices by 38.5% to 12.9%, and interior maintenance boosts values by 32.2% to 34.7%, emphasizing the willingness to pay for a well-maintained home. Good overall maintenance further enhances property values by 5.96% to 5.4%. Interestingly, the presence of a garden decreases property prices for Couples and Families by 8.52% and 4.4%, respectively, suggesting potential preferences for less maintenance-intensive spaces.

Other significant factors include the property's historical and construction characteristics. Being a listed property increases prices by 4.0% to 6.6%, while for family properties, there is no significant effect. New construction positively impacts prices, with increases of 8.2% to 17.8%, highlighting a preference for new buildings. The increase in property value due to new building is largely explained by the housing shortage and policies in the Netherlands (Boelhouwer, 2017).

6.3.2 Proximity to amenities

For the ‘distance to large supermarket’ for single brings an additional kilometre from a large supermarket increase the property prices by 2.0%. The other household type show no relevant estimations. For the presence of a large supermarket property value increase for 1.1% and decrease by 0.7% for couple and family, holding other variables constant.

The distance to ‘Other stores’ raises the property prices for Singles, Couples and Families by 16.1%, 1.7% and 1.2%, respectively. Moreover the present of an additional alternative store within the area decreases the property values for all household types.

For warehousing we observe a divergency in trend while singles and family observe a decrease in property value, couples seem to prefer an increase in property value when distance increases. The presence for warehousing within the 1km area gives a very small variable for singles and couples.

Proximity to cafes is valued for singles and couples, with property prices decreasing of 2.6% and 3.9% per additional kilometre, while families see an increase of 0.5% per kilometre. The variation among amenities could be explained by the differing lifestyle preferences. For the presence of another radius we found slight decreases in property value with the strongest for families. This argument is further strengthened by the proxy to a café within a presence radius. For eating spots (cafetaria), the distance to nearest eating point will increase the property value for couples and families. Presence of another eating spot within the areas would slight increase the property value with a small margin excluding singles households.

For our proximity for restaurant we found that an significantly increase for property prices for all groups; a 21.2% decrease for singles, 12.2% for couples and 9.8% for families per additional kilometre. Having an additional restaurant within a 1 km radius increases property prices for all household groups with a 1 percent increase at most. The same trend follows for hotels when distance to nearest hotel increases, property prices decreases by 2.1%, 0.5% and 1.3%. While the presence of another hotel within a neighbourhood brings a slight positive effect on the property value.

6.4 Estimated Results on city level

In the last section we compared the regression on a city level. In our estimation we include fixed effect for years, housing characteristics and the same groups of amenities. Overall in our regression we found a reasonable to good fit. Leiden has the lowest number of observations compared to other 'regular' cities as Alkmaar or Breda. We start with analysing the retail amenities in table 7A and 7B whereafter Horeca amenities will be addressed in table 8A and 8B. At last, accessibility variables will be shortly discussed.

Table 7A VARIABLES	(1) Amsterdam	(2) Rotterdam	(3) Haarlem	(4) Utrecht
grotesupermarktafstand	0.0384***	-0.0282***	-0.0348*	0.00767
	(0.00596)	(0.00853)	(0.0178)	(0.0117)
grotesupermarkt1km	0.00103	-0.0191***	0.0205***	-0.0106***
	(0.000665)	(0.00185)	(0.00315)	(0.00203)
ovlevensmiddelenafstand	0.0523***	-0.0293**	0.0134	0.0793***
	(0.00654)	(0.0122)	(0.0203)	(0.0149)
ovlevensmiddelen1km	0.000263*	0.000263	-0.00611***	0.00333***
	(0.000150)	(0.000312)	(0.000821)	(0.000466)
warenhuisafstand	-0.0286***	-0.0558***	0.0811***	0.0211***
	(0.00192)	(0.00282)	(0.00699)	(0.00257)
warenhuis5km	0.0197***	0.0272***	-0.0219***	0.00460**
	(0.00111)	(0.00162)	(0.00430)	(0.00230)
Constant	12.00***	7.986***	19.55***	10.44***
	(0.0985)	(0.366)	(1.111)	(0.262)
Fixed effect	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Observations	28,474	15,533	7,577	15,567
R-squared	0.848	0.838	0.840	0.833

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

Table 7B VARIABLES	(1) Leiden	(2) Alkmaar	(3) Eindhoven	(4) Breda
grotesupermarktafstand	0.0459	0.0156	0.000441	0.0825***
	(0.0287)	(0.0125)	(0.00937)	(0.0195)
grotesupermarkt1km	0.0112	-0.0367***	-0.0123***	0.00763*
	(0.00961)	(0.00432)	(0.00217)	(0.00417)
ovlevensmiddelenafstand	0.129***	-0.0270**	-0.0292***	-0.0403*
	(0.0274)	(0.0124)	(0.00995)	(0.0222)
ovlevensmiddelen1km	0.00257*	0.00221*	0.00541***	-0.00394***
	(0.00154)	(0.00128)	(0.00101)	(0.00140)
warenhuisafstand	0.0495***	-0.0234***	0.0192***	0.000253
	(0.0103)	(0.00609)	(0.00328)	(0.00433)
warenhuis5km	0.0538***	-0.0275***	-0.0167***	-0.00789
	(0.0104)	(0.00749)	(0.00336)	(0.00499)
Constant	23.67***	11.69***	8.521***	11.36***
	(3.036)	(0.323)	(1.909)	(1.908)
Fixed effects	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Observations	2,204	4,606	6,579	8,252
R-squared	0.858	0.786	0.808	0.826

6.4.1 Estimated results of retail amenities

The regression results for retail variables across Amsterdam, Rotterdam, Haarlem, Utrecht, Leiden, Alkmaar, Eindhoven, and Breda reveal important trends in property values influenced by proximity to supermarkets, everyday goods stores, department stores, and other retail amenities. Below is a summary, incorporating specific coefficients to illustrate the impact.

In Amsterdam and Breda, a 1 kilometre increase in distance to the nearest large supermarket results in property values increasing by approximately 3.8% and 8.3%, respectively. Conversely, in Rotterdam and Haarlem a 1 unit decrease in distance decreases property values by approximately 2.8% and 3.5%, respectively. In the other cities we do not found significant effects. The presence of a large supermarket within 1 km has a significant impact on property values in multiple cities. In Haarlem and Breda property values increase by approximately 2.1% and 0.8% for each unit decrease in distance. In Rotterdam, Utrecht, Alkmaar and Eindhoven property values decreases by 1.9%, 1.1%, 3.7% and 1.2%, respectively. For the other cities we did not find any significant estimations.

For proxy to other stores Amsterdam, Leiden, and Breda demonstrate that a 1 unit increase in distance leads to higher property values, specifically by around 5.23%, 12.9%, and 8.06%, respectively. This indicates a preference for being further away. Conversely, in Rotterdam and Alkmaar, a closer proximity increases property values by about 2.93% and 2.70%, respectively, indicating a preference for closer amenities. When one 'other store' is within a 1km of the neighbourhood. Amsterdam and Utrecht show positive impacts on property values with increases of 0.03% and 3.33% respectively, suggesting that proximity enhances value. In contrast, in Haarlem and Breda, property values decrease with closer proximity, indicating different urban preferences.

With distance to nearest department store, cities for example Amsterdam, Rotterdam, and Leiden show that closer proximity increases property values by approximately 2.86%, 5.58%, and 4.95%, respectively. Conversely, in Haarlem and Utrecht, property values increase with greater distance, by around 8.11% and 2.11%, indicating a preference for being further away. For the presence of a department store within 5 km, proximity tends to increase property values in Amsterdam and Rotterdam by approximately 1.97% and 2.72%, respectively. In contrast, cities like Haarlem and Alkmaar show a decrease in property values by about 2.19% and 2.75%, respectively, with closer proximity, suggesting a preference for being further from these amenities.

The analysis shows that proximity to retail significantly impacts property values across Amsterdam, Rotterdam, Haarlem, Utrecht, Leiden, Alkmaar, Eindhoven, and Breda. In cities like Amsterdam, Leiden, and Breda, being further from large supermarkets and everyday goods stores increases property values, indicating a preference for quieter areas. Conversely, Rotterdam and Haarlem show higher values with closer proximity to these amenities, reflecting the convenience of accessibility. Proximity to department stores generally increases values in Amsterdam, Rotterdam, and Leiden but shows an opposite trend in Haarlem and Utrecht, where greater distance is preferred.

Table 8A VARIABLES	(1) Amsterdam	(2) Rotterdam	(3) Haarlem	(4) Utrecht
cafeafstand	0.0328***	0.0669***	0.0412***	-0.0520***
	(0.00211)	(0.00385)	(0.0126)	(0.00410)
cafe1km	-0.000578***	0.00347***	-0.00170	0.00162*
	(0.000162)	(0.000411)	(0.00117)	(0.000893)
cafetariaafstand	-0.00878	0.117***	0.0755***	-0.0373***
	(0.00778)	(0.0244)	(0.0165)	(0.0132)
cafetaria1km	-0.000779***	-0.00634***	0.00466***	9.90e-05
	(0.000181)	(0.000510)	(0.00107)	(0.000596)
restaurantafstand	-0.104***	-0.0437**	-0.0726***	-0.0500***
	(0.00700)	(0.0220)	(0.0156)	(0.0116)
restaurant1km	0.000471***	0.00598***	0.00121***	0.000326
	(6.45e-05)	(0.000320)	(0.000459)	(0.000390)
hotelafstand	0.00848***	0.0100***	0.100***	-0.0113***
	(0.00327)	(0.00237)	(0.00735)	(0.00310)
hotel5km	0.000385***	0.000353	-0.00806***	0.00140***
	(3.87e-05)	(0.000243)	(0.00168)	(0.000438)
Constant	12.00***	7.986***	19.55***	10.44***
	(0.0985)	(0.366)	(1.111)	(0.262)
Fixed effect	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Observations	28,474	15,533	7,577	15,567
R-squared	0.848	0.838	0.840	0.833

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

Table 8B VARIABLES	(1) Leiden	(2) Alkmaar	(3) Eindhoven	(4) Breda
cafeafstand	0.0481***	0.0152**	-0.00892*	-0.0579***
	(0.0185)	(0.00696)	(0.00509)	(0.00829)
cafe1km	0.0121***	0.0165***	0.00146***	-0.00455***
	(0.00364)	(0.00227)	(0.000475)	(0.000704)
cafetariaafstand	-0.0131	0.0283***	0.0181	-0.120***
	(0.0258)	(0.00996)	(0.0151)	(0.0211)
cafetaria1km	-0.00240	-0.000501	-0.000669	0.00358***
	(0.00182)	(0.000925)	(0.000818)	(0.000881)
restaurantafstand	-0.133***	-0.0788***	-0.0509***	-0.00679
	(0.0302)	(0.00966)	(0.0110)	(0.0172)
restaurant1km	-0.00371***	-0.00525***	0.00129***	0.00344***
	(0.00111)	(0.00101)	(0.000434)	(0.000818)
hotelafstand	0.0796***	-0.0174***	-0.0555***	-0.0384***
	(0.0167)	(0.00625)	(0.00339)	(0.00879)
hotel5km	0.0154**	-0.00213	0.00104	-0.00862***
	(0.00765)	(0.00147)	(0.000742)	(0.00265)
Constant	23.67***	11.69***	8.521***	11.36***
	(3.036)	(0.323)	(1.909)	(1.908)
Fixed effects	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes
Control variable	Yes	Yes	Yes	Yes
Observations	2,204	4,606	6,579	8,252
R-squared	0.858	0.786	0.808	0.826

6.4.2 Estimation results on Horeca amenities

The regression results for the horeca variables—covering cafes, cafeterias, restaurants, and hotels—across the cities of Amsterdam, Rotterdam, Haarlem, Utrecht, Leiden, Alkmaar, Eindhoven, and Breda reveal significant trends in property values.

For the distance to the nearest cafe, Amsterdam, Rotterdam, and Leiden indicate that property values increase as the distance increases by approximately 3.28%, 6.69%, and 4.81%, respectively. This suggests a preference for quieter residential areas away from cafes. Conversely, in Utrecht and Breda, property values decrease by 5.20% and 5.79% respectively with increased distance, indicating a preference for being closer to cafes. Adding another cafe within 1 km, cities like Amsterdam and Utrecht show mixed preferences, with Amsterdam showing a decrease in property values by 0.0578% for each unit decrease in distance, while Utrecht shows an increase by 0.162%, indicating varying urban dynamics.

Proxy to the nearest cafeteria, Rotterdam and Eindhoven show a preference for being further away, with property values increasing by approximately 11.7% and 1.81% respectively as the distance increases. In Utrecht and Breda, the opposite is true, with property values decreasing by 3.73% and 12.0% respectively with increased distance, suggesting a preference for proximity. The marginal effect of adding another a cafeteria within 1 km, Rotterdam and Breda show that values by approximately 0.634% and 0.358% respectively, indicating a preference for being further away. In other cities like Amsterdam and Eindhoven, the impacts are less significant, indicating varied urban preferences.

The proximity variables for restaurant show that all cities except Breda show a preference for closer proximity, with significant decreases in property values with increased distance. Specifically, Amsterdam, Rotterdam, and Leiden show decreases of 10.4%, 4.37%, and 13.3% respectively, indicating the high desirability of being near restaurants. While the presence of a restaurant within 1 km, cities like Amsterdam, Rotterdam, and Leiden show increases in property values by approximately 0.0471%, 0.598%, and 0.371% respectively for each unit decrease in distance, suggesting a preference for proximity.

For the distance to the nearest hotel, Rotterdam, Haarlem, and Alkmaar show a preference for being closer, with property values increasing by approximately 1.00%, 10.0%, and 1.74% respectively with decreased distance. Conversely, in Utrecht and Breda, property values increase by 1.13% and 3.84% respectively with increased distance, indicating a preference for being further away. The Presence of a hotel within 5 km, the trend is generally towards increased property values with closer proximity in cities like Amsterdam and Rotterdam, with increases of 0.0385% and 0.0353% respectively for each unit decrease in distance. In other cities like Haarlem and Breda, the coefficients show a preference for being further away, with property values decreasing by approximately 0.806% and 0.862% respectively with closer proximity.

Upon the Horeca amenities, Amsterdam, Rotterdam, and Leiden see higher property values further from cafes, suggesting a preference for quieter living. In Utrecht and Breda, closer proximity to cafes is more desirable. Rotterdam and Eindhoven prefer greater distance from cafeterias, while Utrecht and Breda favour closer proximity. Most cities, except Breda, show a great increased property values with closer proximity to restaurants, highlighting their appeal. Proximity to hotels has mixed effects; Rotterdam, Haarlem, and Alkmaar prefer closer proximity, while Utrecht and Breda favour greater distance for a quieter residential experience.

6.4.3 Proximity to Accessibility

In Appendix E the accessibility variables reveals that proximity to key transportation hubs significantly affects property values, with varied impacts across different cities. Distance to main roads (hoofdverkeerswegafstand) generally negatively affects property values in Amsterdam and Rotterdam, where increased distance leads to higher property values due to reduced noise and traffic congestion. For example, in Amsterdam, each unit increase in distance from a main road correlates with a 1.91% increase in property value. However, this trend does not hold in all cities, as seen in Breda.

Proximity to train stations has diverse impacts; in Rotterdam and Haarlem, closer proximity increases property values, reflecting the desirability of public transport access. For instance, in Rotterdam, a unit decrease in distance to a train station results in a 0.33% increase in property values. Conversely, in Utrecht, properties further from train stations are more valued, possibly due to preferences for quieter residential areas. The distance to transfer points (overstapafstand) typically shows a negative relationship with property values, with closer properties being more desirable. In Amsterdam and Rotterdam, a unit decrease in distance to a transfer point increases property values by 1.12% and 1.80%, respectively. This consistent trend across most cities underscores the significance of accessibility to major transportation nodes.

7. Discussion

7.1 Econometric analyses.

One of the most dominant criticism on retail and horeca amenities affecting house prices is reversed causality where high valued neighbourhoods thus have higher house prices. Following an increase in house prices might attract more amenities therefore suggesting reversed causality (Beracha et al., 2018). Moreover the paper by Knoll et al (2017) examined house prices on a rather global level indicating that increase in house prices preceded the emergence of new amenities. By differentiating among city level, property type analysis and household preferences this paper tried to grasp the direction of the causality. There a more nuance understanding of the relationship between house prices and amenities can be given.

Many studies discuss that being aware of the spatial heterogeneity. The omission of spatial effect have resulted into integrating spatial effects into the house price models. Despite our results which include significant (to a large extent) independent variables. We can observe that spatial household properties in terms of nearness of neigherhoods characteristics are more related than distant characteristics (Tobler., 1970). Tackling spatial autocorrelation helps generating interdependencies arise due to house pricing affecting other households. Spatial models such as spatial lag or spatial error model could help unobserved influences and omitted variables. For spatial error model a spatial structure such that the error variance is no longer diagonal but according to matrix related to the nearest neighbour. Despite the more straightforward reasoning for an log linear hedonic pricing modelling, those other models could help in tackling spatial heterogeneity.

Type of amenity data, presence variables have multicollinearity due to the fact that certain amenities are difficult to isolate due to clustering effects. Most amenities cluster together for targeting a higher service area. For the simple reason that an area with many cafes is very likely to have many restaurants. The same reasoning holds for supermarkets and other stores are clustered so everyone can buy their needs. Therefore the presence variables including within 1 km may be too broad as explanatory variable. Studies conducted by Droes & Koster (2019) found that proximity to windmills with increase in distance have a varied (negative) effect on house prices. Another study by Meltzer & Schuetz (2012) found that local amenities such as bars and restaurants generally increase property value, however this effect can turn negative if houses are located too close to these establishments. For this reason presence of amenities variables should be analysed at varied distances. For example living above a bar can concern some nuisance during the weekend, yet living further away it would provide convenient access without the drawbacks of disamenities.

7.2 Limitations in data

Despite the richness of the housing characteristics on prices by the NVM and high number of observations, there may still be prone to measurements errors. Inaccuracies in recording property size, condition or proximity to amenities can bias the results. Despite the high share of roughly 70% of household transactions registered nationwide, there still is a 30% gap of household transactions which is not observed. To what extent these transactions thus observations situate within the available data seems unknown. Moreover, number of rooms is a rather broad variable and effect of another room should be more divided into different functions for rooms such as living room, kitchen, sleeping rooms

Our dataset concerns detailed information on micro level for house prices but also information on district level by CBS. Aggregating the data on district level may obscure important intra-neighbourhood differences and lead to incorrect inferences. Besides district level are context specific, influenced by other demographic factors which are not per se generalizable to other areas with different context. Within the NVM dataset geocoded data is applied which can pinpoint the exact location of amenities and housing, allowing for detailed analysis of how proximity to specific amenities like bars, hotels or restaurants impacts house prices at a micro level. For the CBS dataset most variables are neighbour averages with the use of centroid points or weighted average based on different observations within that neighbourhood.

Another criticism on the CBS dataset is the aggregation of certain groups. As Henri de Groot (2010) argue in their paper no distinction has been between the amenities on culinary value. A coffeeshop surely does not have the same relationship to house prices as a popular bar or as they describe 'a fastfood shop surely cannot be compared to a Michelin restaurant'. Aggregating the group can aggregate a positive effects on house price and vice versa.

Regarding the amenities utilised within this paper the exclusion of proximity to primary and secondary schools, jobs employment and cultural heritage are just some examples which could contribute in explaining the house price. However while different amenities appeal to different demographic groups. Focusing on the retail and horeca sector can help understand the housing market dynamic for demographics that prioritize social and dining experiences.

8. Conclusion

This study investigates the extent to which local amenities capitalize into house prices, considering various housing characteristics, the relevance of different amenities and differences in preferences among home buyers based on property types and city specific contexts. The research question addresses the overall impact of local amenities within the Retail and Horeca sector supplemented by sub-questions focusing on housing characteristics, relevant amenities, lifecycle preferences and city-level variations.

The results reveal that housing characteristics significantly influence house prices. Variables such as property size, the number of rooms, and maintenance quality consistently show positive associations with property values across different property types and household preferences. For example, each additional square meter increases house prices by 0.8% to 0.57%, while each additional room adds 2.5% to 2.9% to property values. High-quality maintenance, both interior and exterior, further boosts house prices, reflecting the importance of well-maintained properties in the housing market.

The study also underscores the nuanced effects of proximity to various amenities. While amenities like bars and restaurants generally increase property values due to their convenience and contribution to neighbourhood vibrancy, their effects can turn negative when properties are too close. For instance, living above a bar can result in nuisances such as noise and traffic, negatively impacting property values. Conversely, being within a reasonable walking distance from these amenities enhances neighbourhood attractiveness and supports higher property values. The findings support the need for varied analysis of amenities' impacts at different distances to capture these complex dynamics accurately.

The analysis of lifecycle preferences highlights the different priorities of various household types, including singles, couples, and families. These preferences significantly influence how different amenities impact property values. For instance, single individuals and couples may prioritize proximity to social amenities like cafes, bars, and restaurants, while families has a rather lower or opposite effect on horeca amenities. Conversely, families often value proximity to grocery stores or may prioritise other amenities such as schools, parks, and grocery stores, which cater to the needs of household preferences

For example, the study found that an additional kilometre distance from a large supermarket decreases property values for families by -0.7%, indicating their preference for daily groceries.. Conversely, singles and couples benefit from living closer to a café while families prefer to live further away. This differentiation underscores the importance of considering lifecycle stages when analysing the impact of amenities on property values.

City-level analyses highlight significant variability in how amenities impact property values, underscoring the importance of local context. For example, proximity to supermarkets increases property values in some cities like Amsterdam and Rotterdam but decreases them in others like Leiden and Alkmaar. Similarly, the impact of horeca amenities (cafes, cafeterias, restaurants, and hotels) varies across cities, reflecting different urban dynamics and resident preferences. Proximity to cafes generally enhances property values in cities like Amsterdam and Utrecht, while it detracts from values in Rotterdam and Breda, illustrating diverse urban living preferences.

Overall, the study demonstrates that while local amenities play a crucial role in determining house prices, their impacts are multifaceted and context-dependent. A trade-off between the amenity and disamenities of the retail and horeca amenities should be further investigated.

Incorporating geocoded data allows for a more granular analysis, capturing the varied effects of proximity to amenities more accurately than district-level aggregations. This approach provides valuable insights for urban planners, real estate developers, and policymakers to make informed decisions that balance the benefits of amenities with potential disamenities, ultimately enhancing urban living environments.

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10. Appendix output tables

A. Housing characteristcs

VARIABLES	(1) Model 1	(2) FE Model	(3) Model 1 Modified	(4) Model 1 Robustness
daysonmarket	-0.000296***	-0.000188***	-0.000148***	-0.000148***
	(1.02e-05)	(6.83e-06)	(9.33e-06)	(2.12e-05)
size	0.00563***	0.00499***	0.00374***	0.00374***
	(3.17e-05)	(2.19e-05)	(2.55e-05)	(0.000194)
size_other	0.000905***	0.000842***	1.36e-06	1.36e-06
	(3.81e-05)	(2.61e-05)	(1.66e-06)	(2.26e-06)
rooms	0.0287***	0.0275***	0.0260***	0.0260***
	(0.00101)	(0.000675)	(0.000813)	(0.00398)
terraced	-0.0262***	0.111***	-0.342***	-0.342***
	(0.00252)	(0.00192)	(0.00405)	(0.0102)
semidetached	0.0165***	0.178***	-0.259***	-0.259***
	(0.00321)	(0.00240)	(0.00404)	(0.00925)
detached	0.136***	0.330***		
	(0.00597)	(0.00444)		
garden	-0.0340***	0.0126***	-0.0185***	-0.0185***
	(0.00211)	(0.00144)	(0.00210)	(0.00296)
listed	0.0978***	0.0316***	0.0841***	0.0841***
	(0.00590)	(0.00399)	(0.0149)	(0.0244)
newbuilt	0.0348***	0.0393***	-0.00674	-0.00674
	(0.00890)	(0.00603)	(0.00929)	(0.00835)
constryear	-0.000114***	-3.62e-06		
	(4.09e-05)	(2.93e-05)		
constrlt1905	-0.0259	-0.0125		
	(0.0684)	(0.0460)		
constr19061930	-0.0848	-0.0364		
	(0.0693)	(0.0467)		
constr19311944	-0.140**	-0.0172		
	(0.0697)	(0.0469)		
constr19451959	-0.273***	-0.103**		
	(0.0701)	(0.0473)		
constr19601970	-0.416***	-0.176***		
	(0.0703)	(0.0475)		
constr19711980	-0.409***	-0.141***	0.0126***	0.0126***
	(0.0706)	(0.0477)	(0.00444)	(0.00478)
constr19811990	-0.358***	-0.117**	0.0159***	0.0159***
	(0.0708)	(0.0478)	(0.00460)	(0.00445)
constr19912000	-0.196***	-0.00867	0.0718***	0.0718***
	(0.0710)	(0.0480)	(0.00444)	(0.00497)
constr20012010	-0.192***	0.0303	0.104***	0.104***
	(0.0713)	(0.0481)	(0.00446)	(0.00592)
constr20112020	-0.153**	0.0485	0.141***	0.141***
	(0.0715)	(0.0483)	(0.00544)	(0.00570)
constr20212030	-0.0795	0.0736	0.164***	0.164***
	(0.0779)	(0.0525)	(0.0367)	(0.0252)
maintoutside	0.326***	0.121***	0.0978***	0.0978***
	(0.0131)	(0.00879)	(0.0138)	(0.0158)
maintinside	0.279***	0.298***	0.293***	0.293***
	(0.0121)	(0.00810)	(0.0134)	(0.0151)
maintgood	0.0579***	0.0354***	0.0527***	0.0527***

	(0.00352)	(0.00234)	(0.00337)	(0.00354)
year	0.104***			
	(0.000817)			
pc4	-0.000103***			
	(6.65e-07)			
lotsize			4.08e-09	4.08e-09***
			(8.32e-09)	(1.10e-09)
before_1960			0.0589***	0.0589***
			(0.00318)	(0.00376)
listed_before			-0.0285*	-0.0285
			(0.0160)	(0.0254)
Constant	-197.9***	12.30***	12.91***	12.91***
	(1.651)	(0.0501)	(0.0275)	(0.0409)
Fixed Effects	No	Yes	Yes	Yes
Observations	89,069	89,069	39,399	39,399
R-squared	0.720	0.878	0.883	0.883

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

B. Proximity to amenity

VARIABLES	(1) OLS 1	(2) OLS 2	(3) FE	(4) All Robust
daysonmarket		-0.000272***	-0.000189***	-0.000189***
		(8.94e-06)	(6.91e-06)	(1.85e-05)
size		0.00564***	0.00513***	0.00513***
		(2.71e-05)	(2.18e-05)	(0.000210)
size_other		0.000820***	0.00101***	0.00101***
		(3.35e-05)	(2.77e-05)	(0.000211)
rooms		0.0264***	0.0237***	0.0237***
		(0.000871)	(0.000676)	(0.00408)
apartment			-0.318***	-0.318***
			(0.00453)	(0.0116)
terraced		0.115***	-0.198***	-0.198***
		(0.00235)	(0.00426)	(0.0115)
semidetached		0.171***	-0.137***	-0.137***
		(0.00299)	(0.00430)	(0.0103)
o.detached			-	-
garden		-0.0201***	0.00600***	0.00600***
		(0.00183)	(0.00144)	(0.00184)
maintoutside		0.274***	0.153***	0.153***
		(0.0114)	(0.00885)	(0.0107)
maintinside		0.310***	0.312***	0.312***
		(0.0106)	(0.00818)	(0.00872)
maintgood		0.0585***	0.0418***	0.0418***
		(0.00307)	(0.00236)	(0.00240)
listed		0.0625***	0.0394***	0.0394***
		(0.00511)	(0.00401)	(0.00682)
newbuilt		0.118***	0.0979***	0.0979***
		(0.00700)	(0.00569)	(0.00660)
constryear		-1.87e-05	0.000231***	0.000231***
		(1.98e-05)	(1.64e-05)	(2.72e-05)
grotesupermarktafstand	0.0673***	0.00499	0.0140***	0.0140***
	(0.00684)	(0.00379)	(0.00448)	(0.00502)
grotesupermarkt1km	-0.0297***	-0.00749***	-0.00367***	-0.00367***
	(0.000909)	(0.000532)	(0.000727)	(0.000828)
ovlevensmiddelenafstand	0.0902***	0.0447***	0.0446***	0.0446***
	(0.00787)	(0.00433)	(0.00516)	(0.00544)
ovlevensmiddelen1km	-0.00137***	-0.00278***	0.000701***	0.000701***
	(0.000188)	(0.000111)	(0.000165)	(0.000185)
warenhuisafstand	-0.0243***	-0.00996***	-0.00841***	-0.00841***
	(0.00167)	(0.000921)	(0.00206)	(0.00190)
warenhuis5km	0.00818***	0.0101***	0.00451***	0.00451***
	(0.000753)	(0.000422)	(0.000889)	(0.000924)
cafeafstand	0.0772***	0.0338***	-0.00878***	-0.00878***
	(0.00255)	(0.00141)	(0.00272)	(0.00255)
cafe1km	-0.00394***	-0.00407***	-0.00117***	-0.00117***
	(0.000194)	(0.000112)	(0.000182)	(0.000220)

cafetariaafstand	0.151***	0.00698	-0.0260***	-0.0260***
	(0.00832)	(0.00461)	(0.00586)	(0.00606)
cafetaria1km	-0.00119***	0.00103***	0.00117***	0.00117***
	(0.000220)	(0.000128)	(0.000174)	(0.000236)
restaurantafstand	-0.145***	-0.133***	-0.0720***	-0.0720***
	(0.00737)	(0.00407)	(0.00508)	(0.00499)
restaurant1km	0.00485***	0.00288***	0.000191**	0.000191
	(8.33e-05)	(4.98e-05)	(8.84e-05)	(0.000117)
hotelafstand	-0.0279***	-0.0258***	0.00524**	0.00524**
	(0.00195)	(0.00106)	(0.00227)	(0.00209)
hotel5km	0.000874***	0.000901***	0.000197***	0.000197***
	(2.27e-05)	(1.29e-05)	(4.78e-05)	(4.85e-05)
hoofdverkeerswegafstand	0.00863***	0.0154***	0.0242***	0.0242***
	(0.00175)	(0.000990)	(0.00221)	(0.00231)
treinstationafstand	0.00223**	-0.00852***	-0.0110***	-0.0110***
	(0.00113)	(0.000616)	(0.00200)	(0.00190)
overstapafstand	-0.0253***	-0.0155***	-0.00641***	-0.00641***
	(0.000923)	(0.000507)	(0.00131)	(0.00111)
2019.year			0.0473***	0.0473***
			(0.00180)	(0.00184)
2020.year			0.124***	0.124***
			(0.00185)	(0.00195)
2021.year			0.273***	0.273***
			(0.00199)	(0.00222)
geminhh			0.00556***	0.00556***
			(0.000110)	(0.000222)
o.apartment		-		
detached		0.328***		
		(0.00556)		
year	0.0911***	0.0922***		
	(0.00130)	(0.000728)		
pc4	-1.74e-05***	-6.90e-05***		
	(1.40e-06)	(7.86e-07)		
Constant	-171.1***	-174.3***	11.65***	11.65***
	(2.627)	(1.472)	(0.0389)	(0.0566)
Observations	97,085	89,065	88,792	88,792
R-squared	0.266	0.785	0.875	0.875

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

C. Property type

VARIABLES	(1) Apartment	(2) Terraced	(3) semidetached	(4) detached
daysonmarket	-0.000271***	-0.000407***	-0.000333***	-8.87e-05***
	(9.73e-06)	(2.21e-05)	(2.46e-05)	(2.37e-05)
size	0.00759***	0.00390***	0.00491***	0.00249***
	(3.85e-05)	(4.25e-05)	(7.27e-05)	(8.50e-05)
size_other	0.00185***	0.000522***	0.00151***	0.000532***
	(6.45e-05)	(5.21e-05)	(0.000111)	(7.07e-05)
rooms	0.0122***	0.0294***	0.0146***	0.0132***
	(0.00113)	(0.00131)	(0.00214)	(0.00343)
garden	-0.0106***	-0.0200***	-0.0356***	0.0118
	(0.00197)	(0.00345)	(0.00459)	(0.0107)
maintoutside	0.294***	0.182***	0.216***	0.247***
	(0.0123)	(0.0207)	(0.0342)	(0.0915)
maintinside	0.260***	0.352***	0.257***	0.284***
	(0.0108)	(0.0199)	(0.0331)	(0.0925)
maintgood	0.0564***	0.0626***	0.0664***	-0.0230
	(0.00333)	(0.00515)	(0.00830)	(0.0209)
listed	0.0597***	0.0825***	0.0374**	0.0553
	(0.00497)	(0.0107)	(0.0180)	(0.0357)
newbuilt	0.119***	0.107***	0.0894***	0.0342
	(0.00750)	(0.0130)	(0.0198)	(0.0401)
constryear	0.000117***	-8.19e-05**	-0.000503***	0.000280**
	(2.05e-05)	(3.95e-05)	(6.99e-05)	(0.000140)
grotesupermarktafstand	0.0323***	0.0160**	-0.0140*	0.0274**
	(0.00485)	(0.00717)	(0.00823)	(0.0129)
grotesupermarkt1km	0.00387***	0.0109***	0.00373	0.0143**
	(0.000524)	(0.00126)	(0.00230)	(0.00706)
ovlevensmiddelenafstand	0.0433***	-0.00862	0.00776	-0.0373**
	(0.00597)	(0.00764)	(0.00899)	(0.0160)
ovlevensmiddelen1km	-0.00270***	-0.00213***	-0.000795	-0.00326
	(0.000105)	(0.000254)	(0.000540)	(0.00212)
warenhuisafstand	0.00122	0.00707***	-0.00565***	-0.0358***
	(0.00132)	(0.00150)	(0.00197)	(0.00384)
warenhuis5km	0.00467***	0.0210***	0.0151***	0.0135***
	(0.000459)	(0.000832)	(0.00134)	(0.00369)
cafeafstand	0.0353***	0.0177***	-0.00138	-0.0160**
	(0.00184)	(0.00217)	(0.00324)	(0.00692)
cafe1km	-0.00230***	-0.00489***	-0.00294***	-0.00913***
	(0.000104)	(0.000294)	(0.000595)	(0.00210)
cafetariaafstand	-0.0361***	-0.0420***	0.00689	0.00718
	(0.00696)	(0.00809)	(0.00925)	(0.0144)
cafetaria1km	0.00105***	0.00132***	-0.00494***	-0.00453*
	(0.000118)	(0.000341)	(0.000703)	(0.00248)
restaurantafstand	-0.111***	-0.0902***	-0.0805***	-0.0287*
	(0.00607)	(0.00670)	(0.00842)	(0.0151)
restaurant1km	0.00178***	0.00213***	0.00422***	0.00566***
	(4.68e-05)	(0.000134)	(0.000303)	(0.00127)

hotelafstand	-0.0250***	-0.0254***	-0.0138***	-0.00375
	(0.00148)	(0.00156)	(0.00229)	(0.00518)
hotel5km	0.000936***	0.000269***	0.000375***	0.00170***
	(1.36e-05)	(3.82e-05)	(7.71e-05)	(0.000231)
hoofdverkeerswegafstand	0.00494***	0.0122***	0.0350***	0.0645***
	(0.00104)	(0.00182)	(0.00290)	(0.00719)
treinstationafstand	-0.00664***	-0.0150***	-0.0142***	0.00266
	(0.000787)	(0.000965)	(0.00137)	(0.00377)
overstapafstand	-0.0205***	-0.00416***	-0.00164	0.00353
	(0.000658)	(0.000782)	(0.00110)	(0.00277)
2019.year	0.0519***	0.0192***	0.0149**	0.00352
	(0.00244)	(0.00386)	(0.00610)	(0.0158)
2020.year	0.113***	0.0972***	0.0874***	0.0789***
	(0.00243)	(0.00382)	(0.00605)	(0.0151)
2021.year	0.245***	0.246***	0.239***	0.218***
	(0.00256)	(0.00404)	(0.00639)	(0.0159)
pc4	-6.25e-05***	-6.91e-05***	-6.69e-05***	-7.43e-05***
	(1.05e-06)	(1.22e-06)	(1.86e-06)	(4.48e-06)
geminhh	0.00518***	0.0145***	0.0121***	0.00735***
	(0.000104)	(0.000193)	(0.000264)	(0.000476)
Constant	11.21***	11.67***	12.60***	11.82***
	(0.0407)	(0.0770)	(0.137)	(0.274)
Observations	50,842	24,700	10,717	2,533
R-squared	0.855	0.800	0.769	0.688

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

D. Household preferences

VARIABLES	(1) Single	(2) Couple	(3) Family
daysonmarket	-0.000263***	-0.000144***	-0.000173***
	(2.61e-05)	(1.37e-05)	(1.52e-05)
size	0.00465***	0.00526***	0.00560***
	(4.87e-05)	(4.36e-05)	(5.10e-05)
size_other	0.00168***	0.00138***	0.000767***
	(9.69e-05)	(5.05e-05)	(4.33e-05)
rooms	0.0628***	0.0281***	0.0315***
	(0.00156)	(0.00133)	(0.00148)
garden	-0.00327	-0.0141***	-0.0324***
	(0.00333)	(0.00315)	(0.00354)
maintoutside	0.240***	0.194***	0.172***
	(0.0231)	(0.0210)	(0.0241)
maintinside	0.364***	0.299***	0.223***
	(0.0210)	(0.0199)	(0.0235)
maintgood	0.0405***	0.0366***	0.0584***
	(0.00606)	(0.00535)	(0.00589)
listed	0.0635***	0.0388***	0.00999
	(0.00682)	(0.0104)	(0.0184)
newbuilt	0.178***	0.0818***	0.116***
	(0.0141)	(0.0117)	(0.0110)
constryear	-6.24e-05**	-6.66e-06	-0.000121**
	(2.55e-05)	(3.96e-05)	(5.77e-05)
grotesupermarktafstand	0.0199**	0.00411	-0.00717
	(0.00992)	(0.00540)	(0.00553)
grotesupermarkt1km	0.000311	0.0119***	-0.00698***
	(0.000843)	(0.00121)	(0.00196)
ovlevensmiddelenafstand	0.161***	0.0165***	0.0118**
	(0.0145)	(0.00592)	(0.00593)
ovlevensmiddelen1km	-0.00190***	-0.00130***	-0.00103*
	(0.000158)	(0.000288)	(0.000528)
warenhuisafstand	-0.0194***	0.0139***	-0.00643***
	(0.00302)	(0.00124)	(0.00127)
warenhuis5km	0.00339***	-0.00277***	-0.000644
	(0.000993)	(0.000762)	(0.000999)
cafeafstand	-0.0259***	-0.0391***	0.00533***
	(0.00697)	(0.00238)	(0.00175)
cafe1km	-0.00210***	-0.00143***	-0.00988***
	(0.000151)	(0.000237)	(0.000743)
cafetariaafstand	0.00103	0.0248***	0.0232***
	(0.0168)	(0.00579)	(0.00605)
cafetaria1km	1.31e-05	0.000447*	0.00411***
	(0.000172)	(0.000249)	(0.000786)
restaurantafstand	-0.212***	-0.122***	-0.0977***
	(0.0166)	(0.00566)	(0.00532)
restaurant1km	0.00191***	0.000705***	0.000939**
	(7.75e-05)	(0.000123)	(0.000436)

hotelafstand	-0.0210***	-0.00482***	-0.0133***
	(0.00391)	(0.00158)	(0.00150)
hotel5km	0.000741***	0.000840***	0.000342***
	(2.87e-05)	(2.52e-05)	(4.43e-05)
hoofdverkeerswegafstand	-0.00291	0.0148***	0.0123***
	(0.00206)	(0.00167)	(0.00191)
treinstationafstand	-0.0239***	-0.0159***	-0.0103***
	(0.00216)	(0.00114)	(0.000929)
overstapafstand	-0.00727***	-0.00540***	-0.0114***
	(0.00175)	(0.000952)	(0.000715)
2018b.year			
2019.year	0.0222***	0.0441***	0.0433***
	(0.00434)	(0.00414)	(0.00409)
2020.year	0.0766***	0.119***	0.123***
	(0.00433)	(0.00409)	(0.00403)
2021.year	0.179***	0.249***	0.258***
	(0.00482)	(0.00417)	(0.00426)
pc4	-4.46e-05***	-4.62e-05***	-6.95e-05***
	(2.08e-06)	(1.23e-06)	(1.26e-06)
geminhh	0.00741***	0.0102***	0.0114***
	(0.000241)	(0.000179)	(0.000191)
Constant	11.67***	11.49***	11.87***
	(0.0521)	(0.0780)	(0.114)
Observations	20,922	27,622	24,696
R-squared	0.815	0.775	0.772

E. City level analysis

VARIABLES	(1) Amsterdam	(2) Rotterdam	(3) Haarlem	(4) Utrecht
daysonmarket	-0.000271***	-0.000113***	-0.000487***	-0.000417***
	(2.01e-05)	(1.28e-05)	(4.80e-05)	(2.71e-05)
size	0.00523***	0.00555***	0.00523***	0.00547***
	(4.21e-05)	(5.87e-05)	(8.04e-05)	(5.89e-05)
size_other	0.00206***	0.00162***	0.000895***	0.00115***
	(7.63e-05)	(8.53e-05)	(0.000148)	(6.76e-05)
rooms	0.0548***	0.0257***	0.0518***	0.0459***
	(0.00132)	(0.00176)	(0.00217)	(0.00156)
garden	0.00251	-0.0252***	0.0357***	-0.00584*
	(0.00259)	(0.00440)	(0.00508)	(0.00326)
maintoutside	0.149***	0.176***	0.110***	0.0271
	(0.0164)	(0.0239)	(0.0287)	(0.0240)
maintinside	0.288***	0.266***	0.428***	0.358***
	(0.0143)	(0.0213)	(0.0277)	(0.0238)
maintgood	0.0342***	0.0674***	0.0179**	0.0554***
	(0.00471)	(0.00639)	(0.00800)	(0.00587)
listed	0.0373***	0.0525***	0.0470***	-0.0373***
	(0.00591)	(0.0156)	(0.0124)	(0.0100)
newbuilt	0.132***	0.143***	0.114***	0.0548***
	(0.00913)	(0.0196)	(0.0230)	(0.0121)
constryear	-1.39e-05	0.00114***	-0.000276***	-0.000193***
	(2.52e-05)	(6.55e-05)	(5.72e-05)	(3.65e-05)
grotesupermarktafstand	0.0384***	-0.0282***	-0.0348*	0.00767
	(0.00596)	(0.00853)	(0.0178)	(0.0117)
grotesupermarkt1km	0.00103	-0.0191***	0.0205***	-0.0106***
	(0.000665)	(0.00185)	(0.00315)	(0.00203)
ovlevensmiddelenafstand	0.0523***	-0.0293**	0.0134	0.0793***
	(0.00654)	(0.0122)	(0.0203)	(0.0149)
ovlevensmiddelen1km	0.000263*	0.000263	-0.00611***	0.00333***
	(0.000150)	(0.000312)	(0.000821)	(0.000466)
warenhuisafstand	-0.0286***	-0.0558***	0.0811***	0.0211***
	(0.00192)	(0.00282)	(0.00699)	(0.00257)
warenhuis5km	0.0197***	0.0272***	-0.0219***	0.00460**
	(0.00111)	(0.00162)	(0.00430)	(0.00230)
cafeafstand	0.0328***	0.0669***	0.0412***	-0.0520***
	(0.00211)	(0.00385)	(0.0126)	(0.00410)
cafe1km	-0.000578***	0.00347***	-0.00170	0.00162*
	(0.000162)	(0.000411)	(0.00117)	(0.000893)
cafetariaafstand	-0.00878	0.117***	0.0755***	-0.0373***
	(0.00778)	(0.0244)	(0.0165)	(0.0132)
cafetaria1km	-0.000779***	-0.00634***	0.00466***	9.90e-05
	(0.000181)	(0.000510)	(0.00107)	(0.000596)
restaurantafstand	-0.104***	-0.0437**	-0.0726***	-0.0500***
	(0.00700)	(0.0220)	(0.0156)	(0.0116)
restaurant1km	0.000471***	0.00598***	0.00121***	0.000326
	(6.45e-05)	(0.000320)	(0.000459)	(0.000390)

hotelafstand	0.00848***	0.0100***	0.100***	-0.0113***
	(0.00327)	(0.00237)	(0.00735)	(0.00310)
hotel5km	0.000385***	0.000353	-0.00806***	0.00140***
	(3.87e-05)	(0.000243)	(0.00168)	(0.000438)
hoofdverkeerswegafstand	0.0191***	-0.00678**	-0.0508***	-0.0212***
	(0.00147)	(0.00304)	(0.00667)	(0.00358)
treinstationafstand	0.00384**	0.00329**	0.0333***	-0.0447***
	(0.00154)	(0.00148)	(0.00688)	(0.00279)
overstapafstand	-0.0112***	-0.0180***	-0.151***	-0.00411*
	(0.00112)	(0.00174)	(0.00746)	(0.00242)
2019.year	0.0298***	0.0726***	0.0796***	0.0439***
	(0.00339)	(0.00490)	(0.0102)	(0.00417)
2020.year	0.0539***	0.162***	0.167***	0.127***
	(0.00344)	(0.00482)	(0.0106)	(0.00425)
2021.year	0.202***	0.339***	0.309***	0.267***
	(0.00388)	(0.00571)	(0.00864)	(0.00557)
pc4	-0.000462***	0.000244**	-0.00359***	0.000338***
	(7.66e-05)	(0.000114)	(0.000544)	(6.96e-05)
geminhh	0.00583***	0.0130***	0.00627***	0.0163***
	(0.000121)	(0.000309)	(0.000288)	(0.000345)
Constant	12.00***	7.986***	19.55***	10.44***
	(0.0985)	(0.366)	(1.111)	(0.262)
Observations	28,474	15,533	7,577	15,567
R-squared	0.848	0.838	0.840	0.833

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

	(5)	(6)	(7)	(8)
VARIABLES	Leiden	Alkmaar	Eindhoven	Breda
daysonmarket	-0.000347***	-9.72e-05***	-7.52e-05***	-0.000121***
	(6.29e-05)	(1.98e-05)	(2.42e-05)	(2.07e-05)
size	0.00591***	0.00546***	0.00500***	0.00519***
	(0.000143)	(9.68e-05)	(7.27e-05)	(6.48e-05)
size_other	0.000199	0.00130***	0.00151***	0.000463***
	(0.000254)	(8.83e-05)	(0.000107)	(5.07e-05)
rooms	0.0337***	0.0233***	0.0229***	0.0239***
	(0.00373)	(0.00282)	(0.00195)	(0.00203)
garden	0.00899	-0.0339***	-0.0149***	-0.0405***
	(0.00944)	(0.00694)	(0.00483)	(0.00539)
maintoutside	0.147***	0.135***	0.0897**	0.157***
	(0.0531)	(0.0456)	(0.0366)	(0.0393)
maintinside	0.304***	0.369***	0.291***	0.381***
	(0.0494)	(0.0424)	(0.0352)	(0.0385)
maintgood	0.0382***	0.0330***	0.0457***	0.0269***
	(0.0125)	(0.0102)	(0.00823)	(0.00966)
listed	0.0426**	0.123***	0.169***	-0.185***
	(0.0181)	(0.0241)	(0.0244)	(0.0408)
newbuilt	0.129***	0.0254	0.0709***	0.126***

	(0.0362)	(0.0267)	(0.0217)	(0.0236)
constryear	2.05e-05	0.000304***	0.000765***	-7.21e-05
	(6.93e-05)	(8.65e-05)	(9.87e-05)	(7.84e-05)
grotesupermarktafstand	0.0459	0.0156	0.000441	0.0825***
	(0.0287)	(0.0125)	(0.00937)	(0.0195)
grotesupermarkt1km	0.0112	-0.0367***	-0.0123***	0.00763*
	(0.00961)	(0.00432)	(0.00217)	(0.00417)
ovlevensmiddelenafstand	0.129***	-0.0270**	-0.0292***	-0.0403*
	(0.0274)	(0.0124)	(0.00995)	(0.0222)
ovlevensmiddelen1km	0.00257*	0.00221*	0.00541***	-0.00394***
	(0.00154)	(0.00128)	(0.00101)	(0.00140)
warenhuisafstand	0.0495***	-0.0234***	0.0192***	0.000253
	(0.0103)	(0.00609)	(0.00328)	(0.00433)
warenhuis5km	0.0538***	-0.0275***	-0.0167***	-0.00789
	(0.0104)	(0.00749)	(0.00336)	(0.00499)
cafeafstand	0.0481***	0.0152**	-0.00892*	-0.0579***
	(0.0185)	(0.00696)	(0.00509)	(0.00829)
cafe1km	0.0121***	0.0165***	0.00146***	-0.00455***
	(0.00364)	(0.00227)	(0.000475)	(0.000704)
cafetariaafstand	-0.0131	0.0283***	0.0181	-0.120***
	(0.0258)	(0.00996)	(0.0151)	(0.0211)
cafetaria1km	-0.00240	-0.000501	-0.000669	0.00358***
	(0.00182)	(0.000925)	(0.000818)	(0.000881)
restaurantafstand	-0.133***	-0.0788***	-0.0509***	-0.00679
	(0.0302)	(0.00966)	(0.0110)	(0.0172)
restaurant1km	-0.00371***	-0.00525***	0.00129***	0.00344***
	(0.00111)	(0.00101)	(0.000434)	(0.000818)
hotelafstand	0.0796***	-0.0174***	-0.0555***	-0.0384***
	(0.0167)	(0.00625)	(0.00339)	(0.00879)
hotel5km	0.0154**	-0.00213	0.00104	-0.00862***
	(0.00765)	(0.00147)	(0.000742)	(0.00265)
hoofdverkeerswegafstand	-0.0609***	-0.0205**	0.00886**	-0.000195
	(0.00988)	(0.00968)	(0.00442)	(0.00458)
treinstationafstand	-0.0141	0.0511***	-0.00551	0.0466***
	(0.0102)	(0.00597)	(0.00516)	(0.00647)
overstapafstand	-0.0796***	-0.0436***	0.00974*	-0.0218***
	(0.0172)	(0.00597)	(0.00582)	(0.00705)
2019.year		0.0466***		0.0339***
		(0.00781)		(0.00755)
2020.year	0.0504***	0.104***	0.0811***	0.112***
	(0.0113)	(0.0107)	(0.00523)	(0.00801)
2021.year	0.281***	0.285***	0.214***	0.219***
	(0.0174)	(0.0106)	(0.00587)	(0.00803)
pc4	-0.00558***	-0.000513***	0.000271	8.51e-06
	(0.00128)	(0.000151)	(0.000338)	(0.000396)
geminhh	0.00894***	0.0123***	0.00643***	0.0144***
	(0.000641)	(0.000805)	(0.000296)	(0.000703)
Constant	23.67***	11.69***	8.521***	11.36***
	(3.036)	(0.323)	(1.909)	(1.908)

Observations	2,204	4,606	6,579	8,252
R-squared	0.858	0.786	0.808	0.826

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.