How do external effects of mosques relate to transaction prices in the proximity. A case study in the city of Amsterdam.

Abstract

"Social integration of the Islam in the Netherlands is a relevant topic in society. Where the social impact of immigrants is extensively discussed in the existing literature, there is hardly any literature on economic integration of Muslims in society. Mosques are the visible and physical representation of the Islam and therefore, a benchmark of Islamic religion in a community. In this paper, the aim is to examine whether mosque construction affects communities. A difference-in-difference method is used to capture three moments in time and two groups of observations. The intention is to find out of there is a significant difference in transaction prices between properties in the proximity of a mosque and properties not located in the proximity of a mosque. No significant evidence is found that transaction prices in the proximity of a mosques are positively or negatively affected by its presence. This study expands the existing literature by examining the relation between transaction prices and mosques at different moments in time. Altogether, the research is of aid to policymakers to assist them in decision processes to protect social structures within communities and prevent losses in terms of transaction prices."

Keywords: Mosques, Muslims, difference-in-difference method, transaction prices, amenities.

Student: M.G.J. Ponds University of Groningen, 2020
Supervisor: Dr. X. Liu

Colophon

Issue	Master thesis Real Estate Studies
Author	M. G. J. Ponds
Student number	S2550695
Supervisor:	Dr. X. Liu
Second supervisor	Dr. M. Van Duijn
Title	How do external effects of mosque construction affect transaction prices of properties located in the proximity of these mosques?
Contact details	
Student:	m.g.j.ponds@student.rug.nl maxponds94@gmail.com
Supervisor	xiaolong.liu@rug.nl
Date	09-01-2020
Word count	9.566 (with in text references)
University of Groningen	
Faculty of Spatial Sciences	

Table of contents

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu
University of Groningen, 2020

1. Introduction

The number of Muslim immigrants in Western countries has been growing rapidly over the past decade. Social integration of the Islam in the Netherlands is a relevant topic in society (Wagendorp, 2019). Even though the Netherlands are perceived to be an open-minded country with both freedom of religion and speech, enshrined in article 6 and 7 in "the Dutch constitution" (2005), friction in Muslim's social integration is present. The growing influence of the Islam forms the base of conflicts between Muslims and non-Muslims. According to the Dutch Central Bureau for Statistics (hereafter CBS; NOS, 2017), the number of Muslims in the Netherlands has increased from 4,5% to 4,9% between 2010 and 2015, which amounts to 850.000 Muslim residents in the Netherlands. The increasing number of Muslims requires policy makers to establish and maintain social cohesion and accommodate minorities (Norris & Inglehart, 2012). Several incidents have stressed the current difficulties in protecting social cohesion after an ongoing fast settlement of Muslims. First, the murder on filmmaker Theo Van Gogh in 2004. Van Gogh was murdered by a Muslim for making criticizing movies on the Islam. Secondly, the 2005 Muhammad protests. A Danish cartoonist made satirical drawings of the Islamic prophet Muhammad, resulting in worldwide protests in Islamic countries. Thirdly, the terroristic attacks in Western countries since 2000. In the last two decades we experienced terroristic attacks such as 9/11, Bataclan, the Madrid train bombings and the bombing on Brussels' airport (Norris & Inglehart, 2012). These examples have created and amplified a certain public opinion in which Muslims threaten social cohesion within communities. As a result, social exclusion of Muslim immigrants has increased (Fozdar, 2012).

The growing image of Muslims threatening social cohesion threatens the inclusion of Muslims in Western society. The Netherlands altered laws regarding integration and immigration of Muslims over time (Mohiuddin, 2017). In the 1960s, immigration was actively encouraged when the Dutch government invited guest workers from Islamic countries to the Netherlands. According to Mohiuddin (2017), the Netherlands were precursors on the topic of multiculturism. Nowadays, Muslim immigrants are up for discussion and friction is present between Muslims and non-Muslims communities in the Netherlands. Within these communities, friction could disturb social patterns and trigger instability which indirectly may affect property values. One way of measuring the effect of instability between Muslims and non-Muslims is by examining the external effects of religious places on property values in the proximity of their location (Buijs, 2009). Wilkinson (1973) found how similar dwellings with a different location differ in prices. The 'internal' and 'external' attributes of properties are drivers behind the transaction prices of these properties. The theory of Wilkinson (1973) implies that you can measure effects of religious buildings, based on the location of dwellings and their combination of amenities. An amenity is one of the attributes that defines the property value of dwellings. Where existing literature discusses the amenities of churches within communities (Brandt et al., 2013; Babawale & Adewunmi,

2011; Do et al., 1994), there is hardly any literature on the amenities of mosques. Do et al. (1994) find negative external effects of churches on property values in the proximity in the United States (hereafter: U.S.). Babawale & Adewunmi (2011) find the same results while examining the amenities of churches in Lagos (Nigeria). The Dutch society claims to encourage mosques to locate in Dutch cities without knowing potential positive or negative effects of mosques on communities. (De Jong, 2007; De Koning et al., 2006). Increasing the number of mosques within communities may result in changes in the physical environment. A growing number of mosques is associated with a growing number of Muslims. If the number of Muslims in a community increases, it may attract more Islamic oriented stores, bars, and shops (Sabri & Ludin, 2009). Although positive social actions of mosques are noted, the predominantly negative associations with Muslims could blur the vision of non-Muslims in a community (Van der Valk, 2016).

In summary, this paper aims to examine the social and physical changes within communities as a result of the increasing number of Muslims by analyzing the external effects of mosques on transaction prices. As religious buildings represent the presence of religious groups in communities, they can be used to measure the effect of the growing number of Muslims in the Netherlands. Instable communities could experience decreasing property values if mosques are integrated in the community. Despite the existing literature about religious buildings in relation to surrounding property values (Brand et al., 2013; Babawale & Adewunmi, 2011; Do et al., 1994), the literature on mosques and transaction prices is limited. Therefore, the aim of this paper is to provide insights in the relation between mosque construction and transaction prices in the proximity. The intention is to measure the external effects of mosques in Amsterdam, since this city has the highest absolute number of Muslims in the Netherlands. Therefore, the following research question will be central in this study:

How do external effects of mosque construction affect transaction prices of properties located in the proximity of these mosques?

In this study a hedonic pricing model is used, based on the model of Rosen (1974). The hedonic pricing model means you can measure the price of a property by its set of characteristics. To analyze the time effect of mosque construction and their external effects, a difference in difference method is used. Several mosques found suitable for this research in the city of Amsterdam.

The structure of the paper is as followed; First, the strengths and weaknesses of the existing literature will be reviewed. Secondly, different hypotheses will be introduced. Hereafter, the methods-section introduces the empirical model. After the mathematical explanation of the chosen method, the dataset and descriptive statistics are discussed. The results will then be presented and critically discussed. Finally, the conclusion provides a brief summary and connect the results to the discussed theory.

2. Theory and hypotheses

2.1 Literature review

Research regarding the relation between religious places and their interaction with residential real estate transaction prices is relatively scarce in existing literature. On the other hand, the amount of literature concerning the social and cultural integration of religious places is abundant (Collins, 2011; Casidy & Tsarenko, 2014). The scientific literature is inconsistent when it discusses external effects of religious places on neighborhoods (Carrol et al., 1996). In this section, the existing literature is critically discussed and emphasizes how this study will extend the field of scientific literature.

The hedonic pricing method contains information on explanatory house variables, trend series and distance and therefore, it is a common method to study the effects of places of worship on property values (Brandt et al., 2013; Do et al., 1994; Babawale & Adewunmi, 2011). The literature focusses on property prices since they reflect how residents value certain events or buildings. Since real estate is bound to its location, transaction prices can be used as a reflection whether residents are positively or negatively affected. If churches are accompanied with amenities, a higher demand is expected. Higher demand results in higher prices, therefore property prices are an interesting topic in the existing literature. Do et al. (1994) discovered a negative relation between churches and house prices in the U.S.. Do et al. (1994) found results that house prices would decrease around 3% when a place of worship was located in the proximity.

In contrast to Do et al. (1994), Carrol et al. (1996) find positive external effects of churches on property values. They criticize Do et al. (1994) on two topics. First, Carrol et al. (1996) criticize Do et al. (1994) on the use of a small dataset, which is associated with biased results. Secondly, for their 'simple' intentions, which leads to restrictions limiting the effectiveness of Do et al.'s (1994) article. Carrol et al. (1996) copy the research of Do et al. (1994) to control for results. They find a positive relation between churches and transaction prices in the proximity, based on a substantially larger dataset. Carrol et al. (1996) conclude that the location of a church and the 'state' of a community contributes to external effects. Carrol et al. (1996) continue that 'moral hazard' could partly clarify the discounted transaction prices in Chula Vista based on the community. With the term moral hazard, Carrol et al. (1996) refer to how location affects the way churches are received by residents. Chula vista (used by Do et al., 1994) is crammed with churches, causing residents to sell their properties at a discount. Carrol et al. (1996) use Henderson (Nevada), a village closely located to Las Vegas. Residents in this village are willingly towards the construction of churches on vacant lots, otherwise a casino could be built on this plot. So, the term 'moral hazard' is in this case means that buyers demand lower transaction prices since they know churches exert negative effects. Considering these similarities and contradictions, both papers show how location, size of the data and restrictions are rigging results.

Following the results of Do et al. (1994), Babawale & Adewunmi (2011) also found negative externalities between churches and transaction prices. In their research, Babawale & Adewunmi (2011) aim to explain the essence of understanding the effects of externalities. Babawale & Adewunmi (2011) examined the effect of three churches in the city of Lagos, the capital of Nigeria. In Lagos, 450 questionnaires were conducted in the proximity of the three churches. Their intention was to measure how respondents experienced the externalities of churches. Besides questionnaires, Babawale & Adewunmi (2011) performed a hedonic regression. Results show that negative externalities outweigh the amenity function of the selected churches in Lagos. Babawale & Adewunmi (2011) agree to Do et al. (1994) and also found that bigger churches exert more negative external effects. Babawale & Adewunmi (2011) confirm earlier research that real estate tends to be more strongly affected by externalities since its immobility (E.g. Kaufman & Cloutier, 2006; Paterson & Boyle, 2002; Bourassa et al., 2004). Relating to Do et al. (1994), Babawale & Adewunmi (2011) share the conclusion that churches negatively affect transaction prices in the proximity.

Admittedly, Babawale & Adewunmi (2011) found significant results, but their research contains errors. First, the selection of three churches is a rather small sample size and not large enough to draw evident conclusions. Is the same pattern observed if the amount of churches will increase in the sample? Secondly, the churches were all from the same neighborhood. Following Wilkinson (1973), location is an important driver behind dwelling prices. Babawale & Adewunmi (2011) forgot to control for location. Lastly, there is no control group to compare with. It could be possible that the complete metropolitan area of Lagos experienced decreasing transaction prices when the questionnaires were conducted. Moreover, the limitations point out that improvements can be made.

More recent research of Brandt et al. (2013) includes a case study in Hamburg. Their paper aims to analyze different sorts of 'places of worship'. Following the hedonic pricing method as introduced by Rosen (1974), Brandt et al. (2013) extend the model by leaving out restrictions and adding extra variables to diminish biased results. They explain transaction prices based on neighborhood statistics including income, demographic population, foreign population and the amount of social housing. The results show that places of worship have a small positive relation with transaction prices. This positive relation is predominantly the case if the place of worship is a church. Other places of worship (mosques and synagogues) do not show any statistical significant relations with house prices in the proximity. Brandt et al. (2013) conclude that churches must be preserved due to the price premiums they generate. However, Hamburg is known for its open-mindedness and liberal attitude, insinuating a potential opposite result if the same research would be executed in a conservative region.

Brand et al. (2013) only study the effect of transaction prices, which are gathered when a place of worship was already established in a particular neighborhood. The results are therefore mainly dependent on the distance in relation to the place of worship. However, no time effect is included in the method of Brandt et al. (2013). With this method, a substantial effect of house prices in relation to places

of worship is lost. Announcing the construction of a place of worship is expected to have an immediate impact on transaction prices in the proximity; Brandt et al. (2013) do not control or adjust their results for this effect. Consequently, a research gap is present for a paper which discusses transaction prices and time in relation to places of worship.

The paper of Gautier et al. (2009) does not involve religious places, but it does examine the social patterns between Muslims and non-Muslims. Gautier et al. (2009) examined the aftermath of the murder on Theo van Gogh on 2 November 2004. Theo van Gogh was known as a prominent national and international public figure in TV business and for openly criticizing the Islam in the public debate. Gautier et al. (2009) used the hedonic pricing method in the city of Amsterdam.

The murder triggered a so-called 'shock-effect'. A 'shock-effect' means that emotions are the driver behind actions of people. In this case, the 'shock-effect' resulted in a negative attitude towards Muslim people, since the murderer had a Muslim origin. Since the driver of a 'shock-effect' are emotions, these negative attitude diminish over time. Continuing with the results of Gautier et al. (2009), they show how transaction prices decreased each week in communities where at least 25% of the neighborhood had a Turkish or Moroccan origin. These neighborhoods were titled as type I neighborhoods where neighborhoods with a lower percentage of people from Turkish and Moroccan origin were labelled type II neighborhoods. The results of Gautier et al. (2009) present significant differences in transaction price fluctuations between type I and type II neighborhoods after the murder on Van Gogh. Type I neighborhoods observed a decrease in house prices of 0,7% per week. The decrease in house prices after the murder on Van Gogh went on for 10 months, adding up to a total decrease in house prices of over 3%. According to the Gautier et al. (2009), shocking events (or 'shock events') cause an increase in segregation between different population groups. Hence, the aftermath of the murder on Van Gogh, provoked a drop in affection between ethnicities and so, resulted in less affection to move to predominant Muslim dominated neighborhoods. This loss of affection between ethnicities is shown by a quote of Buijs (2009, page 434):

"Shortly after the assassination, almost 90 per cent of the Dutch population applauded all measures taken by the government to catch Muslim extremists. (…) Although these opinions were strongly affected by the recent events, they affirmed the image of a confused and insecure society. (…) In the first month after the murder 174 violence incidents with racist or extreme-right-wing motivations occurred."

This quotation shows how anxiety and fear provokes tension between Muslims and non-Muslims, which is measurable by examining transaction prices (Gautier et al, 2009). However, this external effect of decreasing transaction prices is diminishing after several months. The observed decrease in house prices in type I neighborhoods has its origin in a terroristic attack, which breaks down the relations in a community (Gautier et al., 2009).

Referring to the 'shock effect' introduced earlier, it caused a sudden decrease in transaction prices, which diminished after several months. Hence, Gautier et al. (2009) explain how time is an important variable while examining transaction prices. Their research shows that time should be considered while examining the effects mosque construction on transaction prices.

The studies presented above provide support that religious places can affect transaction prices. However, the results provide contradictory statements. Where Babawale & Adewunmi (2011) and Do et al. (1994) find evidence of a negative relation between religious places and transaction prices, Carrol et al. (1996) and Brandt et al. (2013) report the opposite. These articles relate predominantly to churches (Do et al., 1994; Carrol et al., 1996; Babalawe & Adewunmi, 2011) and an overall view of religious places (Brandt et al., 2013). Gautier et al. (2009) relate to the aftermath of a crucial event, but do not use religious places to measure these effects.

2.2 Hypotheses development

This paper will extend the existing literature by examining how mosque construction affects transaction prices over time. By using different moments in time, the relationship between transaction prices and mosque construction could create a better understanding how visibility of the Islam is received in a period where the number of Muslims in the Netherlands is growing. Based on the existing literature, three hypotheses were formulated.

According to the existing literature, religious places can either have positive or negative external effects on dwellings in the proximity (E. g. Brandt et al., 2013; Do et al., 1994; Carrol et al., 1996). In this paper the existing literature is expanded by examining the external effects of mosque construction on transaction prices. Based on the aforementioned literature the expectation is that mosque construction radiates negative external effects on transaction prices in the proximity. Besides, the existing literature did not control for time effects during the construction period of religious places. Therefore, this paper further expands the existing literature. The following hypothesis is posed:

H1: The construction of mosques causes negative external effects on the transaction prices of properties in the proximity.

Babawale & Adewunmi (2011) argue that size determines the effectiveness of externalities on properties in the proximity. This implies that transaction prices experience bigger changes if the constructed mosque is larger than usual. In addition, informal prayer rooms located in apartments of warehouses, are often known to be a mosque for Muslims, but are less likely to be recognized as a mosque by non-Muslim communities (Saint-Blancat & Schmidt di Friedberg, 2005).

So, the size and visibility of mosques matter to what extend transaction prices are affected. In this study, bigger and more visible mosques are expected to radiate more external effects on transaction prices in the proximity, based on the previous research. The results of previous research are checked, and the existing literature is expanded by examining possible external effects of mosque construction on transaction prices. Considering the implications of Babawale & Adewunmi (2011) the following hypothesis is composed:

H2: Visible mosques cause more negative external effects on transaction prices of properties in the proximity compared to non-visible mosques.

According to Gautier et al. (2009), the decrease in transaction prices after the murder of Van Gogh was higher in Turkish and Moroccan dominated neighborhoods, implying a relation between religion and transaction prices. Apparently, people were less interested to acquire properties in Muslim dominated neighborhoods. In addition, Landman & Wessels (2005) argue that construction of mosques causes instability in a neighborhood. A higher percentage of Moroccan and Turkish people relates to lower transaction prices (Landman & Wessels, 2005).

The existing literature implies that demographic structures could determine the effect of externalities on transaction prices. Moreover, the expectation is that the demographic structure of a neighborhood is one of the drivers behind the effects of mosques on transaction prices. This paper will control for the results found in previous research and expand the literature by examining the effects of mosque construction on transaction prices and a possible relation with the percentage of Muslims in a community. This results in the following hypothesis:

H3: The negative effect of mosque construction on transaction prices is lower in Muslim dominated neighborhoods compared to non-Muslim neighborhoods.

3. Methodology

The hedonic price model is a frequently used method in real estate studies and is also necessary when performing a difference-in-difference analysis. In this research, the following definition of the hedonic pricing from Rosen (1974) will be used (Rosen, 1974; page 34): "Hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them." The model of Rosen (1974) is extended by several authors who add additional information to the model (Sheppard, 1999; Van Duijn et al.; 2016 Schwartz et al., 2006).

Since the real estate market is heterogeneous, all properties have different values because of their individual characteristics. To capture the external effects of mosques on property values in Amsterdam, this study uses the hedonic price model to examine how property values react to the proximity of a mosque during different moments in time. Based on Rosen (1974), a basic model is subtracted, which sums up property values based on their characteristics:

$$p(PV) = f(c_\alpha, c_b, \dots, c_z) \tag{1}$$

The function of f sums up the independent variables that influences the value of the dependent variable; $p(PV)$. In this study, the transaction price of a house is based on several aspects. Firstly, the characteristics of the property. Secondly, the neighborhood characteristics. Thirdly, the location of the property. Together the variables form the base of the simple model. In the empirical model, the formula of Rosen (1974) is extended with supplements of Van Duijn et al. (2016) and Schwartz et al. (2006).

$$ln(P_{ijt}) = b_0 + \sum_{s=1}^{S} \theta_s R_{i\,\mathrm{tr}\,s} D_i + \sum_{s=1}^{S} \varphi_s R_{i\,\mathrm{tr}\,s} D_i^2 + \sum_{s=1}^{S} \alpha_s R_{i\,\mathrm{tr}\,s} + \Sigma_{k=1}^{k} \beta_k X_{kit} + \pi_j N_j + y_t Y_t + \varepsilon_{it} \tag{2}$$

In this model, $ln(P_{ijt})$ is the natural logarithm of the transaction price of property i, which is located in neighborhood j at transaction year t; variable D_i represents the distance between property i and the nearest mosque in the proximity; $R_{i\,\mathrm{tr}\,s}$ is a vector of ring variables s, depending on the location of property i, the year of transaction t and the treatment radius r ; the variable X_{kit} represents the characteristics (k) of property i sold during year t; N_j is a dummy variable, taking one for neighborhood j and 0 for all others; Y_t is a vector dummy taking one for year t and zero for all others. ε_{it} is an error term. $\beta_x, \pi_j, a_s, \theta_s, \varphi_s$ and y_t are the parameters to be estimated in the model.

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu
University of Groningen, 2020

A difference-in-difference model is used in this paper. The presence of a mosque in the proximity is related to $d = 1$. If there is no mosque in the proximity, the observation would be ranked as a control observation, $d = 0$. In addition, the proximity of mosques is based on a critical value of 1000 meters of a mosque; this is inspired by research of Schwartz et al. (2006), they determine four rings of either 0-150 feet, 151-500 feet, 501-1000 feet and 1501-2000 feet. A larger distance is not necessarily a benefit to your research. If the distance to a mosque becomes larger, the bias within results increases, since more factors will affect transaction prices. Therefore, distances of aforementioned papers are found suitable in this research (Schwarz et al., 2006). Properties are destined to be in the target group if they are located within 1000 meters of a mosque. These properties are part of the so-called target group, since they receive the external effects of the mosque they are closely located to. The control group involves properties that are located within 1000-2000 meters distance of a mosque. Also, three moments of time will be examined to control for time effects. These time effects are named 'Before' (before construction of a mosque), 'Between' (between construction and completion of a mosque) and 'After' (when the construction of a mosque has finished).

There are fourth different ring variables ($R_{i\,\mathrm{tr}\,s}$), which will determine the external effects of mosque construction in a specific neighborhood. The first ring variable is a distance ring dummy and contains properties which are located in the target area. The BEFORE dummy will show the external effects of the (vacant) lots before mosque construction started. The second consists of transactions, which fall in the target group and are sold between the start of the construction of a mosque and its completion (s = BETWEEN). This provides the opportunity to discover any anticipation effects which may occur. The third ring variable includes all property transactions, which occurred in the target area after the construction of a mosque is finished (and ready to be used). This coefficient (s = AFTER) shows whether external effects are present in the target area after completion of mosque construction. Fourthly, a variable is included, which captures the time difference between the transaction date of a property and the completion date of a mosque (s = TRENDAFTER). Note that these transactions must meet the conditions of the AFTER dummy. The TRENDAFTER variable provides the opportunity to analyze how the possible external effects change over time.

Furthermore, the ring variables interact with the distance to the selected mosques. This allows us to control how distance of the external effects is spatially distributed. Following Van Duijn et al. (2016), the quadratic form for D (distance) is added to show how distance decay is linear, concave or convex. Besides the different ring variables, the dependent variable in the model is based on a natural logarithm of the transaction price. Using a natural logarithm is necessary to prevent biased results, since problems with normality could occur. When using a natural logarithm, the coefficients of all results need to be interpreted as percentual changes.

In addition, 11 property characteristics explain the transaction prices with the hedonic pricing method. Besides the property characteristics, additional information on mosques and neighborhoods is added. As for mosques, the type of building and their visibility is taken in account. In total, the researchers added 8 neighborhood characteristics, which are used to understand how neighborhood characteristics interact with transaction prices.

4. Data

Two datasets are used in this paper. The first dataset is subtracted from the 'Nederlandse vereniging van Makelaars en Taxateurs' (hereafter NVM; NVM, 2019). Since years, the NVM and the University of Groningen collaborate in order to provide relevant research projects. This cooperation involves the exchange of data from the NVM in return for research projects specialized in the real estate business. Besides the NVM, the municipality of Amsterdam provides information on mosques in the city, which is an open source and available for anyone who is interested. Furthermore, additional information is added by using the program called Geographical Information Systems (hereafter: ArcGIS), containing data regarding neighborhoods in Amsterdam.

4.1 Municipality of Amsterdam data

The city council of Amsterdam provides a data portal including the Greater Amsterdam region (Amsterdam data, 2019). The selected raw csv. file contains all religious meeting places known by the municipality. In total, Amsterdam knows 305 religious meeting places, however only 41 of these religious places are labelled as mosque. The data regarding mosques is supplemented with information from "Buurten 2015–CBS Wijk- en Buurtkaart" in ArcGIS. This map contains information on neighborhood characteristics, such as population density, percentage of immigrants, average house value and income per inhabitant. Those datasets combined, provide the opportunity to connect neighborhood characteristics to mosques and transaction prices.

Since the NVM data contains transaction prices in the period between 2000 until 2018, relevant mosques must be constructed in that same period. Out of these 41 mosques, 20 mosques are constructed in the year 2001 or later. Mosques constructed in 2000 are not included, since they are not suitable if they do not represent 'Before' results. Table 1 provides an overview on the selected mosques and their characteristics, figure 1 shows the spatial distribution of the selected mosques.

Table 1: Overview of the selected mosques

	Name	Address	Type	Construction	Opening year	Visibility	Origin
1	EL Hijra Moskee	Arthur van Schendelstraat 17	Unknown	2006	2007	Yes	Moroccan mosque
2	Moskee Ghousia Masjid	Baarsjesweg 160	School	2001	2003	No	Surinamese mosque
3	Milli Görüs Mevlana Moskee	Baas Gansendonckstraat 2	Church	2006	2016	No	Turkish mosque
4	Noori Moskee	Bessemerstraat 25	Residence	2005	2006	Yes	Surinamese mosque
5	Stichting Erdem	Doctor H. Colijnstraat 82	Mosque	2013	2014	No	Surinamese mosque
6	Faried-UL-Islam	Ekingenstraat 9-12	Residence	2006	2008	No	Surinamese mosque
7	Taqwah Moskee	Generatorstraat 6	Mosque	2008	2012	Yes	Moroccan mosque
8	Ahmadiyya	Gerard Doustraat 70	Residence	2001	2002	No	Moroccan mosque
9	De Blauwe Moskee	Henri Dunantstraat 10-12	Mosque	2008	2011	Yes	Moroccan mosque
10	Vereniging Moskee Arrayan	IJdoornlaan 36	Store	2010	2011	No	Moroccan mosque
11	Stichting el Mohamadi	Target Evertsenstraat 201	Residence	2008	2008	No	Moroccan mosque
12	Moskee Imam Malik	Johan Huizingalaan 146	School	2009	2011	No	Turkish mosque
13	Moskee el Fath al Moebien	Joubertstraat 15	Mosque	2008	2010	Yes	Moroccan mosque
14	EL Mouhssinine	Meeuwenlaan 31	Mosque	2009	2010	Yes	Moroccan mosque
15	Moskee al-Ihsaan	Mendes Da Costahof 28	Unknown	2004	2006	Yes	Turkish mosque
16	El Ouma Moskee	Postjesweg 179	Residence	2008	2009	Yes	Surinamese mosque
17	Noord Kuba Camii	Ribesstraat 75	Mosque	2017	2019	No	Moroccan mosque
18	Mashid Alkaram	Sint Willibrordusstraat 55	School	2001	2002	No	Moroccan mosque
19	Moskee Badr	Willem Leevendstraat 7	Mosque	2001	2003	Yes	Moroccan mosque
20	Al Houda Moskee	Wolbrantskerkweg 34	School	2007	2009	No	Turkish mosque

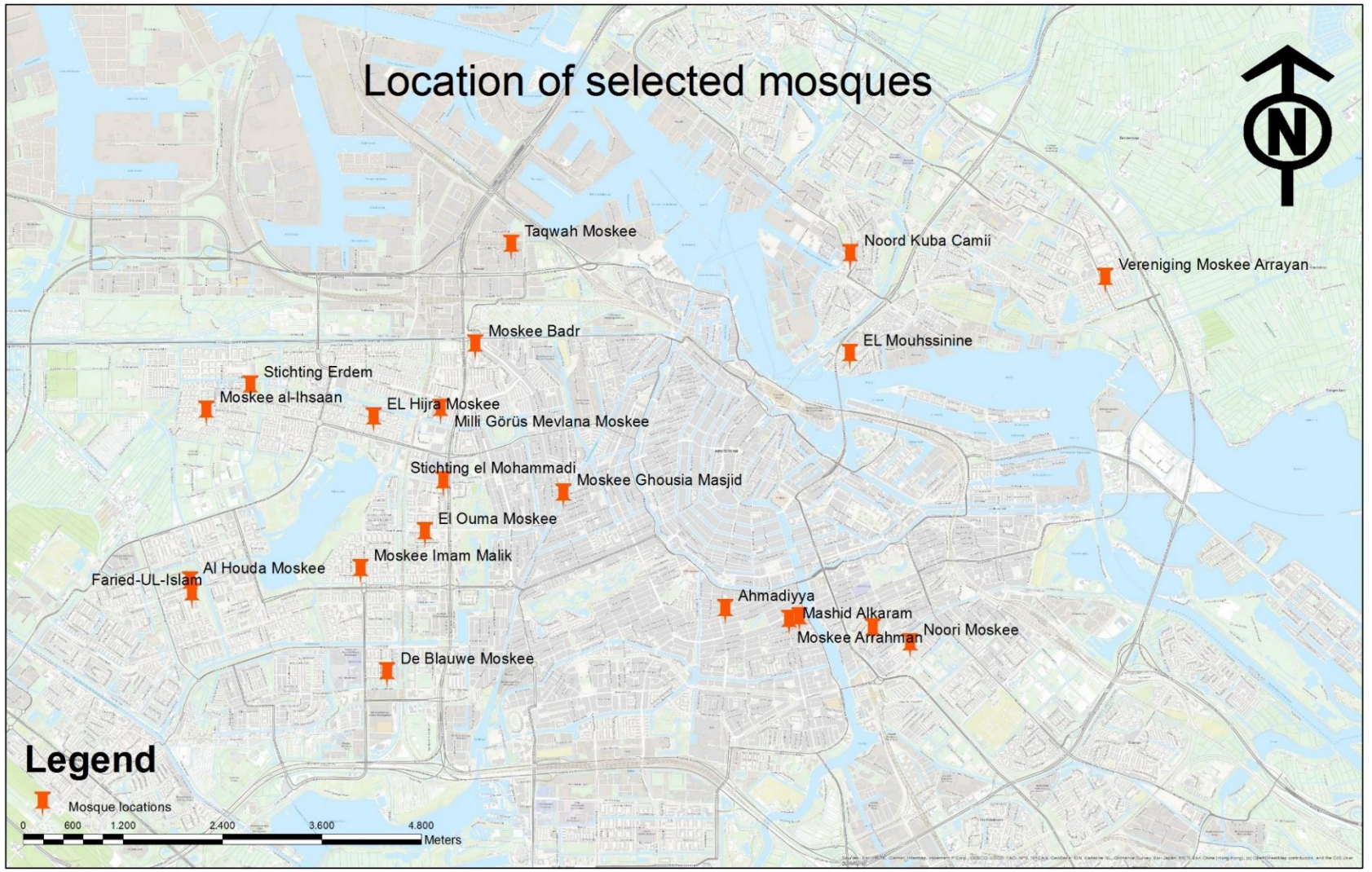

Figure 1: Spatial distribution of the selected mosques

4.2. NVM data

The NVM data consists of 224.969 house price transactions in the city of Amsterdam in the period 2000-2018. In total, the dataset contains 81 variables. However, most of these variables are irrelevant for the purpose of this research. Necessary variables are for example; transaction prices, the year of transaction and spatial location. The transaction of properties connects to a specific mosque based on their spatial location. In the dataset, the geolocations (i.e. latitude and longitude) of all observations are added. This provides the opportunity to spatially join these observations with spatial locations of the selected mosques by using ArcGIS. Furthermore, characteristics of the properties are used to explain fluctuations in transaction prices as is introduced by Rosen (1974) and extended by Van Duijn et al. (2016). Inspired by those authors, 11 variables are selected that provide the necessary information how transaction prices are defined (table 2).

The NVM dataset is processed in the program ArcGIS. In ArcGIS, the locations of the selected mosques and observations are spatially distributed. To ensure the transactions are suitable for this research, a spatial join is performed to measure the distance of each transaction to the nearest mosque. By spatially joining the data in ArcGIS, several observations were dropped since ArcGIS was unable to successfully join these observations. In total 26.969 observations were dropped by ArcGIS, leaving a total of 190.000 observations suitable for this research. Furthermore, many observations in the NVM data had missing values for the transaction price. Since the transaction price is a crucial element in this model, all missing values were dropped. In total 76.948 observations were dropped because of their missing values leaving 113.052 observations.

The target- and control group are defined at a distance of 1000 meters and 2000 meters from the closest mosque, so observations that are located further than 2000 meters from a mosque are not relevant in this study. By dropping all observations that do not meet these requirements, the dataset shrinks to an amount of 82.547 usable observations. Also, several outliers were identified when controlling for normality. To prevent these outliers to bias the results, observations that have transaction values over €2.000.000 are removed. The same is done with outliers that represent unrealistic sales prices. Some observations had sales prices that were too low to be representative for Amsterdam. Therefore, all observations with a transaction price lower than €50.000 are dropped. In total 764 observations are dropped, resulting in a remainder of 81.784 observations that are operable in this research.

Table 2: Selected property characteristics

Variable	**Description**
Transaction price	The natural logarithm of each transaction price
Floor space	The natural logarithm of the size of each sold property
Neglect inside	Dummy variable, 1 = yes
Neglect outside	Dummy variable, 1 = yes
Garden	Dummy variable, 1 = yes
Heating	Dummy variable, 1 = yes
Prominent location	Dummy variable, 1 = yes
Terrace	Dummy variable, 1 = yes
Number of rooms	Number of rooms in the specific property
Parking	Dummy variable, 1 = yes
Housing type	Type of specific property - Apartment - Terraced housing - Semi-Detached - Corner - Two-under-one-roof - Detached
Year of construction	Building period of property - <1945 - 1945-1970 - 1970-2000 - >2000

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

4.3 Descriptive statistics

Table 3 shows the descriptive statistics of all the variables that will be used in the model. It shows that there is a total of 81.784 observations, 41.877 observations in the target group and 39.907 observations in the control group. The difference between both groups is negligible, referring to the almost 50-50 division between the groups. Another inference from table 3 is that the control group has a higher average transaction price (€313.504,10) compared to both the total group (€287.984,50) and target group (€263.665,50). This implies that properties are more expensive in the control group area, compared to the target area.

As could be expected in the Greater Amsterdam region, almost all properties are labelled as apartments (92.25%). The other properties selected in this model, only represent a minor part of the observations. Furthermore, the statistics regarding neighborhood characteristics show how 28,42% of the population has a non-western background, which is partly Moroccan (8,39%) and Turkish (4,83%). The percentages of Moroccan and Turkish immigrants are higher in the target group area than in the control group area. This is in line with the expectations that there is a higher demand for mosques in Muslim oriented neighborhoods. Mosques are therefore expected to be located in communities where the number of Muslims is higher. However, not every mosque has the appearance of a typical mosque. Only 17% of all buildings is labelled as an original mosque. A remarkable fact is that the number of traditional mosques is higher in the control group compared to the target group. This means that from al the observations in the control group, around 30% of these observations has a traditional mosque in the proximity.

Table 3: Descriptive statistics total Group, target group and control group

		Total group		**Target group**		**control group**	
		N= 81.784		*N= 41.877*		*N=39.907*	
Variable		**Mean**	**Std. Dev.**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev.**
Transaction price	€	287984.5	182712.3	263665.5	156899.4	313504.1	203253.2
7oor area	M2	79.569	39.8028	75.745	36.392	83.582	42.727
Distance to nearest mosque	M	1003.744	509.689	576.168	239.840	1452.427	280.821
Neglect inside	Dummy, 1 = yes	.0720	.258	.0678	.251	.0763	.266
Neglect outside	Dummy, 1 = yes	.0232	.151	.0217	.146	.0248	.156
Garden	Dummy, 1 = yes	.204	.403	.193	.395	.216	.411
Heating	Dummy, 1 = yes	.938	.240	.942	.233	.934	.248
Prominent location	Dummy, 1 = yes	.340	.474	.280	.449	.402	.490
Terrace (roof)	Dummy, 1 = yes	.127	.349	.562	.496	.148	.375
Number of rooms in a property	#	3.132	1.767	3.0851	1.699	3.181	1.834
Parking space	Dummy, 1 = yes	.0882	.284	.0799	.271	.0968	.296
Apartment	Dummy, 1 = yes	.922	.267	.934	.249	.911	.285
Terraced	Dummy, 1 = yes	.0553	.229	.0462	.210	.0649	.246
Semi-Detached	Dummy, 1 = yes	.00139	.0371	.000931	.03050	.00188	.0433
Corner house	Dummy, 1 = yes	.0124	.111	.00924	.0957	.0158	.125
Two under one roof	Dummy, 1 = yes	.00457	.0675	.00578	.0758	.00331	.0574
Detached	Dummy, 1 = yes	.00372	.0609	.00413	.0641	.00328	.0572
Construction period							
Constructed <1945	Dummy, 1 = yes	.633	.482	.624	.484	.643	.479
Constructed 1946-1970	Dummy, 1 = yes	.0830	.276	.0776	.268	.0887	.284
Constructed 1971-2000	Dummy, 1 = yes	.232	.422	.244	.429	.220	.414
Constructed >2000	Dummy, 1 = yes	.0499	.218	.0532	.224	.0464	.210
Mosque types							
Church	Dummy, 1 = yes	.00904	.0946	.0105	.102	.00749	.0862
Mosque	Dummy, 1 = yes	.167	.373	.0429	.202	.297	.457
Unknown building	Dummy, 1 = yes	.0758	.265	.0698	.255	.0821	.275
School	Dummy, 1 = yes	.265	.442	.378	.485	.147	.354
Shop	Dummy, 1 = yes	.00117	.0342	.00229	.0478	0	0
Residence	Dummy, 1 = yes	.482	.500	.496	.500	.467	.499
Visibility	Dummy, 1 = yes	.336	.472	.1724	.378	.508	.500
Neighborhood characteristics							
Population density	#km2	19.389	7588.927	19452.95	6989.499	19321.58	8170.344
Percentage non-western immigrants	%	28.429	15.841	35.3414	15.862	21.176	12.14.697
Percentage Moroccan immigrants	%	8.391	7.563	11.999	7.929	4.605	4.823
Percentage Turkish immigrants	%	4.853	4.958	6.894	5.415	2.711	3.262
% young people <25	%	25.133	5.453	26.652	4.932	23.540	5.520
% Elderly people >65	%	10.859	4.945	10.173	3.390	11.579	6.0857
Average house value	€	310.369	99.623	289024.1	84.573	332.769	108.877
Average income per inhabitant	€	20.755	4.486	21.124	4.782	20.368	4.116

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

5. Results

5.1 Empirical results

Table 4 provides the results from the basic empirical model. In table 4, you can distinguish four models which all have a different set of variables included in the regression. Model 1 controls for the variables 'Before', 'Between', 'After', 'Trendafter' and the year fixed effects. Model 1 is considered to be the basic model and has an R^2 of 15,46%. In model 2, structural characteristics and construction periods are added, increasing the R^2 to 66,22%. In model 3, neighborhood fixed effects are added as well. The small increase of the R^2 in model 3 to 70,14% implies that neighborhood fixed effects add marginal explanatory power to the model. The fourth model controls for neighborhood characteristics, increasing the R^2 to 77,13%. Following Schwartz et al. (2006), a high R^2 indicates a proper fit of a model. Therefore, model 4 is the preferred model 4 since it has the highest R^2.

In this section the results of the 'Before' variable from model 4 (shown in table 4) are discussed. The coefficient of the variable 'Before' is negative and significant at the 1% level. This suggests that the target group has lower transaction prices compared to the control group area. The coefficient -.134 actually means that the transaction prices in the target area are: $\left(\exp^{(-0.134)} - 1\right) \cdot 100$ = 12,54% lower than in the control group area (if TREND = 0, D = 0). This negative coefficient may be due to vacant lots. Following Raleigh and Galster (2015), vacant lots increase the likelihood of vandalism, crime and neighborhood decline. In this study, vacant lots could be an explanation for the lower transaction prices in the target group (Titman, 19850). However, another explanation could be the fact that mosques are located in neighborhoods were transaction prices were already lower than transaction prices in neighborhoods without mosques. This would be in line with the findings of Buijs (2009), who state that immigrants are more likely to live in poverty and poverty is often accompanied with lower transaction prices (Buijs, 2009). Table 3 shows that the target group area has higher percentages of Moroccan and Turkish residents. So, the lower transaction prices in the 'Before' variable may be due to vacant lots and/or the fact that transaction prices in those neighborhoods were simply lower at that time.

Continuing with the interaction between the 'Before' variable and the distance variable. This interaction variable has a positive coefficient which is significant at the 1% level. This means that the negative external effects of mosque locations are diminishing when distance increases. This is in line with the explanation introduced by Raleigh and Galster (2015) regarding negative effects of vacant lots. When moving away from vacant lots, the negative effects of these vacant lots will diminish.

Following up on the 'Before' variable, the coefficient of the 'Between' variable has a negative sign, but the result shows no significant evidence. Since the result is not significant, it cannot be used to draw conclusions. To provide a complete overview of the model, the result is shortly discussed. Transaction prices in the target group have risen compared to the transaction prices in the control group. This is not in line with the expectations. This may be due to the amenities developed by the construction on vacant lots. The results suggest that during the construction period the negative external effects of vacant lots disappeared, implying that mosque construction has a positive effect on transaction prices.

The 'After' variable also has a positive coefficient which is not significant. Therefore, it also cannot be used to draw reliable conclusions. The positive coefficient is not in line with the expectations, since existing literature presented evidence of negative effects (Do et al., 1994; Babawale & Adewunmi, 2011). Furthermore, the interaction between the 'After' variable and the distance variable has a positive coefficient. However, with the main variable being insignificant the results of the interaction variable cannot be used, since no effect of mosques is found.

In contrast to the 'After' variable, the 'Trendafter' variable has a negative coefficient and is significant at the 1% level. The 'Trendafter' variable indicates that the decreasing transaction prices, diminish over time. This is in accordance with the interaction variable of 'Trendafter' and distance. The positive coefficient of the variable implies that if distance increases, transaction prices will increase as well. Over the years, the difference in transaction prices between the target and control group will converge, since the effect of distance will diminish.

So, summarizing the results of the 'After' variable, no significant evidence is found between transaction prices in the proximity of mosques and transaction prices located further away from a mosque. Referring to H1, which stated that the construction of mosques causes negative external effects on transaction prices, no significant evidence is found in the city of Amsterdam. Therefore, H1 is rejected. This is not in line with findings of existing literature (E.g. Do et al., 1994; Babawale & Adewunmi, 2011). However, Brandt et al. (2013) suggested that religious places in Hamburg do not radiate negatively on the surrounding area since the city is one of the most tolerable cities in Germany. Amsterdam is known to be a multicultural city, with more tolerance compared to other places in the Netherlands. Perhaps different results would be found if this study is conducted in another city in the Netherlands. In addition, evidence shows that the negative or positive effects of mosques diminish over distance and time.

Table 4: Regression results for model 1, 2, 3 and 4

	Model 1	**Model 2**	**Model 3**	**Model 4**
Sample area	<2000	<2000	<2000	<2000
Target group	0 – 1000 m	0 – 1000 m	0 – 1000 m	0 – 1000 m
Control group	1000 – 2000 m	1000 – 2000 m	1000 – 2000 m	1000 – 2000 m
Before	-.483***	-.294***	-.408***	-.134***
	(.0162)	(.011)	(.0107)	(.0105)
Before * D	.000795***	.000623***	.000597***	.000159***
	(6.72e-05)	(.000043)	.(0000421)	(4.04e-05)
Before * D^2	-3.41e-07***	-3.87e-07***	-2.98e-07***	-3.78e-08
	(6.22e-08)	(3.96e-08)	(3.83e-08)	(3.62e-08)
Between	-.0356***	-.0479***	-.0599***	.030
	(.0226)	(.0143)	(.0142)	(.0383)
Between * D	-.00028	-.00031	-.000216	.000109
	(.9.85e-05)	(6.21e-05)	(.0000602)	(.0000463)
Between * D^2	3.29e-07***	2.92e-07***	2.21e-07***	-4.80e-08
	(9.36e-08)	(5.88e-08)	(5.62e-08)	(5.20e-08)
After	0.134***	.0862***	.0537***	.0128
	(.0249)	(.0161)	(.0157)	(.0142)
After * D	-.00113***	.00055	.00015***	.000353***
	(.000107)	(6.77e-05)	(.0000636)	(5.92e-05)
After * D^2	8.05e-07***	5.28e-07***	-2.10e-07***	-4.11e-07***
	(8.37e-08)	(6.55e-08)	(5.99e-08)	(4.33e-08)
Trend after	-.0114	-.00422	-.0341***	-3.78e-07***
	(.0109)	(.00734)	(.0066)	(.5.64e-08)
Trend after * D	-.00017***	.000046	.000256***	.000235***
	(.0109)	(3.11e-05)	.(0000274)	(2.54e-05)
Trend after * D^2	1.91e-07***	-4.25e-08	-2.63e-07***	-2.44e-07***
	(4.78e-08)	(2.98e-08)	(2.60e-08)	(2.44e-08)
Year fixed effects (17)	YES	YES	YES	YES
Structural characteristics (11)	NO	YES	YES	YES
Construction dummies (4)	NO	YES	YES	YES
Mosque characteristics (2)	NO	NO	YES	YES
Neighborhood fixed effects (6)	NO	NO	YES	YES
Neighborhood characteristics (8)	NO	NO	NO	YES
Observations	81.784	81.784	81.784	81.784
R^2	0.1546	0.6622	0.7014	0.7713

Note: Dependent variable is ln(transaction prices); Robust Standard Errors are between parentheses * P < .10; ** P < .05; *** P < .01

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

5.2 Visibility

Continuing with the results of table 5. Table 5 shows the difference in the external effects of mosques on transaction prices between visible and non-visible mosques. Comparing model 4 (table 4) and model 5 (table 5), there are hardly any differences between the models. The most striking difference is the 'Trendafter' variable. In the previous models (E.g. model 1-4), the 'Trendafter' variable had a negative sign indicating that the negative external effects of mosques would diminish over time. In model 5, the 'Trendafter' variable has a positive sign. This implies that the positive external effect, presented at the 'After' variable in table 5, from mosques on transaction prices, will become larger over time. So, visible mosques radiate more positive external effects when time passes according to the results of table 5.

Following up on model 5, model 6 presents a negative coefficient for the 'Before' and positive coefficients for the 'Between' and 'After' variables. These results are comparable with model 5. However, only the result of the 'Before' variable shows significant evidence. Therefore, no conclusions can be drawn from the 'Between' and ' After' variables. Based on model 5, evidence shows that visible mosques provide amenities to properties in the proximity. This is not in line with the expectations, since the expectations were that visible mosques radiated negatively on properties in the proximity.

Babawale & Adewunmi (2011) argued that size determines the effectiveness of externalities on properties in the proximity. Following these findings, an increase in the effectiveness of externalities on visible mosques compared to non-visible mosques was expected (H2). However, there is no irrefutable evidence that visible mosques radiate more negative external effects than non-visible mosques, since visible mosques experienced positive external effects on transaction prices at the 'After' variable. The results of model 6 do not provide significant evidence and cannot be used for conclusions. Based on model 5, H2, which stated that visible mosques had more negative external effects than non-visible mosques, is rejected.

Table 5: Effect of visibility of mosques

	Visible from outside	**Not visible from outside**
	Model 5	**Model 6**
Sample size	<2000	<2000
Target group	0 – 1000 m	0 – 1000 m
Control group	1000 – 2000 m	1000 – 2000 m
Before	-.209***	-.169***
	(.0274)	(.01154)
Before * D	.000263***	.000218***
	(9.35e-05)	(4.55e-05)
Before * D^2	-5.56e-08	-8.10e-08***
	(7.68e-08)	(4.11e-08)
Between	.0303	.00156
	(.0384)	(.0147)
Between * D	-4.61e-05	4.75e-05
	(.000135)	(6.27e-05)
Between * D^2	-3.16-08	-4.19e-08
	(1.13e-07)	(5.88e-08)
After	.132***	.0159
	(.042)	(.0158)
After * D	.6.54e-05	.000343***
	(.000152)	(6.83e-05)
After * D^2	-2.14e-07	-3.43e-07***
	(1.27e-07)	(6.72e-08)
Trend after	.0612***	-.0326***
	(.0168)	(.00667)
Trend after * D	-5.4e-05	.000291***
	(5.85e-05)	(.3.06e-05)
Trend after * D^2	-1.58e-08	-2.84e-07***
	(4.84e-08)	(3.07e-08)
Year fixed effects (17)	YES	YES
Structural characteristics (11)	YES	YES
Construction dummies (4)	YES	YES
Mosque characteristics (2)	YES	YES
Neighborhood fixed effects (6)	YES	YES
Neighborhood characteristics (8)	YES	YES
Observations	27.262	54.522
R^2	0.7567	0.7883

Note: Dependent variable is ln(transaction prices); Robust Standard Errors are between parentheses * P < .10; ** P < .05; *** P < .01

5.3 Demographics

Table 6 shows the results of model 7 and 8. Model 7 presents how transaction prices in Muslim dominated neighborhoods react on the presence of mosques. However, a few notes need to be made before analyzing the results. First, the percentage of Muslim residents is based on an aggregation of Moroccan and Turkish immigrants. Since there were no exact numbers on Muslim residents, a new variable was generated to approach reality and sketch the Muslim population in neighborhoods. Second, because variables regarding Moroccan and Turkish immigrants were aggregated, both of these variables are left out in the neighborhood characteristics to prevent any collinearity and miscalculations in the regression.

Analyzing table 6, there are several interesting facts. First, in model 7 and 8 the variables tend to follow previous models in terms of coefficients and their sign. Mentioning the 'Between' variable of model 8, a positive and significant coefficient is found, implying that transaction prices in the target group were rising compared to the control group during the construction of the mosques in non- Muslim dominated neighborhoods. The results suggest that the anticipation effect in non- Muslim neighborhoods pushed transaction prices, which is not according to the expectations. Second, the coefficient of the 'After' variable in Muslim dominated neighborhoods is positive and the 'After' variable in non-Muslim dominated neighborhoods is negative. These results are in line with the expectations since the transaction prices are positively affected in Muslim dominated neighborhoods. The 'After' variable of model 8 implies that transaction prices in the target group endured a decrease of 58,23% ($\left(\exp^{(-0.873)} - 1\right) \cdot 100$) in non- Muslim neighborhoods. This result shows a big discrepancy between the 'Between' and 'After' variable in model 8.

The question is where this big discrepancy comes from. One of the explanations could be that mosque construction has an immediate, significant effect on transaction prices in the target group. Also, the target group is based on a lower number of Muslim residents, which could imply that they are more sensitive to mosque construction. Referring to Gautier et al. (2009), a 'shock effect' could have triggered a rapid decrease in transaction prices. Besides, the control group could have experienced increasing transaction prices in the aftermath of mosque construction. The difference between transaction prices in the target group (decreasing prices) and control group (increasing prices), would in that case become even bigger. A last explanation could relate to the rearranged dataset. In model 8, observations are differently distributed compared to the other models. Perhaps, this new division of observations caused an uneven distribution in transaction prices, explaining the discrepancy between the target and control group.

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

Previous research of Landman & Wessels (2005) and Gautier et al. (2009) implied that demographic structures could determine the effects of externalities on transaction prices. Based on their research, H3 was formulated. H3 included a statement that Muslim dominated neighborhoods experience fewer external effects on transaction prices compared to non-Muslim dominated neighborhoods. The results show evidence that transaction prices in Muslim dominated neighborhoods are less affected by mosque construction compared to non-Muslim dominated neighborhoods. This is in line with the existing literature and means that H3 is not rejected. The model suggests that mosque construction in Muslim dominated neighborhoods provides amenities and positively affects transaction prices.

Table 6: Regression results model 7 and 8

	High % Muslim residents	**Low % Muslim residents**
	Model 7	**Model 8**
Sample size	<2000	<2000
Target group	0 – 1000 m	0 – 1000 m
Control group	1000 – 2000 m	1000 – 2000 m
Before	-.141***	-.152**
	(.0109)	(.0524)
Before * D	.0000736	.000343*
	(.000047)	(.000160)
Before * D^2	-3.41e-09	-2.03e-07*
	(4.69e-08)	(1.16e-07)
Between	.0204	.236***
	(.0128)	(.0665)
Between * D	.000127*	-.000621***
	(.000059)	(.000207)
Between * D^2	-1.14-07*	4.01e-07**
	(6.02e-08)	(1.54e-07)
After	.0716***	-.873***
	(.0146)	(.116)
After * D	.000282***	.00255***
	(.0000675)	(.0003023)
After * D^2	-2.29e-07***	-1.63e-06***
	(6.87e-08)	(2.39e-07)
Trend after	-.00385	-.537***
	(00610)	(.0535)
Trend after * D	.000161***	.00159***
	(.0000282)	(.000154)
Trend after * D^2	-1.39e-07***	-1.07e-06***
	(2.76e-08)	(1.09e-07)
Year fixed effects (17)	YES	YES
Structural characteristics (11)	YES	YES
Construction dummies (4)	YES	YES
Mosque characteristics (2)	YES	YES
Neighborhood fixed effects (6)	YES	YES
Neighborhood characteristics (6)	YES	YES
Observations	21.598	53.772
R^2	0.8103	0.7387

Note: Dependent variable is ln(transaction prices); Robust Standard Errors are between parentheses * P < .10; ** P < .05; *** P < .01

6. Conclusion

6.1 Conclusion

In this study, the external effects of mosque construction on transaction prices in the proximity is examined. By using a hedonic pricing method as introduced by Rosen (1974), a mathematical model is built to analyze the effects of mosques on transaction prices. To control for location differences, a difference-in-difference model is used (Van Duijn et al., 2016; Schwartz et al., 2006). In Chapter 2, a theoretical framework is constructed based on the existing literature. As there is limited research available on the external effects of mosques on transaction prices, the theoretical framework is based on coherent literature that is available on similar religious places. Based on research of several authors (E.g. Do et al., 1994; Babawale & Adewunmi, 2011) negative external effects of mosques could be expected. Table 4 shows the results of the empirical model used in this study. This model provides the opportunity to answer the main research question. Model 4 shows no evidence of a negative relation between mosque construction and transaction prices in the proximity. Before mosque construction, vacant lots radiated negatively on transaction prices in the proximity. During mosque construction ('Between' variable), a small increase in transaction prices was found the target group and properties in the control group, however, this result was not significant. The 'After' variable also showed a small increase in transaction prices in the target group compared to the control group, but also was not significant. Overall, the pattern suggests that vacant lots radiate negatively on transaction prices, but when construction has started, transaction prices increase of properties in the proximity of a mosque. But, no hard conclusion can be drawn, since the 'Between' and 'After' variable do not show any significant evidence. Referring to the research question:

'*How do external effects of mosque construction affect transaction prices of properties located in the proximity of these mosques?'*

The following conclusion is drawn: No significant evidence is found that mosque construction has a negative effect on transaction prices in the proximity. The results imply a positive effect of mosques, but do not present significant results. The significant evidence which is found, shows that the effects of mosques diminish over time and distance.

Continuing on the results of table 5 regarding the visibility of mosques. The hypothesis stated that visible mosques cause more negative external effects compared to non-visible mosques. There is no irrefutable evidence that visible mosques radiate more negative external effects than non-visible mosques, since positive effects on transaction prices were observed in the proximity of visible mosques. Therefore, the hypothesis, which stated that visible mosques had more negative external effects than non-visible mosques, is rejected.

Continuing on table 6 regarding the effects of Muslim dominated neighborhoods. Based on the results presented in table 6, the hypothesis, which stated that the negative effects of mosques in Muslim dominated neighborhoods had lower effects on transaction prices, is not rejected. The results show evidence that Muslim dominated neighborhoods experience small increasing transaction prices.

In summary, this paper examined how mosque construction affects transaction prices in the proximity. Where the existing literature was primarily limited to the external effects of churches on transaction prices (E.g. Brandt et al., 2013; Do et al., 1994; Babawale & Adewunmi, 2011), this paper adds to the existing literature by examining the external effects of mosques on transaction prices. With the help of three hypotheses, different scenarios were tested. H1 related to the main research question and was rejected. Furthermore, the literature implied that visible mosques radiate more negative effects than non-visible mosques (Babawale & Adewunmi, 2011; Saint-Blancat & Schmidt di Friedberg, 2005). The results suggested that this is not the case and therefore, H2 was rejected. In addition, other literature implied that Muslim dominated neighborhoods experienced fewer external effects of mosque construction (Gautier et al., 2009; Landman & Wessels, 2005). H3 controlled for these results and showed that this is likely to be the case, so H3 is not rejected. H2 and H3 aimed to expand the information on how mosques affect transaction prices in the proximity.

Altogether, the research is of aid to policymakers to assist them in decision processes to protect social structures within communities and prevent losses in terms of transaction prices (Norris & Inglehart, 2012). Also, external effects are temporary, which strengthens the findings of Gautier et al. (2009), who found that external effects diminish over time. Apparently, habituation seems to occur within communities. In addition, investors can use the results when acquiring properties. Investors now know that mosques can affect transaction prices of properties in the proximity, but that these external effects diminish over time and distance.

6.2 Limitations and further research

The existing literature on mosques is limited. Therefore, the theoretical framework is based on existing literature regarding churches. Even though theories were connected in this paper, more relevant scientific literature would have increased the substantiation of arguments introduced in this paper. Besides the existing literature, table 6 shows the Muslim population in neighborhoods. Since percentages regarding the number of Muslims are unknown, an indicator variable is constructed. This variable is based on the Moroccan and Turkish percentage of residents in each neighborhoods. However, not every Moroccan or Turkish resident has to be a Muslim, which is a limitation in this research. Also, some mosques are constructed and finished in the same year or in the following year. This can cause biased results for the ‘Between’ variable, since the regression cannot measure the ‘Between’ transaction prices since they are based on the same year. Even though this is the case with only a few mosques,

there is a chance some results are influenced in these cases. Lastly, the R^2 of the preferred model is relatively low. Apparently, there is room to improve the model and increase the power of the test. Also, if the R^2 would increase, the results would be more reliable. Perhaps the difference in transaction prices would not be over 100% in model 8.

Future research should focus on determining which variables or factors are the most important drivers behind transaction prices in the proximity of mosques. We showed that transaction prices in the proximity of mosques are suffering from negative external effects. Further research on demographic, social and economic topics could increase the amount of information as a base of explaining the affected transaction prices. Also, the relation between mosques and transaction prices is still a minor substantiated topic, more research would strengthen the reliability of the results presented in this paper. Besides, a possible explanation for converging prices in some models implies that mosque construction is accompanied with certain amenities. It would be interesting to focus specifically on the amenities provided by mosques and how they relate to their communities. Perhaps future research can find certain circumstances where mosques have a positive influence on transaction prices.

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

7. References

Amsterdam data. (2019). Locaties voor religieuze samenkomsten. Available at: https://maps.amsterdam.nl/religie/?LANG=nl. Acquired on: 02-06-2019.

Babawale, G.K., and Adewunmi, Y. (2011). The impact of neighbourhood churches on house prices. *Journal of Sustainable Development*, 4(1), pp. 246–253.

Bourassa S.C., Hoesli, M. and Sun, J. (2004). What's in a View? *Environmental and Planning A*. 36(8), pp. 1427-1450.

Brandt, S., Maennig, W. and Richter, F. (2013). Do places of worship affect housing prices? Evidence from Germany, Hamburg. *Contemporary Economic Discussions*, No. 48, ISBN 978-3-942820- 11-0, Universität Hamburg, Fac. Economics and Social Science, Chair for Economic Policy, Hamburg.

Buijs, F. J. (2009). Muslims in the Netherlands: Social and Political Developments After 9/11. *Journal of Ethnic and Migration Studies*, 35(3), pp. 421–438. doi: 10.1080/13691830802704590.

Casidy, R., and Tsarenko, Y. (2014). Perceived Benefits and Church Participation. *Asia Pacific Journal of Marketing and Logistics*, 26(5), 761–776. doi: 10.1108/APJML-04-2014-0055.

Carroll, T. M., Clauretie, T. M. and Jensen, J. (1996). Living Next to Godliness: Residential Property Values and Churches. *The Journal of Real Estate Finance and Economics*, 12(3), pp. 319–330. doi: 10.1007/BF00127540.

CBS, (2017). Ervaren spanningen in de samenleving. Available at: https://www.cbs.nl/nl-nl/nieuws/2017/15/ervaren-spanningen-in-de-samenleving. Acquired on 26-02-2019.

Collins, H. (2011) The Mosque as a Political, Economic, and Social Institution 622 – Present. Syracuse University Honors Program Capstone Projects. 282.

De Jong, I. (2007). Civil Society in beweging: Vier moskeeorganisaties in Amsterdam Slotervaart. *Journal of Social Intervention: Theory and Practice*, 16(1), pp. 21–31. doi: 10.18352/jsi.94. De

Koning, M., Amer, M., & Boendoer, W. (2006). De discussie over moskeeeën. Available at: https://www.nemokennislink.nl/publicaties/de-discussie-over-moskeeen/. Acquired on 17-06-2019

De Nederlandse Grondwet. (2005). Artikel 6: Vrijheid van godsdienst en levensovertuiging. Available at: https://www.denederlandsegrondwet.nl/id/via0icz1lev4/artikel_6_vrijheid_van_godsdienst_en. Acquired on: 17-06-2019

Do, A. Q., Wilbur, R.W., and Short, J. L. (1994). An empirical Examination of the Externalities of Neighbourhood Churches on Housing Values. *Journal of Real Estate Finance and Economics*, 9(1), pp.127-136.

Fozdar, F. (2012). Social Cohesion and Skilled Muslim Refugees in Australia: Employment, Social Capital and Discrimination. *Journal of Sociology*, 48(2), pp. 167–186. doi: 10.1177/1440783311413482.

Gautier, P., Siegmann, A., and Vuuren, A. (2009). Terrorism and attitudes towards minorities: the effect of the Theo van Gogh murder on house prices in Amsterdam. *Journal of Urban Economics*, 65, pp. 113-126

Kaufman, D. A., & Cloutier, N. R. (2006). The Impact of Small Brownfields and Greenspaces on Residential Property Values. *Journal of Real Estate and Economics*, 33 (1), pp.19–30.

Landman, N. and Wessels, W. (2005). The Visibility of Mosques in Dutch Towns. *Journal of Ethnic and Migration Studies*, 31 (6), 1125-1140, DOI: 10.1080/13691830500282725.

Mohiuddin, A. (2017). Muslims in Europe: Citizenship, Multiculturalism and Integration. *Journal of Muslim Minority Affairs*, 37(4), pp. 393–412. doi: 10.1080/13602004.2017.1405512.

NOS. (2017). Het aantal moslims stijgt, maar met hoeveel? Available at: https://www.cbs.nl/nl-nl/nieuws/2007/43/ruim-850-duizend-islamieten-in-nederland. Acquired on 20-02-2019.

NOS. (2018) In Nederland staan 500 moskeeën en deze moskee is te klein geworden. Available at: https://nos.nl/nieuwsuur/artikel/2235672-in-nederland-staan-500-moskeeen-en-deze-moskee-is-te-klein-geworden.html. Acquired on 19-02-2018.

Norris, P., and Inglehart, R. F. (2012). Muslim Integration into Western Cultures: Between Origins and Destinations. *Political Studies*, 60(2), pp. 228–251. doi: 10.1111/j.1467-9248.2012.00951. x.

NVM. (2019). Over NVM. Acquired on: 20-06-2019. Available at: https://www.nvm.nl/

Paterson, R. W., and Boyle, K. J. (2002). Out of Sight, Out of Mind? Using GIS to Incorporate Visibility in Hedonic Property Value Models. *Land Economics*, 78(3).

Raleigh, E. and Galster, G., (2015). Neighborhood disinvestment, abandonment, and crime dynamics. *Journal of Urban affairs*, 37 (4), pp. 367-396. Doi: 10.1111/juaf.12102.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *The Journal of Political Economy*, 82, pp. 34-55.

Sabri, S. and Ludin, A. N. M. (2009). Studentification, is it a key factor within the residential decision-making process in Kuala Lumpur? *South East Asian Technical Universities Consortium–3rd SEATUC Symposium Proceedings*, (3) 69-75.

Saint-Blancat, C., and Schmidt di Friedberg, O. (2005). Why are Mosques a Problem? Local Politics and Fear of Islam in Northern Italy. *Journal of Ethnic and Migration Studies*, 31:6, pp. 1083-1104, DOI: 10.1080/13691830500282881

Sheppard, S. (1999). Hedonic analysis of housing markets. *Handbook of Regional and Urban Economics*, 3, 1595-1635.

Schwartz, A. E., Ellen, I. G., Voicu, I. & Schill, M. H. (2006). The external effects of place-based ` subsidized housing. *Regional Science and Urban Economics*, 36(6), 679-707.

Titman, S. (1985). Urban land prices under uncertainty. *The American economic review*, 75 (3), pp. 505-514.

Van der Valk, I., (2016). Incidenten bij moskeeën: risico en bescherming. Available at: http://www.republiekallochtonie.nl/blog/achtergronden/de-islamisering-van-nederland-de-feiten. Acquired on 19-02-2019.

Van Duijn, M. and Rouwendal, J., (2013). Cultural heritage and the location choice of Dutch households in a residential sorting model. *Journal of Economic Geography*, 13 (3), pp. 473–500, https://doi.org/10.1093/jeg/lbs028

Van Duijn, M., Rouwendal, J. and Boersma, R. (2016). Redevelopment of industrial heritage: Insights into external effects on house prices. *Regional Science and Urban Economics*, 57, pp. 91-107.

Wagendorp, B. (2019). De door schandalen geteisterde katholieke kerk wordt geregeerd door homofobe homo's, een verbijsterende paradox. Avaiilable at: https://www.volkskrant.nl/columns-opinie/de-door-schandalen-geteisterde-katholieke-kerk-wordt-geregeerd-door-homofobe-homo-s-een-verbijsterende-paradox~bb5b3f194/. Acquired on: 02-11-2019.

Wilkinson, R. (1973). House prices and the measurement of externalities. *Economic Journal*, 83, pp. 72-86.

8. Appendix

Table 7: Results of the complete regression analysis of model 1 to 4

	Model 1	**Model 2**	**Model 3**	**Model 4**
Sample size	<2000	<2000	<2000	<2000
Target group	0 – 1000 m	0 – 1000 m	0 – 1000 m	0 – 1000 m
	1000 – 2000 m	1000 – 2000 m	1000 – 2000 m	1000 – 2000 m
control group				
Before	-.417***	-.255***	-.349***	-.111***
	(.0152)	.(0097)	(.009947)	(.00940)
Before * D	.0007***	.000548***	.000520***	.000126***
	(.0000626)	.(0000398)	.(0000392)	(.0000367)
Before * D^2	-3.05e-07***	-3.41e-07***	-2.60e-07***	-2.41e-08
	(5.80e-08)	(3.67e-08)	(3.56e-08)	(3.31e-08)
Between	-.160***	-.0708***	-.101***	-.0540***
	(.0213)	(.013)	(.0148)	(.0110)
Between * D	-.0000101	-.0000803	-.0000198	.000109*
	(.0000895)	(.0000547)	(.0000568)	(.0000463)
Between * D^2	2.50e-07***	1.60e-07***	1.47e-07***	-5.20e-08***
	(8.35e-08)	(5.09e-08)	(5.12e-08)	(4.30e-08)
After	-.344***	-.205***	-.343***	-.115***
	(.0190)	(.0122)	(.0120)	(.0103)
After * D	-.000344***	.0000732	.000724***	.000505***
	(.0000827)	(.0000525)	(.000048)	(.0000439)
After * D^2	8.05e-07***	1.44e-07***	-4.88e-07***	-4.11e-07***
	(8.37e-08)	(5.23e-08)	(4.63e-08)	(4.33e-08)
Trend after	-.010	-.00352	-.0317***	-.0203***
	(.011)	(.00734)	(.00660)	(.00590)
Trend after * D	-.000176***	.000044	.000244***	.000233***
	(.0000485)	(.0000311)	.(0000274)	(.0000254)
Trend after * D^2	1.95e-07***	-4.07e-08	-2.56e-07***	-2.42e-07***
	(4.78e-08)	(2.98e-08)	(2.60e-08)	(2.44e-08)
Year 2001	.0910***	.0949***	.0948***	.1059***
	(.0126)	(.00833)	(.00776)	(.00672)
Year 2002	.0864***	.0822***	.0842***	.0995***
	(.0120)	(.00813)	(.00759)	(.00659)
Year 2003	.0336***	.0350***	.0311***	.0469***
	(.0117)	(.00787)	(.00737)	(.00651)
Year 2004	.0393***	.0609***	.0597***	.0734***
	(.0114)	(.00794)	(.00745)	(.00657)

Year 2005	.0613***	.0968***	.0988***	.120***
	(.0113)	(.00756)	(.00707)	(.00619)
Year 2006	.130***	.161***	.160***	.186***
	(.0112)	(.00754)	(.00703)	(.00608)
Year 2007	.247***	.283***	.286***	.300***
	(.0114)	(.00760)	(.00708)	(.00613)
Year 2008	.296***	.332***	.330***	.352***
	(.0116)	(.00771)	(.00721)	(.00626)
Year 2009	.192***	.247***	.228***	.271***
	(.0117)	(.00770)	(.00727)	(.00627)
Year 2010	.229***	.274***	.259***	.286***
	(.0116)	(.00764)	(.00718)	(.006214)
Year 2011	.225***	.273***	.252***	.2746***
	(.0121)	(.00799)	.(00754)	(.00652)
Year 2012	.125***	.190***	.172***	.2012***
	(.0120)	(.00775)	(.00730)	(.00636)
Year 2013	.121***	.183***	.167***	.186***
	(.0122)	(.00802)	(.00754)	(.00654)
Year 2014	.194***	.267***	.250***	.274***
	(.0113)	(.00761)	(.00715)	(.00626)
Year 2015	.339***	.398***	.379***	.405***
	(.0113)	(.00775)	(.00726)	(.00635)
Year 2016	.421***	.490***	.527***	.570***
	(.0108)	(.00751)	(.00709)	(.00620)
Year 2017	.663***	.689***	.674***	.693***
	(.0117)	(.00811)	(.007590)	(.0066)
		.006286***	.00592***	.00545***
m2perhouse	X	(.000135)	(.000140)	(.000138)
		-.1139***	-.114***	-.120***
neglectinside	X	(.00476)	(.00446)	(.00406)
		-.0443***	-.0460***	-.0493***
neglectoutside	X	(.00922)	(.00875)	(.00798)
		.0882***	.0928***	.0939***
garden	X	(.0030)	(.00287)	(.00251)
		-.0186***	-.00481***	.009302*
Heating	X	(.00611)	(.00585)	(.00539)
		.0749***	.071***	.0530***
Prominentlocation	X	(.00253)	(.00236)	(.00201)
		.158***	.141***	.116***
Roofterrace	X	(.0036)	(.00357)	(.00331)
		.0396***	.0415***	.0411***
Nofrooms	X	(.00561)	(.00592)	(.00601)
		.115***	.126***	.115***
Parking	X	(.00505)	(.00486)	(.00425)
		-.0275***	-.00901***	.0234***
Terracedhousing	X	(.00933)	.(00916)	(.00848)
		.0586	.0735***	.0577*
Semi_detached	X	(.0429)	(.0410)	(.0347)
Twounderoneroof	X	.0528***	.133***	.115***

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu

		(.0189)	(.0177)	(.0151)
		.1428***	.220***	.141***
Detached	X	(.0283)	(.0270)	(.0262)
		-.320***	-.285***	-.114***
constructed_1945_1970	X	(.00409)	(.00369)	(.00357)
		-.112***	-.137***	-.0374***
constructed_1971_2000	X	(.00269)	(.00262)	(.00242)
constructedafter2000	X	.00703	-.00517***	.0617***
		(.00578)	(.00549)	(.00503)
	X	X	-.207***	-.0564***
Visiblemosquedum			(.00282)	(.00256)
	X	X	.0189***	.0757***
1.Mosque			(.00450)	(.00483)
	X	X	-.103***	-.00738***
WIJKEN3602			(.00635)	(.00570)
	X	X	-.0712***	.0288***
WIJK3603			(.00542)	(.00558)
	X	X	-.302***	-.089***
WIJK3604			(.00653)	(.00685)
	X	X	.0764***	.0183***
WIJKEN3605			(.00651)	(.00653)
	X	X	.0539***	-.00272***
WIJK3606			(.00433)	(.00431)
	X	X	X	2.06e-06***
Population_density				(1.77e-07)
	X	X	X	-.00573***
Perc_nonwestsern_immigrants				(.000250)
	X	X	X	.00693***
Perc_moroccanimmi				(.000433)
	X	X	X	.00114**
Perc_turkish_immigrants				(.000448)
	X	X	X	-.00665***
Youngpeople				(.000295)
	X	X	X	-.00275***
Elderlypeople				(.000243)
	X	X	X	.00131***
Av_house_value				(.0000239)
	X	X	X	.00631***
INKOMEN				(.000511)
Observations	81.784	81.784	81.784	81.784
R^2	0.1517	0.6606	0.6945	0.7707

Student: M.G.J. Ponds
Supervisor: Dr. X. Liu