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Master thesis

Stadium development in the Netherlands: the effect on surrounding house prices

Author: Gijs Bieze*

Supervisor: Prof. dr. E (Ed) F. Nozeman

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Abstract:

The Netherlands has experienced a wave in new stadium development after the mid-nineties until the financial crisis. From then onwards, ambitions or plans for new development have been not progressing. Most of the time, a substantial amount of money is needed from the municipality to finance the new stadium. Policymakers search to deal with the risks regarding the development of new stadiums in the Netherlands and the associated public investments. This study investigates whether those public investments are legitimate, by assessing the effect of 19 new stadiums in the Netherlands on surrounding house prices. Hedonic models in combination with a difference in difference methodology are used to compare house prices in the target area with the control area before the start of development, between the start and end of development, and after the completion of a new stadium development. We find fairly local negative house price effects between the start and end of development of new stadiums. We find that these negative house price effects disappear after the completion of new stadiums and are replaced by positive house price effects up to 1,000 meters, implying an increase in the attractiveness of the neighborhood. However, the result are largely driven by the type of stadium development. Therefore, our analysis shows that large public investments made by municipalities into new stadiums have at least partial support, depending on the type of stadium development.

Keywords: Stadium development, House prices, Hedonic price model, Difference in difference

*Master student Real Estate Studies, Faculty of Spatial Sciences

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Title	Stadium development in the Netherlands: The effect on surrounding house prices
Version	1
Author	Gijs Bieze
Student number	S2554364
E-mail	biezegijs@gmail.com
Supervisor	Prof. dr. E (Ed) F. Nozeman
Second assessor	Dr. M (Michiel) N. Daams

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1. INTRODUCTION

1.1. Motivation

A sports club and its stadium have always been inextricably linked. The stadium serves as the home of the club and is therefore the place where supporters come together. Together the supporters encourage "their" club, every time in the same stadium on the same seats. Nevertheless, in the mid-nineties a turnaround took place in a more commercial direction: new and more modern stadiums succeeded each other in rapid succession. During this time, policies were made with the two folded view that new stadium developments attempt to stimulate urban (re)vitalization in the surrounding area in addition to serve only as a sporting need (Girugten, 2015). Clubs and municipalities (in most cases the owner of the stadium) have three options to meet the new requirements of a modern stadium: renovation, in situ development or relocation. A renovation means that the existing stadium is upgraded and facelifted, sometimes with an increase in capacity as a result. An in situ development means that the old stadium is demolished and is replaced by a newly developed stadium on the same location. A relocation means that the old stadium is demolished and that the new stadium is developed on a different location [1]. Which solution is chosen depends on (a combination of) push factors, such as the magnitude of the external effects and local pressure for alternative use of the building, and pull factors such as the financial possibilities of municipalities, clubs and commercial investors (Van Dam, 2000). As most stadiums in the Netherlands were physically decayed and located in (urbanized) residential areas in the (middle of the) city, many clubs have chosen to build their new stadium on a different location with more space and better infrastructure [2]. These stadiums are generally built on city edges or suburban office areas, next to high-capacity ways and located near large parking lots (Van Steen & Pellenbarg, 2008). In these more peripheral areas there was little resistance from local residents with not-in-my-back-yard (NIMBY) attitudes, which was another benefit. Besides, municipalities were eager to co-invest in new

[1] Note that an in situ developed stadium and a relocated stadium are both new developed stadiums. In this study, these are the stadiums we are interested in.

[2] The capacity in particular can be a reason to develop a new stadium. Feddersen et al. (2006) find that when the existing stadium is always at least 90 percent sold out, a significant increase of visitors can be expected in the newly constructed stadium. According to De Jonghe & Van Hoof (2010), there is also a cumulative causation within professional sports: The financial possibilities of professional clubs strongly correlate with the sporting results. More spectators generate more income. More income increases the chance of sporting success. Sporting successes in turn influence income from ticket receipts, sponsorship, merchandising and TV broadcasts.

relocated stadiums, since they could add new functions (e.g. housing) on the old unused land, while simultaneously being able to co-decide on the new stadium location and stadium requirements (Van Dam, 2000).

Since the beginning of the financial crisis in 2008 with less favorable economic situations, the development of new stadiums seems to have come to an end. A lot of clubs now decide to renovate the existing stadiums since it is the least drastic and relatively cheapest option, ambitions or plans for new development have been not progressing. A well-known Dutch example is the football club Feyenoord, which is working on a stadium project called 'Feyenoord City' since 2006. As with many sports stadium plans after the financial crisis of 2008, Feyenoord has difficulties with the stadiums' financing and has trouble getting sufficient support from all the stakeholders involved. Most of the time a substantial amount of money is needed from the municipality for the development of a new stadium. Direct financial support by the municipality into sports clubs may be in violation of European state-aid rules. However, stadium financing is excluded since it can be regarded as general infrastructure (Ministerie van BZK, 2004). The research of KPMG (2003) shows that all municipalities in the Netherlands where at least one professional football club is active, are somehow involved in financial transactions with those professional football clubs. The vast majority of the support, 80%, is related to financial relationships between municipalities and stadiums, which corresponds to an estimation of 300 million euro's measured over 10 years. The authors also argue that the relationship between the municipality and the professional football clubs via the stadium invites opportunistic behavior. The municipality always has an interest in ensuring that the end-user of a stadium continues to exist because there are hardly any alternatives to its use. This implies that the club can always put pressure on the municipality. Therefore, public investments associated with new stadiums seem riskier, because the stadiums' future is closely intertwined with the state of the club itself. The issue regarding the continuity of a club is often the decisive argument for the cancelation of new plans (Vastgoedmarkt, 2020). Policymakers now search to deal with the high risks regarding the development of new stadiums in the Netherlands and the associated public investments. Consequently, there is an ongoing debate in society at large on the net outcome of newly developed stadiums in the Netherlands.

The extent to which a municipality considers a newly developed stadium is to be worthwhile in the context of urban regeneration and if it justifies public subsidies, is the extent to which the possible benefits for the city outweigh the possible disadvantages. Proponents of new stadium developments argue that new stadiums generate work and stimulate local spending mainly due to the attraction of new residents, tourists and businesses. In addition, subsequent multiplier spillovers will further increase the economic impact of new stadiums (Noll & Zimbalist, 1997). However, the evidence underlying the positive effect of newly developed stadiums is often overstated according to critics. They argue the overlooked opportunity costs, fundamentally exaggerated multiplier effects due to impractical assumptions, no new generation of consumption in the community due to substitution effects and there are only a few new attractions in the surrounding area of the newly developed stadium (Noll & Zimbalist, 1997).

This research only focuses on the economic impact viewed from the community's perspective by assessing the effects of new stadiums in the Netherlands on the price of the surrounding houses using a hedonic approach in combination with a difference in difference model. A new stadium is valued by the host community and is capitalized in the pricing of houses[3]. Understanding whether a new stadium is valued either positively or negatively by the host community, as reflected in the transaction price, is of major importance in the policy evaluation process. It answers the question if the society has benefited from the new stadium project through a monetary value that is easy to compare and to include in cost and benefit analysis for effective policy plans.

On the one hand, new stadiums may be regarded as a source of nuisance. The NIMBY-effect of new stadium developments is often a major concern for the host community. Generally considered negative external effects are vandalism, noise, air pollution and traffic congestion, which may decrease the attractiveness of the neighborhood (Tu, 2005; Van Dam, 2000). On the other hand, new stadiums may

[3] The transaction price of a house is determined by the function of demand and supply for given housing stock and many variables influence this function of demand and supply. The neoclassical theory of consumption assumes that the consumer (the potential buyer of a house) relies for his purchasing decisions (a house) on a fundamental logical principle: the rational choice. The rational consumer wants to achieve the highest possible satisfaction or utility with a given income. In doing so, he will strive for an optimal distribution of his disposable income over the numerous goods from which he can choose, and according to his personal preferences and the price of the products or services in question. The consumer purchases the best bundle of goods he can afford. The sellers of goods (houses), just like the consumers (potential buyers), are also looking for utility maximization. They achieve this through profit maximization and therefore try to sell the goods (houses) for the highest possible amount. The transaction price of a good (a house) thus reflects the maximum price a consumer (a buyer) is willing to pay and the minimum price the seller wants to sell it (Segers, 2003).

be recognized as an urban landmark by the host community with the club as a source of regional civic pride, a place of joy and a place of social bonding, which may increase the attractiveness of the neighborhood (Van Dam, 2000). If the positive external effects of a new stadium outweigh the negative external effects, there will be an increase in the nearby transaction prices of residential housing due to an increase in demand, resulting in supportive evidence for policymakers that new stadiums are (re)vitalizing neighborhoods. And therefore, at least to some extent, justifying the public investments associated with the development of new stadiums.

1.2. Review of literature

The literature has long been investigating the urban regeneration process and associated public investments, in which real estate is considered to be an integrated part. The importance of specific spatial investments in cities is underlined by the work of Brueckner et al. (1999) and their theory on the importance of certain urban amenities and their attraction to different population groups. The aforementioned authors argue that these urban amenities are of great importance in attracting higher educated people to the center of a city. According to Breuckner et al. (1999), this is one of the driving forces of a city's economic prosperity. Complementary, Glaeser et al (2001) also argue that a favorable endowment and provision of a wide variety of consumer goods are the driving force behind urban growth of cities. Therefore, much literature is about the links between urban amenities and the value of the surrounding housing market, such as shopping centers (van Duijn et al., 2019) and industrial heritage (van Duijn et al., 2016). As a characteristic of the neighborhood, new stadiums can also potentially affect the value of the surrounding housing prices.

The effects of sports facilities on the surrounding housing market have also been addressed extensively in previous literature, predominantly using estimations of hedonic models (Tu, 2005; Feng & Humphreys, 2018; Huang & Humphreys 2014; Carlino & Coulson, 2004; Ahlfeldt & Kavetsos, 2014). The majority of those studies are using hedonic pricing models to examine the differences in house prices in close proximity of the sports facility development or the impact of the announcement of the sports facility development. As potential buyers and sellers strive for utility maximization, house prices reflect how favorable a new sports facility is in a neighborhood (Segers, 2003). If the completion of a sports facility development lead to higher house prices in close proximity of the development, the host community benefits due to an increase in the quality and livability of the neighborhood. This justifies (at least partly) the high (public) investments associated with sports facility development.

Most of the literature is conducted in the Unites States (US) and find positive impacts on the development of sports facilities. However, the impacts vary across the existing US literature.

Huang & Humphreys (2014) use a difference in difference analysis to discover the relationship between the opening of sports facilities in the US and mortgage applications in the neighborhood of those sports facilities. The results show that there is an increase of 20% in mortgage applications in the neighborhood of the sports facility. Since the increase in mortgage applications reflects more trading activity, the increased trading activity partly explains the rise in house prices and rents. However, the effect is less than half when conditioning on local income and poverty figures, so it seems that location-specific characteristics account for much of the increase.

Carlino & Coulson (2004) found that rents are 8% higher in central US cities with franchises of the NFL using hedonic rent equations, implying that sports franchises appear to be a good public investment for the city.

Tu (2005) investigated the price difference between single-family homes in the vicinity of the newly relocated Fed-Ex Stadium in Washington D.C. and single-family homes with similar characteristics but at a distance from the stadium. Although the results of the hedonic price model show that the single-family homes close to the stadium are being sold for cheaper prices, the results of the difference in difference analysis show that this price difference also existed before the stadium was built. The difference diminished after the announcement of development and became even less after the stadium was completed. In addition, the results showed that the closer the single-family homes are to the Fed-Ex stadium, the greater the price improvement and the impact is minimal when the homes are more than 4,000 meters away from the stadium.

Feng & Humphreys (2018) examined the effect of two sports facilities in Columbus, OH on surrounding house prices. Utilizing a hedonic pricing model approach, their study demonstrates that the presence of a sports facility has a significant positive effect on the surrounding house prices. Unlike Tu (2005), their results suggest positive distance decaying effects. Even when the model corrects for spatial autocorrelation, it shows that house prices increase by 1.75% for every 10% decrease in distance from the house to the sports facility. The positive effect disappears after around 1,600 m. The results indicate that sports facilities create intangible benefits for the local population and helps in the debate of justifying public subsidies into sports facilities.

The positive impacts of sports facility development are also found in studies in Europe, that is dominated by research in the United Kingdom (UK).

Ahlfeldt & Kavetsos (2014), which examines the external effects of the New Wembley Stadium and the Emirates Stadium in London on surrounding house prices, find almost the same price effects for the relocated Emirates Stadium as Feng and Humphreys (2018), but then with a greater impact area. Their results indicate a 1.7% increase in house prices for every 10% decrease in distance from the house to the relocated Emirates Stadium (up to 5,000 meters). However, the in situ developed Wembley Stadium in their research shows positive house price effects up to 15%, wherein the positive effects are gradually decreasing with distance. This decreasing distance decaying effect is similar to the findings of Tu (2005). Furthermore, Ahlfeldt & Kavetsos (2014) contribute to the discussion that stadium architecture plays a role in promoting positive spillovers to the surrounding housing market.

Ahlfeldt & Maennig (2010) find that two new sports arenas on vacant sites in Berlin, Germany have positive impacts on land values up to 3,000 meters. However, the distance patterns of impact vary in their research.

Kavetsos (2012) explored the relationship between the announcement of a major sports event, the 2012 London Olympics, and house values using a difference in difference estimation. The houses that were located in boroughs that are hosting the event were sold for an additional 2.1% to 3.3% compared to the non-hosted boroughs, depending on the reference location dummy. An alternative approach to the model shows that properties near the main Olympic stadium even sold for a 5% premium up to a radius of 4,800 meters.

There is a gap in the current literature, firstly because most of the literature focuses on North America and the United Kingdom, whereas little or no research has been done into the impact of stadium development in the Dutch context. This is also endorsed by Van Dam (2000), who in this context refers to 'academic neglection': "Whereas in the United Kingdom the problem of negative spillovers and externality fields has been studied extensively (…) and the issue of stadium redevelopment and relocation has become a major planning issue (…), the Dutch academic world (especially geographers and planners) have neglected these issues almost entirely " (Van Dam, 2000. p. 137) [4]. This gap is supported by the view of Ahfeldt & Maennig (2012), who argue in their study that proximity costs and benefits of sports facilities vary across countries. Secondly, there is a clear discussion about the magnitude of potential effects of new stadiums, so we can argue that these are certainly not unambiguous. Finally, this research is unique as it examines potential differences between new stadiums that are in situ developed and new stadiums that are relocated to another place. The potential differences and magnitude of effects are interesting for effective policy plans in the Netherlands. For example, if the results of this study find hardly any positive price effects for new in situ developed stadiums, the large sums of public money that is often needed for the development of those stadiums cannot be justified in economic terms.

1.3. Objective, main question and subquestions

There is an ongoing debate in society at large on the net outcome of new developed stadiums in the Netherlands. The objective of this research is to examine the effects of new stadiums in the Netherlands on surrounding house prices. In our study, renovations are not included as a type of new stadium development as it was often not clear in what particular timeframe the renovation took place.

Consequently, the main research question is:

- What is the effect of new stadiums on surrounding housing prices in the Netherlands?

The main research question is split up into three subquestions:

[4] To the best of my knowledge, there is only 1 published article by Nooij et al. (2013) after the year 2000 that perform a cost and benefit analysis on holding of the 2018 World Cup in the Netherlands and Belgium. A major sports event like this requires large investments in stadiums. The outcome of this study is that the costs associated with this mega event exceeds the financial gains. However, the results do show that there are a number of nonfinancial benefits, such as national pride.

- Based on existing literature, what is the expected effect of a new stadium on house prices in close proximity to the stadium?
- To what extent does a new stadium affect house prices in close proximity to the stadium? And what is the effect of distance on spatial interaction between stadium location and house prices?
- Is there a difference in effect observable between in situ developed stadiums and relocated stadiums?

In our quantitative analyses, we investigate the effects that influence house prices in close proximity to the stadium before, between the start and end of completion and after the completion of the 19 selected newly developed stadiums in the Netherlands. With residential transaction price data provided by the Kadaster, this can be measured in two ways. With a repeated sales method or with a hedonic price method in combination with a difference in difference model. The repeated sales method observes the transaction price of the same house that is sold multiple times and thus controls for any time or location fixed effects. However, it decreases the number of observations. In our research, this could be problematic since it is unlikely that a house is sold more than once near new stadiums, as those stadiums are generally relocated to the more peripheral areas. With the same rationale, including only houses that are sold more than once could be problematic as it gives probably more weight to observations near in situ developed stadiums relative to relocated stadiums. Therefore, we use hedonic price methods wherein house prices can be substantiated for each specific physical housing- and neighborhood characteristics, controlled for time- and location fixed effects. By using a difference in difference model, house prices within a certain distance ring called ‘the target area’ are compared with house prices outside this ring called ‘the control area’. This comparison is performed before, during and after the completion of the stadium development. Finally, we examine potential heterogeneity in the model between in situ developed and relocated stadiums.

The remainder of this paper is structured as follows. Section 2 describes our empirical approach, the data and the exploratory analysis. Section 3 presents the results and Section 4 concludes. Moreover, the conclusion will be discussed and recommendations for future research will be added in Section 4.

2. METHODOLGY & DATA

2.1. Methodology

Houses are difficult to correctly compare since each house has its own specific physical characteristics and has its own locational attributes. The theory of Rosen (1974) shows that the value of a house is the sum of the value of those individual physical characteristics of the house in question. His theory provides the theoretical underpinnings for the hedonic valuation approach. The hedonic valuation approach assumes a relationship between the house price and the collection of individual characteristics of the house in question. Therefore, hedonic valuation models are used to assign an implicit price on each of the characteristics of the heterogeneous goods that are not tradable on the market. By using a hedonic regression, house prices can be substantiated for each specific physical housing characteristic. Although the primitive hedonic approach only includes physical house characteristics, more recent hedonic studies incorporate locational attributes as well (van Duijn et. al., 2016; Schwartz et. al., 2006). This seems rather logical, because location choices of households are affected by the presence of locational characteristics, such as the presence of urban amenities. Accordingly, this study includes location dummies and neighborhood characteristics to control for the location of the house in question. The hedonic approach is based on assumptions that the market is in equilibrium, the supply is fixed and that there is a transparent market. In reality, these assumptions will not hold. Consumers do not have complete information about the housing market and it is difficult to determine to what extent certain characteristics contribute to the price of a house exactly. Nonetheless, households will pay more for a house with popular housing characteristics that is located in a desirable location than for the opposite. Based on Rosen (1974), the following simplistic base model (0) has been derived:

$$p(PV) = f(c_{\alpha}, c_b, \dots, c_z) \qquad (0)$$

Where the value of the dependent variable $p(PV)$ is determined by the sum of function f, that sums up the independent variables $c_{\alpha}, c_b, \dots, c_z$. In this study, the transaction price is determined by physical and neighborhood characteristics and the location of the house in question.

To answer our research question, there is a need to compare the house price development of houses that are sold in close proximity to the stadium before, during and after the new stadium development relative to the house price development of houses that are sold relatively further away. The difference in difference model is used for this type of analysis. In this model, house prices within a certain distance ring of the stadium development are compared with house prices outside this ring. This comparison is performed before, during and after the completion of the stadium development. Before the difference in difference model can be used in the analysis, it is important to define a target area and a control area.

The target area is the area in which the houses are located that are possibly affected by the new development. The control area is the area in which the houses are not affected by the new development. In other words, the target area comprises the surrounding houses of a stadium and the control area the houses that are relatively further away. Since our research design is similar to those of Schwartz et al. (2006) and Van Duijn et al. (2016), our methodology is also similar to the one used in their research. Taken this into consideration, those studies may be used as a benchmark to set up a target and control area for our analysis. The target area of interest is 600 meters in the study of Schwartz et al. (2006), which assesses the external effects of place-based subsidized housing in the Netherlands. Van Duijn et. al. (2016), who examine the external effects of the redevelopment of industrial heritage in the Netherlands is using a target area of 1,000 meters. Considering the existing stadium literature, where Tu (2005) found an effect on house prices up to 4,000 meters around the new FedEx stadium in the United States and where Kavetsos (2012) observed a price premium of 5% up to 4,800 meters near the Olympic stadium after the announcement of the London Olympic Games in 2012, this study will focus on houses located within 1,500 meters of the selected stadiums in the Netherlands. We propose to use a control ring of houses located between 1,500 and 3,000 meters, just outside the specified target ring of 1500 meters (e.g. Schwartz et al., 2006; Van Duijn et al., 2016). We use alternative model specifications to check the robustness of our predefined target- and control area range.

The base model of Rosen (1974) is extended with a difference in difference model, comparable with the research of van Duijn (2016). This leads to the following model specification, our baseline model (1):

$$ln(P_{ijt}) = \Sigma_{s=1}^{s} \alpha_s R_{i\,\mathrm{tr}\,s} + \Sigma_{k=1}^{k} \beta_k X_{kit} + \pi_j N_j + y_t Y_t + \varepsilon_{it} \quad (1)$$

Where $ln(P_{ijt})$ is the natural logarithm of the transaction price of house i, which is located in neighborhood j at transaction year t. $R_{i\,\mathrm{tr}\,s}$ is a vector of ring variables s, depending on the location of house i, the year of transaction t and the treatment radius r. The variable X_{kit} includes the characteristics k of house i sold during year t. N_j is a dummy, which has the value of 1 for neighborhood N_j and 0 otherwise. Y_t is a dummy, which has the value of 1 for year Y_t and 0 for all others. The error term is represented by ε_{it} in the model. The estimation parameters are α, β, π and y.

The model contains three different ring variables $R_{i\,\mathrm{tr}\,s}$. These are the before, between and after variables and are generated to measure the effect of new stadiums in a specific neighborhood. The before variable includes a dummy that equals 1 if the house is within a distance of 1,500 meters of the stadium development, where the coefficient of (s=before) indicates the effect before the development of stadium (x) has started. The between dummy variable (s=between) equals 1 when a house is located within the target area and is sold between the start and end of the development, which shows the anticipation effects that may occur during the development period. The third ring dummy is the after variable (s=after) and has the value of 1 when a house is located within a distance of 1,500 meters of a completed stadium development, where the coefficient indicates the effect of the 'treatment'. To answer the second subquestion, we are most interested in the 'treatment' effect, since it measures the effect that is present after the stadium development.

Model specification (2) below reveals the spatial distribution of the effects of the stadium development, because the specification adds interaction with distance to the stadiums. The interaction variable D_i measures the distance decay of the effect. The interaction variable D_i^2 determines whether the distance decay is linear, concave or convex.

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

Besides physical house characteristics and neighborhood characteristics, a dummy variable is added if the stadium is in situ developed (1) or developed at a different location (0). The difference between the two may drive up or some of the coefficients. Therefore, the dataset will be split up into two subsets. With a Chow-test, differences between in situ developed stadiums and relocated stadiums can be measured and helps in the ongoing debate in society at large on the net outcome of in situ developments and relocation of stadiums. Besides, it is important to meet the conditions for a multiple linear regression when we analyze our models in STATA (Brooks & Tsolacos, 2010). These can be found in appendix A.

In the alternative model specification (3), the target area of 1.500 meters is split up into multiple distance rings. This alternative model specification (3) uses the baseline model (1) of this study as the basis. To be more precise, the target area of 1.500 meters is divided into three distance rings, each with a radius of 500 meters. The control area remains the same. In this way, the model can estimate the coefficient for each of the three distance rings. This alternative model specification (3) analyzes the robustness of the results and to what extent the external effect of the stadium development project assumes significant value.

$$ln(P_{ijt}) = \Sigma_{r=d1-d2}^{r\max} + \Sigma_{s=1}^{s} \alpha_s R_{i\,\mathrm{tr}\,s} + \Sigma_{k=1}^{k} \beta_k X_{kit} + \pi_j N_j + y_t Y_t + \varepsilon_{it} \quad (3)$$

2.2. Selection of new stadium developments

There are 21 identified new stadium developments in the Netherlands between 1993 and 2020 with a minimum capacity of 3.000 spectators. The "Johan Cruijff ArenA" situated in Amsterdam and the "Abe Lenstra Stadion" situated in Heerenveen have been both removed since there are no observations available before the start of development in 1993 and our interest is to measure potential effects before, during and after the stadium development. Table 1 provides an overview of the 19 selected stadiums that are used for this study including their location, capacity, the start and end year of development and if the stadium is in situ developed or relocated to another place [5]. Figure 2 shows a geographic overview of the selected stadiums in the Netherlands.

Table 1: Overview stadium developments between 1993 – 2020 in the Netherlands.

#	Stadium name	Location	Adress	Capacity	Start	End	In situ developed
1	MAC³PARK stadion	Zwolle	Stadionplein 1	13.250	2007	2009	Yes
2	Cars Jeans Stadion	Den Haag	Haags Kwartier 55	15.000	2005	2007	No
3	AFAS Stadion	Alkmaar	Stadionweg 1	17.250	2005	2006	No
4	Yanmar Stadion	Almere	Competitieweg 20	4.500	2005	2005	No
5	Hitachi Capital Mobility Stadion	Groningen	Boumaboulevard 41	22.550	2004	2005	No
6	Stadion Galgenwaard	Utrecht	Herculesplein 241	24.426	2000	2004	Yes
7	Parkstad Limburg Stadion	Kerkrade	Ring 1	19.200	1999	2000	Yes
8	Frans Heesen Stadion	Oss	Mondriaanlaan 4	4.560	1997	2000	Yes
9	Erve Asito	Almelo	Stadionlaan 1	12.080	1998	1999	No
10	Fortuna Sittard Stadion	Sittard	Milaanstraat 120	12.500	1998	1999	No
11	De Grolsch Veste	Enschede	Colloseum 65	30.205	1997	1998	No
12	Gelredome	Arnhem	Batavierenweg 25	21.248	1996	1998	No
13	Stadion De Vliert	Den Bosch	Victorialaan 21	8.500	1996	1997	Yes
14	Mandemakers Stadion	Waalwijk	Akkerlaan 2	7.500	1996	1996	Yes
15	Rat Verlegh Stadion	Breda	Stadionstraat 3b	19.000	1995	1996	No
16	Topsportcentrum Rotterdam	Rotterdam	Van Zandvlietplein 20	3.400	1998	1999	No
17	Omnisport Apeldoorn	Apeldoorn	De Voorwaarts 55	6.000	2006	2008	No
18	Topsportcentrum Almere	Almere	Pierre de Coubertinplein 4	3.045	2005	2007	No
19	Ziggo Dome	Amsterdam	De Passage 100	10.700	2010	2012	No

[5] Some of the selected new stadiums are actually not relocated, but just new. However, we treat them as relocated since both types are developed on a vacant site in the city.

Figure 2: Geographic locations of the selected new developed stadiums in the Netherlands

2.3. Data

This research contains a unique dataset with residential transaction data provided by 'Kadaster' which is the Dutch Land Registry Office. The dataset includes each owner-occupied housing transaction in the Netherlands from 1993 with almost five million records. Each record provides information about the transaction, such as the date, the price and the address. Moreover, it contains information about multiple physical housing characteristics, such as floor area, year of development and type of home based on the BAG-register. The BAG-register contains characteristics of each address and building in the Netherlands recorded by each municipality. This dataset is enriched with neighborhood information from a publicly available dataset of the Dutch Central Bureau of Statistics (CBS). As mentioned earlier, this complementary dataset contains physical, socio-economic, socio-cultural and functional neighborhood variables, since we want to control for neighborhood effects in our study. The main dataset is also enriched with some additional stadium information. The residential transaction data are imported into a Geographical Information System. The software ArcGIS is used to calculate the distance and to create distance buffers between the transaction and the selected stadiums. These distance variables were added to the main dataset and imported into STATA.

First of all, transaction records with a distance greater than 3,000 meters to the stadium are removed, since we are only interested in transactions in close proximity to the stadium. Secondly, records with incomplete information are removed. Thirdly, outliers that may bias the results are removed. Transaction prices greater than €2,000,000,- and lower than €50,000,- and floor sizes bigger than 500 m2 and smaller than 25 m2 are removed. Almost the same is done with lot sizes. Lot sizes bigger than 10,000 m2 and smaller than 25 m2, but bigger than 0 m2 are removed from our dataset. The reason for this is that a lot of apartments have a lot size of 0 m2. This makes sense, as they are often situated in high rise buildings. Apartments in particular count for a large proportion in our dataset, since they are often located near stadiums. Therefore we cannot ignore the 0 m2 values as it would bias the results if we did. Finally, some variables are transformed. For example, transaction price and floor size are variables that are normalized to a logarithmic scale. Again, the variable lot size is also transformed, but in a slightly different manner. Since we know that apartments have 0 m2 values, we have added plus 1 for every lot size record and then transformed the variable into a logarithmic scale. Otherwise, all the records with 0 m2 would have been dropped from our dataset and this would have biased the results.

This results in a dataset that consists of 358,767 records, from which 90,637 records in the target area and 268,130 records in the control area (see the do-files in appendix E for a detailed overview of the data cleaning process). The difference between both groups is as expected, because most stadiums in our dataset are relocated (13 out of 19). Most relocations of stadiums in the Netherlands have been relocated to the edge of the city where there is more space. Besides, stadiums are often large scale projects with a lot of infrastructure and big parking lots around them, implying fewer houses in close proximity to the stadium than relatively further away. Therefore, it also seems plausible that the population density is higher in the control area, as can be seen in table 2. The table also presents that the average transaction price in the control area is higher than the total and target area. Yet, the transaction price is highest in the first 500 meters. This may suggest that stadiums have a positive effect on the price of a house in close proximity to the stadium. As expected, the most common types of houses in the total area are terraced houses and apartments. The house type in the target area is predominantly terraced housing, while there are slightly more apartments relative to terraced housing in the control area.

Table C1 in the appendix shows that the 'Hitachi Capital mobility stadion' in Groningen has a lot of apartment transactions (over 70%) around the stadium. In Utrecht, near 'stadion Galgenwaard', there are almost no semi-detached and detached houses (both 0,4%) transacted, but there are the most transacted houses of all stadiums. Near 'topsporthal Almere' in Almere and 'De Grolsch Veste' in Enschede are the fewest transacted houses. The building period dummy is quite evenly distributed in table 2, where most records in our dataset have a building age older than 1945.

Table C2 in the appendix shows a more detailed overview of transacted houses within building periods per stadium. As can be seen in this table, the stadiums that are located in Almere have no observations until the building period 1981-1990. This makes sense, because Almere is situated in the province of

Flevoland and was founded in 1986. Most records are found near ‘stadion Galgenwaard’ in the building period before 1945.

As this research is also interested if there are differences between in situ developed and relocated stadiums, there is an extra table ‘C3’ in the appendix with differences between those in our dataset. Noticeable differences are that the average transaction price is higher nearby in situ developed stadiums (€212,067,-) than relocated stadiums (€183,581). There are far more non-western immigrants in the areas around relocated stadiums than in situ developed stadiums, 18.7% and 9.9% respectively. The population density is greater in areas where in situ developed stadiums are located, because those are often located in (urbanized) residential areas in the (middle of the) city.

Table 2: Descriptive statistics with target area 0-1500m.

	Total		Target		Control	
	mean	**sd**	**mean**	**sd**	**mean**	**sd**
Dependent variable						
Transaction price (€x1000)	192.980	122.215	186.702	119.680	195.102	122.988
0-500 meter	217.735	120.279	217.735	120.279	x	x
500-1000 meter	181.635	112.834	181.635	112.834	x	x
1000-1500 meter	186.784	122.910	186.784	122.910	x	x
1500-2000 meter	194.425	127.098	x	x	194.425	127.098
2000-3000 meter	195.358	121.390	x	x	195.358	121.390
Physical characteristics						
Floor size (m2)	109.545	43.695	108.479	42.976	109.905	43.929
Lot size (m2)	137.134	221.478	143.869	228.821	134.857	218.894
House type						
Apartment (1=yes)	0.369	0.483	0.329	0.470	0.383	0.486
Corner house (1=yes)	0.127	0.333	0.136	0.343	0.124	0.330
Semi-detached house (1=yes)	0.064	0.244	0.065	0.247	0.063	0.243
Terraced house (1=yes)	0.390	0.488	0.419	0.493	0.380	0.485
Detached house (1=yes)	0.050	0.218	0.051	0.219	0.050	0.217
Building period						
<1945 (1=yes)	0.262	0.440	0.243	0.429	0.268	0.443
1945-1960 (1=yes)	0.111	0.314	0.112	0.316	0.111	0.314
1961-1970 (1=yes)	0.141	0.348	0.161	0.368	0.135	0.341
1971-1980 (1=yes)	0.137	0.343	0.134	0.341	0.137	0.344
1981-1990 (1=yes)	0.145	0.352	0.153	0.360	0.142	0.349
1991-2000 (1=yes)	0.130	0.337	0.120	0.325	0.134	0.340
>2000 (1=yes)	0.074	0.262	0.076	0.265	0.073	0.260
Time period						
Before crisis (1=yes)	0.543	0.498	0.538	0.499	0.545	0.498
Within crisis (1=yes)	0.171	0.377	0.170	0.375	0.172	0.377
After crisis (1=yes)	0.285	0.452	0.293	0.455	0.283	0.450
Neighborhood characteristics						
Population density (#/km2)	6424.891	3732.757	6067.881	3243.958	6545.566	3876.672
Average household size (#)	2.032	0.365	2.044	0.353	2.028	0.369
Non-western migrants (%)	15.801	14.528	16.429	15.821	15.588	14.057
Young people (%)	29.155	6.014	29.452	5.910	29.055	6.045
Elderly people (%)	15.633	7.324	15.323	6.901	15.737	7.459
Building stock						
Single-family (%)	56.336	28.193	58.777	26.325	55.511	28.750
Multi-family (%)	43.665	28.193	41.223	26.325	44.490	28.750
Owner-occupied (%)	53.708	19.358	53.718	19.696	53.704	19.243
Rental house (%)	45.342	19.031	45.394	19.335	45.324	18.927
House association (%)	29.324	18.137	30.763	19.153	28.838	17.755
Vacant house (%)	4.125	3.082	3.702	2.862	4.268	3.140
N	**358.767**		**90.637**		**268.130**	

3. RESULTS

3.1. Main regression models

This section provides the estimation results of the model specifications of the difference in difference hedonic approach as described in the methodology section. We investigate whether there are house price effects of newly developed stadiums on surrounding house prices based on a target area of 0-1,500 meters and a control area of 1,500-3,000 meters. Additionally, we pay attention if the effects change over space.

Table 3 reports the results from our baseline model (1) with the main coefficients and corresponding standard errors. This model contains four columns. Column (1) is considered as the most basic and only includes transaction year dummies. The adjusted R-squared is close to 33%. In column (2), physical characteristics and building period dummies are added, increasing the adjusted R-squared to 65.9%. Location dummies are added in column (3), which controls the model for location fixed effects. The adjusted R-squared has increased up to 78.3%. The last column (4) also includes neighborhood characteristics, which has the best model fit with an adjusted R-squared of 80.2%. This means that 80.2% of the variance for the dependent variable 'log transaction price' is explained by the independent variables in the regression model, correcting for the number of terms in the model. Therefore, model (4) is the preferred model.

All the coefficients of the control variables are as expected in this model (see table D1 in the appendix). The year coefficients with the year '1993' as reference are rising in the beginning until the financial crisis in 2008. After 2008, there is a little drop of the coefficients until 2013 and then the coefficients rise again. All locations have a negative sign, which is as expected since we used Amsterdam as a reference category. All the house types have a positive coefficient, implying that those house types are relatively more expensive than our reference category 'apartments'. This is as expected, because the effects of a bigger house have in general a more positive effect on house prices.

The results of model (4) in table 3 show that the main coefficient of the BEFORE variable is negative and significantly different from zero. The results indicate that before the start of the development of the stadium, houses located within 1,500 meters of the stadium sold for $\left(\exp^{(-0.00405)} - 1\right) \cdot 100$ = 0.41% less than houses between 1,500 and 3,000 meters of the stadium. This result suggests that before development, (the location of) stadiums were a dis-amenity for surrounding houses. The BETWEEN and AFTER variables are also both negative and significant. Thus, houses located within 1,500 meters of the stadium, between the start and end of the development, are sold for $\left(\exp^{(-0.0140)} - 1\right) \cdot 100$ = 1.39% less, and after the completion of a stadium for $\left(\exp^{(-0.0145)} - 1\right) \cdot 100$ = 1.44% less than houses relatively further away. The results imply that new stadium developments have negative effects on surrounding house prices.

Table 3: Regression results of the baseline model (1) with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE	-0.0343***	-0.00934***	-0.0177***	-0.00405**
	(0.00299)	(0.00201)	(0.00178)	(0.00173)
BETWEEN	-0.00840*	0.0113***	-0.0263***	-0.0140***
	(0.00467)	(0.00324)	(0.00257)	(0.00250)
AFTER	-0.0522***	-0.0432***	-0.0272***	-0.0145***
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.328	0.659	0.783	0.802

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Table D1 in the appendix also shows the coefficients of the control variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 4 reports the results from model specification (2), where the interaction with distance is added to the baseline model. The adjusted R square is over 80% in the last column (4) and is our preferred model. Now, the BETWEEN variable sign is positive in this model specification compared to the negative sign in the baseline model. Although these coefficients are not significant, the positive sign suggests that there might be an anticipation effect. This anticipation effect occurs when people expect that the houses in close proximity to the stadium can be sold for a premium when the development of the stadium has taken place. Moreover, the BEFORE variable is positively significant in this model, implying that houses located in close proximity to the stadiums are sold for $\left(\exp^{(0.129)} - 1\right) \cdot 100$ = 13.8% more than houses located between 1,500 and 3,000 meters prior to the development. The AFTER variable shows similar results as the BEFORE variable. The results of the AFTER variable indicate that houses located within 1,500 meters of the stadium are sold for $\left(\exp^{(0.0882)} - 1\right) \cdot 100$ = 9.2% more than houses located between 1,500 and 3,000 meters after the development of the stadium. The relatively large positive values of the BEFORE- and AFTER variable in table 4 compared to the negative values of the BEFORE- and AFTER variable in table 3 may be an indication that the effects are fairly local. As can be seen in figure 3, the target area is indeed not subject to the same effects across space. The coefficient of the interaction BEFORE*D- and AFTER*D are both negative significant. These results indicate that the further a house is located relative to the stadium within the target area of 1,500 meters, the lower the transaction price of the house that is sold. Moreover, this distance decaying effect is non-linear across space, since the coefficients of the interaction variables BEFORE*D2- and AFTER*D2 are both positive and significant. It means that the price of the transacted houses within the target area both before- and after development is decreasingly decreasing when the distance increases. Before development, estimation results imply a decrease of 2.3%-point $\left(\exp^{\left(-0.000247*100+1.06e^{-7}*100^2\right)} - 1\right) \cdot 100)$ for the first 100 meters and this decrease diminishes over space until the positive effect disappears, which is around 900 meters (see figure 3). After completion, estimation results imply a decrease of 1.8%-point $\left(\exp^{\left(-0.000191*100+8.24e^{-8}*100^2\right)} - 1\right) \cdot 100)$ for the first 100 meters and this decrease diminishes over space until the positive effect disappears, which is near 700 meters (see figure 3). The results show a smaller area than our original target area of 1,500 meters. Therefore, we also ran regressions where we set our target area at a distance of 1,000 meters instead of 1,500 meters. However, the results suggest that new stadium developments have negative effects on surrounding house prices when we compare the values of after completion with the values of before development. This may be a result of negative externalities such as congestion and vandalism.

Table 4: Regression results of model specification (2) with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE	0.368***	0.336***	0.142***	0.129***
	(0.0253)	(0.0157)	(0.0135)	(0.0134)
BEFORE*D	-0.000898***	-0.000731***	-0.000298***	-0.000247***
	(5.48e-05)	(3.50e-05)	(3.02e-05)	(2.97e-05)
BEFORE*D2	4.54e-07***	3.54e-07***	1.29e-07***	1.06e-07***
	(2.80e-08)	(1.82e-08)	(1.58e-08)	(1.54e-08)
BETWEEN	0.273***	0.228***	0.0503**	0.0290
	(0.0431)	(0.0301)	(0.0253)	(0.0255)
BETWEEN*D	-0.000533***	-0.000408***	-6.11e-05	2.42e-07
	(9.21e-05)	(6.44e-05)	(5.36e-05)	(5.38e-05)
BETWEEN*D2	2.33e-07***	1.78e-07***	-8.75e-09	-3.46e-08
	(4.63e-08)	(3.25e-08)	(2.68e-08)	(2.67e-08)
AFTER	0.271***	0.184***	0.106***	0.0882***
	(0.0173)	(0.0126)	(0.00945)	(0.00913)
AFTER*D	-0.000657***	-0.000479***	-0.000272***	-0.000191***
	(3.66e-05)	(2.70e-05)	(2.03e-05)	(1.97e-05)
AFTER*D2	3.07e-07***	2.31e-07***	1.27e-07***	8.24e-08***
	(1.84e-08)	(1.37e-08)	(1.03e-08)	(1.00e-08)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.329	0.660	0.783	0.802

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Table D2 in the appendix also shows the coefficients of the control variables. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

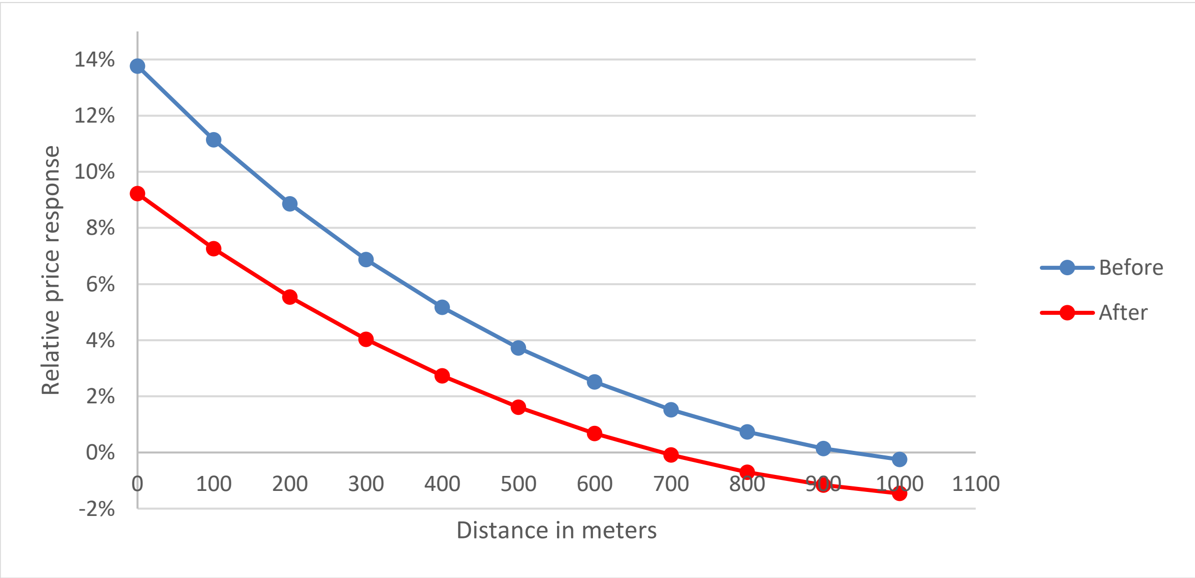

Figure 3: Relative price response across space before and after the development with target area 0-1,500m.

Before we change our original target area, we first analyze the robustness of our results with the original target area. Table 5 shows the coefficients and standard errors of the alternative model specification (3). This is a more flexible version of our model specification (2). Where our target area of model specification (2) was set based on existing literature, the target area of the alternative model specification (3) is divided into different distance rings. Each distance ring with a radius of 500 meters and this allows us to estimate the magnitude of effects between the different distance rings. As can be seen in column (4), only the distance ring 0-500m shows an insignificant result after the stadium development took place. The other coefficients are at least significant at a 5% level. The results of table 5 support the distance decay effect of the positive externality before development presented in table 4. While the first two distance rings until 1,000 meters show a positive coefficient, the coefficient becomes negative in the last distance ring. More specifically, houses that are located within 500 meters and houses that are located between 500 and 1,000 meters before development are sold for $\left(\exp^{(0.0232)} - 1\right) \cdot 100$ = 2.3% and $\left(\exp^{(0.0102)} - 1\right) \cdot 100$ = 1.0% respectively more than houses in the control area. This even becomes negative when houses are located between 1,000 and 1,500 meters, which are sold for $\left(\exp^{(-0.0143)} - 1\right) \cdot 100$ = 1.4% less than houses in our control area before development. The negative sign of the distance ring 0-500m compared to the positive sign of the distance ring 500-1.000m between the start and end of development relative to the positive sign of the BETWEEN variable in table 4 suggests that the negative effect of the development period may be fairly local. After stadium completion, the coefficients of the distance ring 500-1,000m and the distance ring 1,000-1,500m present negative signs, whereas the sign of the AFTER variable in table 4 shows a positive sign. In other words, the positive house price effects after the development of a stadium took place disappeared completely and have been replaced for negative effects in table 5. Although the coefficients are low, there is reason to believe that our target area of 1,500 meters is not appropriate. Therefore, the next section provides the results with an adjusted target area at a distance of 1,000 meters instead of 1,500 meters.

Table 5: Regression results of the alternative specification (3) with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE 0-500m	0.0643***	0.0868***	0.0240***	0.0232***
	(0.0104)	(0.00579)	(0.00516)	(0.00515)
BEFORE 500-1000m	-0.0666***	-0.0165***	-0.00974***	0.0102***
	(0.00483)	(0.00319)	(0.00273)	(0.00269)
BEFORE 1000-1500m	-0.0245***	-0.0139***	-0.0258***	-0.0143***
	(0.00374)	(0.00257)	(0.00226)	(0.00217)
BETWEEN 0-500m	0.0538***	0.0222*	-0.0177	-0.0298***
	(0.0203)	(0.0127)	(0.0112)	(0.0114)
BETWEEN 500-1000m	0.0447***	0.0255***	0.0126**	0.0119**
	(0.00952)	(0.00635)	(0.00517)	(0.00502)
BETWEEN 1000-1500m	0.0118*	0.0177***	-0.0180***	-0.0180***
	(0.00676)	(0.00475)	(0.00379)	(0.00367)
AFTER 0-500m	0.0564***	-0.0376***	-0.00146	-0.000988
	(0.0128)	(0.00807)	(0.00669)	(0.00654)
AFTER 500-1000m	-0.00771	-0.0351***	-0.0196***	-0.0173***
	(0.00576)	(0.00389)	(0.00325)	(0.00320)
AFTER 1000-1500m	-0.0307***	-0.0328***	-0.00469*	-0.00724***
	(0.00443)	(0.00313)	(0.00263)	(0.00253)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.329	0.659	0.783	0.802

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Table D3 in the appendix also shows the coefficients of the control variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

3.2. Regression models with the adjusted target- and control area

This section provides the estimation results of the model specifications of the difference in difference hedonic approach as described in the methodology section, but then with an adjusted target area of 0-1,000 meters based on the results of the previous section. The descriptive statistics of the adjustment can be found in appendix tables C4, C5, C6 and C7. Again, we pay attention if the effects change over space.

Although the observed house transactions decrease with the adjusted target- and control area, the baseline model (1) fit slightly increases to an adjusted R-squared of 80.5% in column (4) compared to the original target- and control baseline model (1). As can be seen in appendix table D4 the coefficients of the control variables show similar results and are as expected. Table 6 shows now all positive significant coefficients for the BEFORE, BETWEEN and AFTER variables. However, the lowest coefficient for the AFTER-variable still indicates that new stadiums have negative effects on surrounding house prices.

Table 6: Regression results of the baseline model (1) with target area 0-1000m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m
BEFORE	-0.0285***	0.0211***	0.00678***	0.0138***
	(0.00463)	(0.00306)	(0.00261)	(0.00259)
BETWEEN	0.0187**	0.0425***	0.0207***	0.0253***
	(0.00767)	(0.00514)	(0.00414)	(0.00405)
AFTER	-0.0286***	-0.0203***	-0.000724	0.00900***
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	164,439	164,439	164,439	164,439
Adjusted R-squared	0.343	0.653	0.791	0.805

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Table D4 in the appendix also shows the coefficients of the control variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

Table 7 reports the results from model specification (2), where the interaction with distance is added to the baseline model (1). The adjusted R square is over 80% in the last column (4) and is our preferred model. Now, the BEFORE variable sign is negative in this model specification (2) compared to the positive sign in the baseline model (1). Although this coefficient is not significant, the negative sign suggests that there might be negative effects for houses located within the target area of 1.000 meters relative to houses located further away from the stadium. Moreover, the BETWEEN variable is negative significant in this model, implying that houses located in close proximity to the stadiums are sold for $\left(\exp^{(-0.163)} - 1\right) \cdot 100$ = 15.0% less than houses located between 1,000 and 2,000 meters between the start and end of the development. The results suggest that the development period of new stadiums create negative effects for houses nearby. The coefficient of the AFTER variable shows positive significance. The results of the AFTER variable indicate that houses located within 1,000 meters of the stadium are sold for $\left(\exp^{(0.0910)} - 1\right) \cdot 100$ = 9.5% more after the development of the stadium took place. The results here suggest that stadium developments do create positive effects on nearby house prices. Also in this model, the interaction variables are significant. Therefore, the target area is not subject to the same effects across space according to the data. The coefficient of the interaction BETWEEN*D is positively significant. These results indicate that the further a house is located relative to the stadium within the target area of 1,000 meters, the higher the transaction price of the house that is sold. Moreover, this distance decaying effect is non-linear across space, since the coefficient of the interaction variable BETWEEN*D2 is negative and significant. It means that the price of the transacted houses within the target area between the start and end of development is decreasingly increasing when the distance increases. Between the start and end of a stadium development, estimation results imply an increase of 5.7%-point $\left(\exp^{(0.000595*100-4.32e^{-7}*100^2)}-1\right)\cdot 100)$ for the first 100 meters and this increase diminishes over space until the negative effect disappears, which is around 300 meters (see figure 4). The coefficient of the interaction AFTER*D is negative significant. These results indicate that the further a house is located relative to the stadium within the target area of 1,000 meters, the lower the transaction price of the house that is sold. Moreover, this distance decaying effect is non-linear across space, since the coefficient of the interaction variable AFTER*D2 is negative and significant. It means that the price of the transacted houses within the target area after the completion of the development is decreasingly decreasing when the distance increases. After the completion of the development, estimation results imply a decrease of 1.6%-point $\left(\exp^{(-0.000116*100+7.05e^{-8}*100^2)}-1\right)\cdot 100)$ for the first 100 meters and this decrease diminishes over space until the negative effect disappears, which is around 1,000 meters (see figure 4). Therefore, we could argue that new stadium development has positive effects on the houses in close proximity to the stadium, which is in line with the results of the existing literature (Tu, 2005; Feng and Humphreys, 2018). Nonetheless, our results implicate only rather local effects compared to their studies. Table D6 in the appendix presents the coefficients and standard errors of our alternative model specification (3), which further analyzes the robustness of our adjusted target- and control area.

Table 7: Regression results of model specification (2) with target area 0-1000m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m

BEFORE	0.290***	0.261***	0.00449	-0.0224
	(0.0564)	(0.0342)	(0.0284)	(0.0291)
BEFORE*D	-0.000463***	-0.000382***	0.000168*	0.000217**
	(0.000170)	(0.000106)	(8.77e-05)	(8.94e-05)
BEFORE*D2	4.64e-08	7.70e-08	-2.08e-07***	-2.13e-07***
	(1.21e-07)	(7.64e-08)	(6.34e-08)	(6.48e-08)
BETWEEN	0.372***	0.235***	-0.0798	-0.163***
	(0.0978)	(0.0717)	(0.0604)	(0.0598)
BETWEEN*D	-0.000653**	-0.000308	0.000374**	0.000595***
	(0.000297)	(0.000218)	(0.000183)	(0.000180)
BETWEEN*D2	2.20e-07	5.92e-08	-3.03e-07**	-4.32e-07***
	(2.12e-07)	(1.55e-07)	(1.31e-07)	(1.29e-07)
AFTER	0.611***	0.267***	0.132***	0.0910***
	(0.0344)	(0.0255)	(0.0189)	(0.0187)
AFTER*D	-0.00163***	-0.000674***	-0.000292***	-0.000166***
	(0.000105)	(7.69e-05)	(5.71e-05)	(5.64e-05)
AFTER*D2	9.67e-07***	3.63e-07***	1.43e-07***	7.05e-08*
	(7.56e-08)	(5.54e-08)	(4.12e-08)	(4.07e-08)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	164,439	164,439	164,439	164,439
Adjusted R-squared	0.347	0.655	0.791	0.805

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Table D5 in the appendix also shows the coefficients of the control variables. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

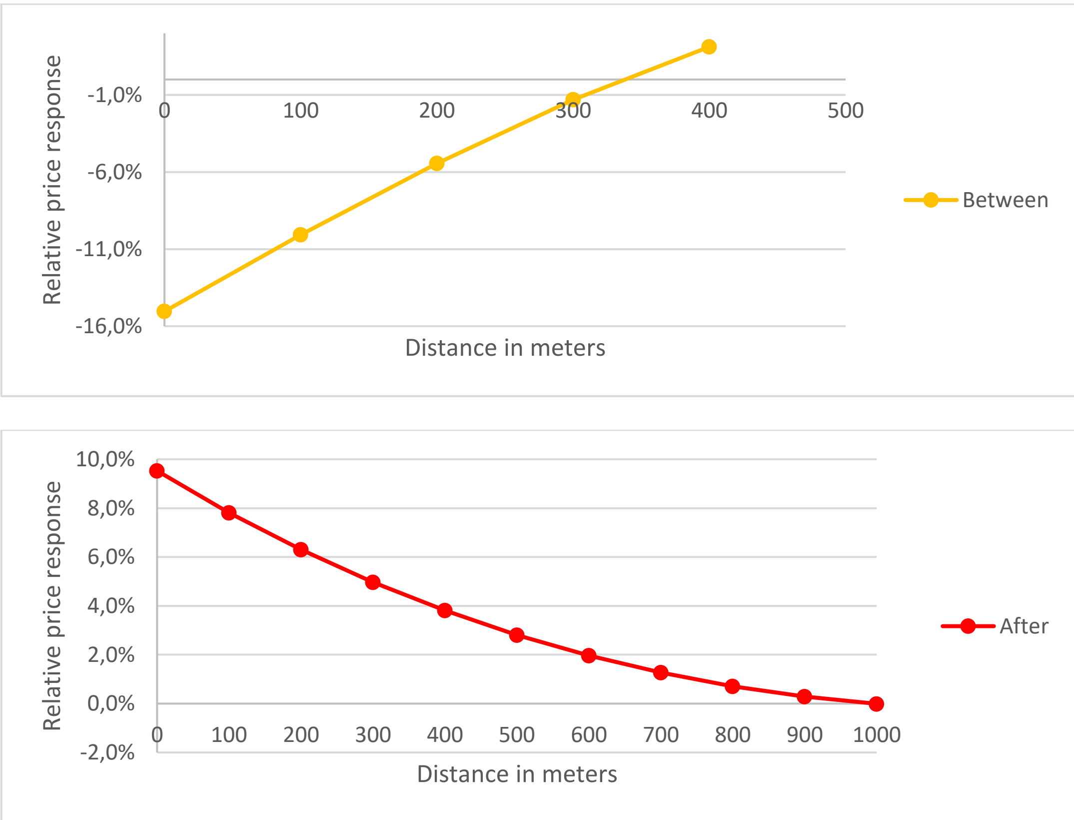

Figure 4: Relative price response across space between and after the development with target area 0-1,000m.

3.3. Sensitivity analyses

The results of the alternative model specification (3) show different outcomes compared to model specification (2), where the effects of new stadiums seem to be even more local than expected. Another reason could be that the current selection might be problematic and could bias our results. It is likely that either in situ developed or relocated stadiums drive up the coefficients that we found in our specification models. Therefore, we perform a Chow test. We split our dataset into stadiums that are in situ developed (6) and stadiums that are relocated (13). The performed regressions will be the same as column (4) of our model specification (2) in table 7.

Table 8 reports the results of model specification (2), where column (1) includes all the new stadiums, column (2) only includes the in situ developed stadiums and column (3) only includes the relocated stadiums. The results indicate striking differences between the two separated models and compared to the pooled model in column (1). This is supported by the Chow test, where the F-statistic > F critical value is at the 99% level (see appendix table D9). Therefore, the null hypothesis that the coefficients are stable across the sample, is rejected. This means that there is a significant difference in the coefficients between the predetermined in situ developed and the relocated subsample. The in situ developed sample in column (2) shows that the effects are larger, but comparable to the pooled model, whereas the relocated sample in column (3) shows no significant results for the main variables at all. The result suggests that there are no effects on house prices in areas where the stadium is relocated and the only effects that are observed are in areas where the stadium was in situ developed. Therefore, our earlier results are mostly driven by in situ developed stadiums.

Table 8: Regression results of the pooled dataset, the in situ developed sub dataset and the relocated sub dataset with target area 0-1,000m

	(1)	(2)	(3)
	Pooled	In situ developed	Relocated
TARGET AREA	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m
BEFORE	-0.0224	-0.187***	-0.0300
	(0.0360)	(0.0544)	(0.0532)
BEFORE*D	0.000217**	0.000757***	0.000213
	(0.000107)	(0.000174)	(0.000150)

BEFORE*D2	-2.13e-07***	-5.86e-07***	-2.05e-07**
	(7.58e-08)	(1.30e-07)	(1.02e-07)
BETWEEN	-0.163***	-0.335***	-0.00691
	(0.0520)	(0.0689)	(0.0912)
BETWEEN*D	0.000595***	0.00113***	6.33e-05
	(0.000159)	(0.000219)	(0.000262)
BETWEEN*D2	-4.32e-07***	-7.84e-07***	-4.24e-08
	(1.15e-07)	(1.64e-07)	(1.81e-07)
AFTER	0.0910***	0.152***	-0.00462
	(0.0187)	(0.0279)	(0.0257)
AFTER*D	-0.000166***	-0.000227***	-5.98e-05
	(5.67e-05)	(8.71e-05)	(7.62e-05)
AFTER*D2	7.05e-08*	8.05e-08	5.94e-08
	(4.12e-08)	(6.46e-08)	(5.42e-08)
Year fixed effects	YES	YES	YES
Physical characteristics	YES	YES	YES
Location fixed effects	YES	YES	YES
Neighborhood characteristics	YES	YES	YES
Adjusted R-squared	0.805	0.793	0.817

Note: Dependent variable is log(transaction price) and physical characteristics includes building period dummies. Table D7 in the appendix also shows the coefficients of the control variables. Regressions are without the STATA option 'robust' to perform a Chow test. Robust standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.1

3.4. Regression models of the in situ developed sub dataset with the adjusted target- and control area

This section analyzes the estimation results of the last two model specifications of the difference in difference hedonic approach as described in the methodology section, only including our in situ developed sub dataset based on the adjusted target area of 1,000 meters.

As we can see in column (2) of table 8, the adjusted R square of model specification (2) for our in situ developed sub dataset is near 80%. The coefficients of the main variable and interaction variables of 'BEFORE' are all significant. If we follow the same rationale as our previous sections when analyzing these coefficients, the results suggest that houses located in close proximity to the stadium are sold for $\left(\exp^{(-0.187)} - 1\right) \cdot 100$ = 17.1% less than houses located between 1,000 and 2,000 meters prior to the in situ development of a stadium. Moreover, the results indicate that the closer a house is located relative to the stadium within the target area of 1,000 meters, the lower the transaction price of the house that is sold. To be more precise, the results imply an increase of 7.2%-point $\left(\exp^{(0.000757*100-5.86e^{-7}*100^2)} - 1\right) \cdot 100)$ for the first 100 meters and this increase diminishes non-linear over space until the negative effect disappears, which is around 300 meters (see figure 5). Similar effects are found when we analyze the significant coefficients of the main variables and interaction variables of 'BETWEEN', but then larger. The results show that houses which are located in the target area are sold for $\left(\exp^{(-0.335)} - 1\right) \cdot 100$ = 28.5% less than houses in the control area between the start and end of the in situ stadium development. For the first 100 meters, results imply an increase of 11.1%-point $\left(\exp^{(0.00113*100-7.84e^{-7}*100^2)} - 1\right) \cdot 100)$. This increase diminishes non-linear over space until the negative effect disappears, which is around 300 meters (see figure 5). The only insignificant coefficient is from the interaction variable AFTER*D2. However, both the coefficients of the main variable AFTER and the interaction variable AFTER*D are still significant, which means that the positive effect after the completion of the in situ stadium development is decreasing linear across space. The results of the AFTER variable indicate that houses located within 1,000 meters of the stadium are sold for $\left(\exp^{(0.152)} - 1\right) \cdot 100$ = 16.4% more after the in situ development of the stadium took place. Estimation results suggest a decrease of 2.2%-point $\left(\exp^{(-0.000116*100)} - 1\right) \cdot 100)$ for every 100 meters. Consequently, the positive effect disappears around 700 meters according to the results (see figure 5).

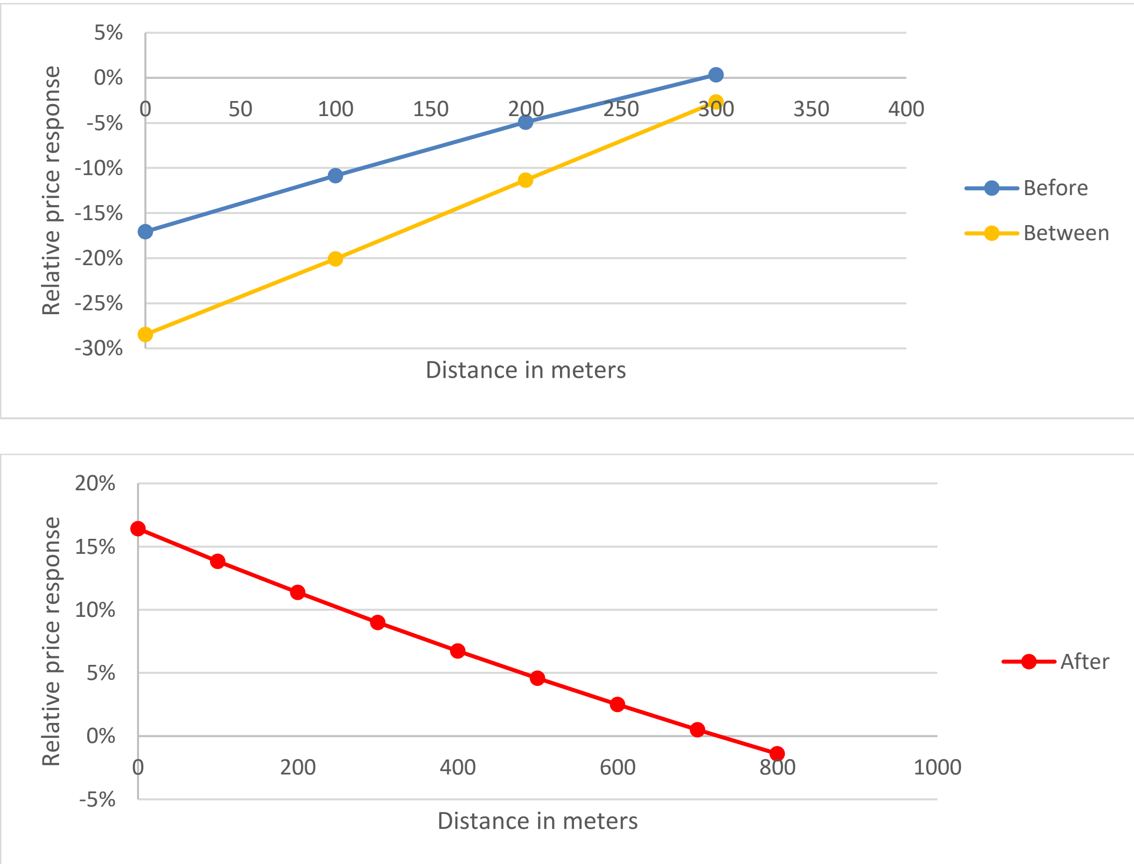

Figure 5: Relative price response across space before, between and after the development with target area 0-1,000m based on the in situ developed sub dataset.

4. CONCLUSION

4.1. Conclusion

This research provides the first empirical evidence of how a new stadium in the Netherlands may affect surrounding housing prices. We have selected 19 new stadiums across the Netherlands, of which 13 new stadiums have been relocated to another site and 6 new stadiums were developed in situ. In the analysis, a distinction is made between 3 periods: the period before the start of the new stadium development, the period between the start and end of the new stadium development and the period after the new stadium development took place. Additional attention is paid to the effect of distance on spatial interaction between stadium location and house prices. A hedonic approach in combination with a difference in difference model is used to effectively compare house prices in a target ring with house prices in a control area. This comparison is performed before, in between and after the stadium development. Furthermore, we analyzed potential heterogeneity in the model between in situ developed and relocated stadiums. Based on existing literature, we expect that new stadiums create positive price effects after completion. We consider whether new stadium development in the Netherlands can justify the large public investments into the stadiums' financing due to an increase in the attractiveness of the neighborhood as reflected in higher house prices in the target area after completion of a stadium.

We find fairly local negative externalities between the start and end of development of new stadiums in the Netherlands. We find that these negative externalities disappear after the completion of new stadiums into positive externalities up to 1,000 meters. However, our results are driven by the effects observed in areas where new stadiums were in situ developed. We find that before the development of an in situ developed stadium, house prices in the target area are on average lower than similar houses in the control area. These negative externalities become smaller with increasing distance from the in situ developed stadium until the negative effect diminishes, which is around 300 meters. House prices in the target area between the start and end of an in situ development are also on average lower than a similar house in the control area. Although these negative externalities are larger than before the development, they rapidly become smaller with increasing distance from the in situ developed stadium (300m), implying that the local negative externalities become worse when the development of the in situ stadium takes place. However, after the completion of the in situ stadium development, house prices substantially increases in the target area, and are on average higher than the control area. These effects decrease linear over space until the effect diminishes, which is around 700 meters. The results of our sensitivity analyses confirm the main results of the between- and after period of an in situ development. However, the sensitivity analyses show some inconsistency with the results of the house prices effects before the in situ development of stadiums takes place. Nonetheless, even if the old stadium was already perceived as an amenity and created positive externalities for the surrounding neighborhood as reflected in the transaction price, then still the positive externalities are larger after the in situ development took place. Since our research about stadium externalities has so far been neglected by the Dutch academic world, our empirical findings have important implications and fills the gap in the current literature that is dominated by research in the US and UK.

4.2. Policy implications

This study has clear policy implications and helps in the debate of justifying public investments for the development of new stadiums in the Netherlands. Our analysis shows that large public investments made by municipalities into new stadiums have partial support, by removing negative externalities (e.g. being a source of nuisance, vandalism and traffic congestion) before the development of an in situ development, into positive externalities (e.g. being a source of civic pride, a place of joy and a place of social bonding) after the completion of the in situ development. The positive externalities cover at least partly the in situ development costs. People are willing to pay a premium for the house if the new in situ developed stadium generates a higher amenity area with a favorable endowment. Therefore, our results confirm the effectiveness of urban regeneration policies and public investments of municipalities in those in situ developed stadiums due to welfare benefits. However, our results also highlight the importance of location when assessing the potential impact of new stadiums. The stadiums that are relocated, mostly built on city edges or suburban office areas, do not confirm the emergence of any significant effects at all. It suggests that the more urban locations of the in situ developed stadiums is an important driver for the positive effects found in our study and should be considered in cost and benefit analysis by policy makers.

4.3. Discussion

As stated by Ahlfeldt & Maennig (2012), who argue in their study that proximity costs and benefits of sports facilities vary across countries, our empirical research into the effects of new stadiums on surrounding house prices in the Netherlands is a major contribution to the existing literature about stadium externalities, that has so long been neglected by the Dutch academic world (Van Dam, 2000).

Generally, our results suggest that the impact that new stadiums deliver to its surrounding neighborhood depends on whether a new stadium is in situ developed or relocated to another place. We assume this has a lot to do with the geographic location of the stadium in question, like in the research of Van Duijn et. al (2016). The in situ developed stadiums are most of the time located in more dense urban areas whereas relocated stadiums are most of the time located in less dense suburban areas near city edges. As most of the old stadiums where an in situ development took place, were probably located in physically decayed and outdated areas of the city (Van Steen & Pellenbarg, 2008), the impact of investments in a new in situ developed stadium on the surrounding neighborhood will assumably be larger. As can be seen in our data, buildings near an in situ development are a lot older than buildings near relocated stadiums, which may indicate that those areas are indeed a lot older and would probably have been physically decayed.

Our main finding is that new stadiums have positive effects on surrounding house prices in the Netherlands. This is in line with the existing stadium literature from the US and Europe (e.g. Tu, 2005; Ahlfeldt & Meannig, 2010; Ahlfeldt & Kavetsos, 2014). We find that this positive effect is decreasing when the distance of a house to the stadium increases. This pattern is in line with the research of Tu (2005) and Ahlfeldt & Kavetsos (2014). However, our findings indicate that the results are largely driven by in situ developed stadiums.

There is also a clear discussion in the literature about the potential effects of new stadiums. For the in situ developed stadiums, our results indicate a positive price effect of 16.4% with a linear distance decaying decrease in the price of 2.2%-point for every 100 meters until the positive effect diminishes, which is around 700 meters. These results are similar, but rather local compared to the research of

Ahlfeldt & Kavetsos (2014). They also observe an increase in house prices of around 15% near the in situ developed New Wembley stadium in London. However, the area of impact is much smaller in our research compared to their research (also compared to the other existing literature). Their result indicates a price decrease of 2.7% per kilometer. We assume that it has much to do with the capacity of the stadium and the size of the city. The New Wembley Stadium is at least four times larger in size than our average stadium. Besides, London is denser than any city in the Netherlands. Furthermore, London is known for its competitive housing market. Therefore, a new stadium will provide more trading activity. The increased trading activity will result in even higher house prices. The same rationale applies for new stadiums in Berlin (Ahlfledt & Maennig, 2010) and for new stadiums in the literature of the US (Tu, 2005; Feng & Humphreys, 2018). If we compare our impact area of 700 meters with other urban theories in the Netherlands, then it seems to make sense (e.g. Schwartz et al.,2006).

4.4. Recommendation for future research

First, future literature about stadium externalities should clearly distinguish the type of new stadium development, as we find clear differences in newly developed in situ stadiums and new stadiums that are relocated. Another possibility is to do a case study of one or a couple of new stadiums. Each stadium tells its own story and some new stadiums are known by society as a successful development, while others are known as a complete disaster. Secondly, in the context of public investments into the development of new stadiums and whether those investments are justified, future studies could focus to aggregate the house price improvement with a monetary value that is easy to use in cost and benefit analysis. Finally, since municipalities were eager to co-invest in new relocated stadiums, as they could add new functions (e.g. housing) on the old unused land, it is also interesting to study the effect of the abandoned location on surrounding house price in future research.

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APPENDIX A: ASSUMPTIONS LINEAR REGRESSION

1. Linearity
2. Homoscedasticity
3. Autocorrelation
4. Independency
5. Normality

1) The mean value of the residuals must be equal to 0. This assumption is met by adding a constant to the model (Brooks & Tsolacos, 2010).

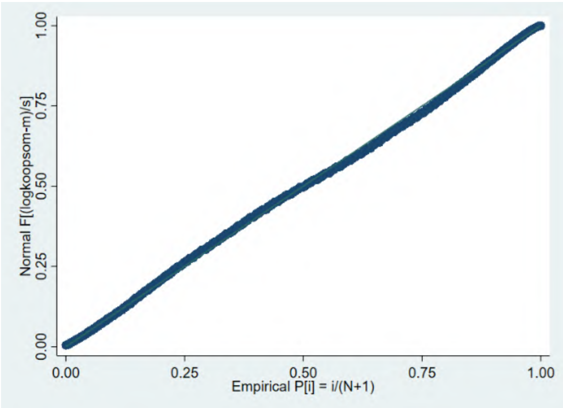

Figure A1: Standardized normal probability plot

2) Homoscedasticity refers to the variance of the residuals. If these have a constant variance, no pattern should be visible when the residuals are plotted against the 'fitted values' (Brooks & Tsolacos, 2010). There is some kind of pattern observable (see figure A2). Therefore we performed a Breush-Pagan / Cook-Weisberg test for heteroscedasticity (see figure A3). Where H0: Constant variance means that there is no heteroscedasticity in our data. The P-value is significant, which means that there is heteroskedasticity in our data. Therefore, we add robust errors in our regressions.

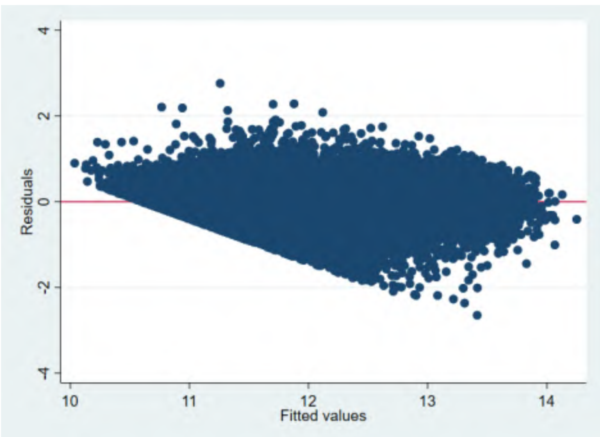

Figure A2: Residual - fitted plot

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

         chi2(1)      =  3158.27
         Prob > chi2  =   0.0000
```

Figure A1: Breusch-Pagan / Cook-Weisberg test

3) The assumption about autocorrelation is difficult to test. It is well known that real estate data often contain trends (Brooks & Tsolacos, 2010). To counter spatial autocorrelation, the model uses location fixed effects. The same applies to autocorrelation over time. We use year dummies to control for time fixed effects.

4) To check whether the independent variables are not strongly correlated with each other, the Variance Inflation Factor (VIF) should not exceed 10. After the correlation matrix in our do-file, we already explored that 'logvloeropp' and 'logperceelgrootte' had a moderate-high coefficient (0.6176). The coefficient was not high enough (> 0.68) to expect that these variables strongly correlated with each other. However, after analyzing the VIF, the variable 'logperceelgrootte' exceeded 10 (see figure A4). The same applies to 'tussenofgeschakeldewoning'. Therefore, we ran the regression without the variable 'logperceelgrootte', decreasing our adjusted R-squared slightly but still over 80%. All the variables including 'tussenofgeschakeldewoning' are now having a VIF lower than 10, which means that this is appropriate for regressions (see figure A5).

Variable	VIF	1/VIF
transactie~r		
1994	2.09	0.478338
1995	2.14	0.467624
1996	2.35	0.426372
1997	2.47	0.405571
1998	2.59	0.386020
1999	2.91	0.343330
2000	2.86	0.349487
2001	2.99	0.334544
2002	3.10	0.322654
2003	3.01	0.332044
2004	3.03	0.330441
2005	3.15	0.317519
2006	3.15	0.317247
2007	3.12	0.320423
2008	2.96	0.338395
2009	2.39	0.418008
2010	2.37	0.422303
2011	2.24	0.446398
2012	2.20	0.455280
2013	2.13	0.468916
2014	2.59	0.386551
2015	2.85	0.350986
2016	3.27	0.305704
2017	3.45	0.289992
2018	3.23	0.309504
2019	3.17	0.315249
2020	2.07	0.482499
logvloeropp	1.93	0.518982
logperceel~e	16.02	0.062403
hoekwoning	7.77	0.128714
tweeondereen	5.27	0.189576
tussenofge~d	14.05	0.071153
vrijstaand	5.20	0.192344
eerderd~1945	4.34	0.230673
tussen1~1960	2.61	0.383762
tussen1~1970	3.00	0.333687
tussen1~1980	2.99	0.334714
tussen1~1990	3.03	0.329951
tussen1~2000	2.65	0.377583
zwolle	4.32	0.231450
denhaag	4.00	0.249998
alkmaar	4.13	0.242005
almere	3.65	0.273686
groningen	5.88	0.170048
utrecht	7.18	0.139327
kerkrade	2.91	0.344190
oss	3.68	0.271727
almelo	3.14	0.318856
sittard	3.87	0.258238
enschede	2.14	0.467416
arnhem	4.65	0.215119
denbosch	4.91	0.203849
waalwijk	2.81	0.355539
breda	5.33	0.187493
rotterdam	3.97	0.252144
apeldoorn	5.26	0.189934
almere2	1.70	0.588782
bev_dichth	2.47	0.404562
gem_hh_gr	2.67	0.374915
youngpeople	2.76	0.362243
elderlypeo~e	3.06	0.327259
per~twesters	2.96	0.337310
Mean VIF	3.71	

Figure A4: VIF with 'logperceelgrootte'

Variable	VIF	1/VIF
transactie~r		
1994	2.09	0.478339
1995	2.14	0.467625
1996	2.35	0.426372
1997	2.47	0.405572
1998	2.59	0.386024
1999	2.91	0.343675
2000	2.86	0.349630
2001	2.99	0.334664
2002	3.10	0.322766
2003	3.01	0.332196
2004	3.03	0.330566
2005	3.15	0.317599
2006	3.15	0.317319
2007	3.12	0.320479
2008	2.95	0.338449
2009	2.39	0.418033
2010	2.37	0.422338
2011	2.24	0.446415
2012	2.20	0.455283
2013	2.13	0.468922
2014	2.59	0.386552
2015	2.85	0.350986
2016	3.27	0.305705
2017	3.45	0.289998
2018	3.23	0.309507
2019	3.17	0.315250
2020	2.07	0.482500
logvloeropp	1.83	0.546649
hoekwoning	1.72	0.582200
tweeondereen	1.57	0.637711
tussenofge~d	2.23	0.448190
vrijstaand	1.66	0.603944
eerderd~1945	4.33	0.231103
tussen1~1960	2.60	0.384977
tussen1~1970	2.99	0.334796
tussen1~1980	2.98	0.335728
tussen1~1990	3.02	0.331040
tussen1~2000	2.64	0.378708
zwolle	4.32	0.231453
denhaag	4.00	0.250082
alkmaar	4.13	0.242039
almere	3.65	0.273806
groningen	5.88	0.170124
utrecht	7.17	0.139378
kerkrade	2.90	0.344235
oss	3.68	0.271742
almelo	3.14	0.318899
sittard	3.87	0.258331
enschede	2.14	0.467425
arnhem	4.64	0.215295
denbosch	4.90	0.203881
waalwijk	2.81	0.355540
breda	5.33	0.187494
rotterdam	3.97	0.252168
apeldoorn	5.26	0.189941
almere2	1.70	0.588875
bev_dichth	2.47	0.405047
gem_hh_gr	2.65	0.377378
youngpeople	2.76	0.362582
elderlypeo~e	3.05	0.327663
per~twesters	2.96	0.337520
Mean VIF	3.10	

Figure A5: VIF without 'logperceelgrootte'

5) Figure A6 shows the histogram of the residuals, which is normally distributed. Nonetheless, the Jarque-Bera normality test shows a significant result, implying that our data are not normally distributed (see figure A7). However, we do have a sufficiently large dataset and it is not expected that the violation of the zero-mean assumption will have consequences that could bias our results.

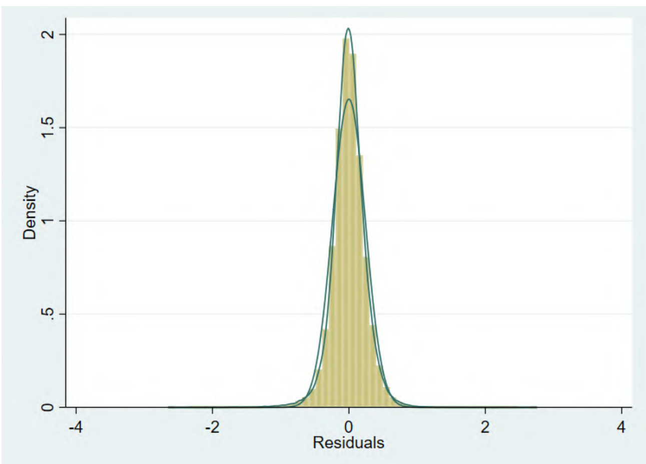

Figure A6: Histogram of residuals

```
. jb resi
Jarque-Bera normality test:  2.1e+05 Chi(2)      0
```

Figure A7: Jarque-Bera test

APPENDIX B: TRANSFORMATIONS

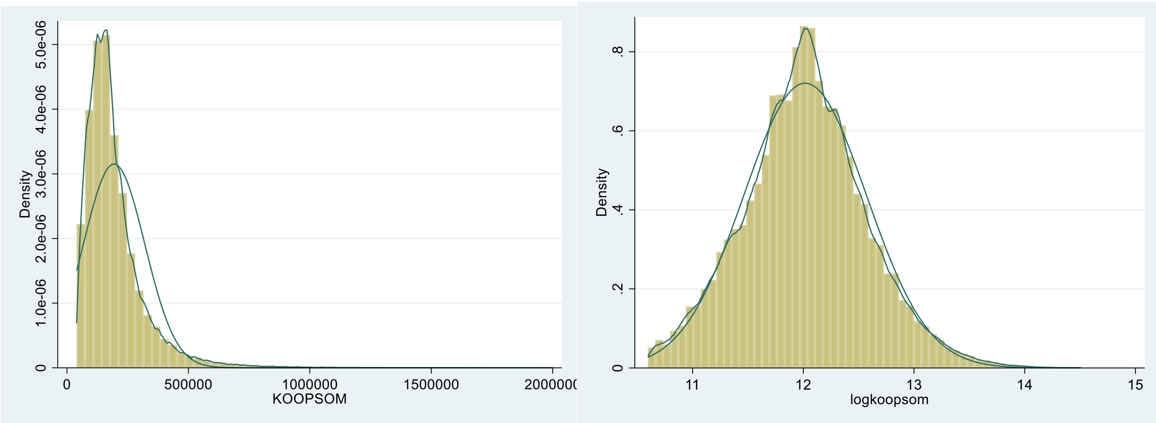

Figure B1: Transformation 'koopsom' into logarithmic scale

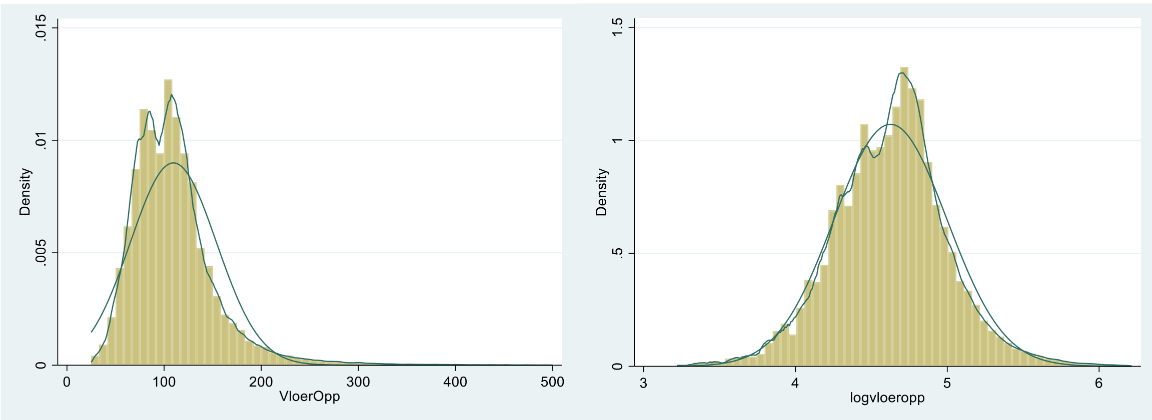

Figure B2: Transformation 'vloeropp' into logarithmic scale

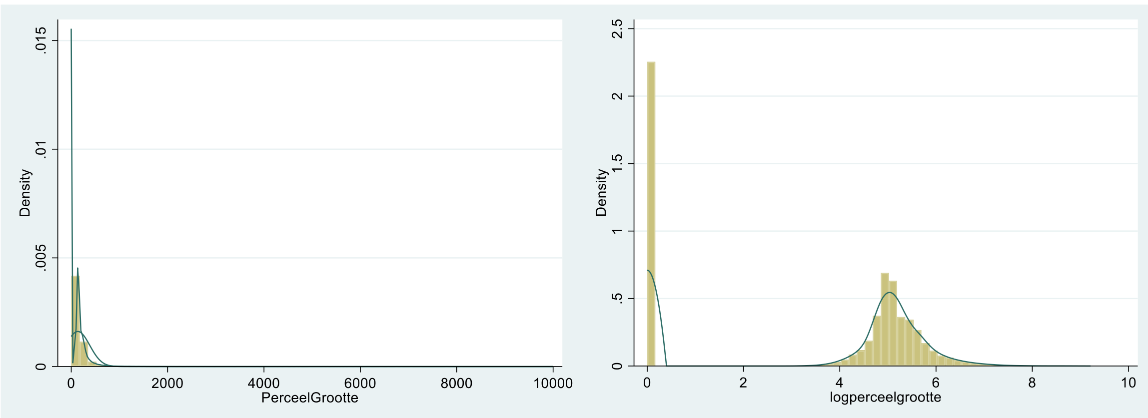

Figure B3: Transformation 'perceelgrootte' into logarithmic scale

APPENDIX C: ADDITIONAL DESCRIPTIVES

Table C1 : Descriptive statistics of records per house type per stadium with target area 0-1500m

	House types					
Stadium	Apartment	Corner house	Semi-detached house	Terraced house	Detached house	Total
MAC³PARK stadion	5025	2803	985	10390	725	19928
	(25.2)	*(14.1)*	*(4.9)*	*(52.1)*	*(3.6)*	*(100.0)*
Cars Jeans Stadion	8901	2132	911	6350	575	18869
	(47.2)	*(11.3)*	*(4.8)*	*(33.7)*	*(3.0)*	*(100.0)*
AFAS Stadion	6752	2438	996	7223	1388	18797
	(35.9)	*(13.0)*	*(5.3)*	*(38.4)*	*(7.4)*	*(100.0)*
Yanmar Stadion	1871	3681	499	12754	846	19651
	(9.5)	*(18.7)*	*(2.5)*	*(64.9)*	*(4.3)*	*(100.0)*
Hitachi Capital Mobility Stadion	**18530**	1288	451	4702	569	25540
	(72.6)	*(5.0)*	*(1.8)*	*(18.4)*	*(2.2)*	*(100.0)*
Stadion Galgenwaard	17731	1943	**150**	16415	**147**	36386
	(48.7)	*(5.3)*	***(0.4)***	*(45.1)*	***(0.4)***	*(100.0)*
Parkstad Limburg Stadion	1722	1995	1718	4099	829	10363
	(16.6)	*(19.3)*	*(16.6)*	*(39.6)*	*(8.0)*	*(100.0)*
Frans Heesen Stadion	3933	2776	2018	6563	1620	16910
	(23.3)	*(16.4)*	*(11.9)*	*(38.8)*	*(9.6)*	*(100.0)*
Erve Asito	2106	2805	2526	5305	1352	14094
	(14.9)	*(19.9)*	*(17.9)*	*(37.6)*	*(9.6)*	*(100.0)*
Fortuna Sittard Stadion	3086	2960	3059	5498	1625	16228
	(19.0)	*(18.2)*	*(18.9)*	*(33.9)*	*(10.0)*	*(100.0)*
De Grolsch Veste	1266	1136	1504	1986	620	6512
	(19.4)	*(17.4)*	*(23.1)*	*(30.5)*	*(9.5)*	*(100.0)*
Gelredome	8243	4037	854	11536	412	25082
	(32.9)	*(16.1)*	*(3.4)*	*(46.0)*	*(1.6)*	*(100.0)*
Stadion De Vliert	10626	2880	1037	8401	1054	23998
	(44.3)	*(12.0)*	*(4.3)*	*(35.0)*	*(4.4)*	*(100.0)*
Mandemakers Stadion	1386	2030	1120	5056	1193	10785
	(12.9)	*(18.8)*	*(10.4)*	*(46.9)*	*(11.1)*	*(100.0)*
Rat Verlegh Stadion	8624	3578	1484	12674	1833	28193
	(30.6)	*(12.7)*	*(5.3)*	*(45.0)*	*(6.5)*	*(100.0)*
Topsportcentrum Rotterdam	**19796**	1753	467	5003	228	27247
	(72.7)	*(6.4)*	*(1.7)*	*(18.4)*	*(0.8)*	*(100.0)*
Omnisport Apeldoorn	5988	4084	2708	11403	2529	26712
	(22.4)	*(15.3)*	*(10.1)*	*(42.7)*	*(9.5)*	*(100.0)*
Topsportcentrum Almere	1006	660	227	2469	327	4689
	(21.5)	*(14.1)*	*(4.8)*	*(52.7)*	*(7.0)*	*(100.0)*
Ziggo Dome	5857	678	151	2037	60	8783
	(66.7)	(7.7)	(1.7)	(23.2)	(0.7)	(100.0)
Total	132449	45657	22865	139864	17932	358767
	(36.9)	*(12.7)*	*(6.4)*	*(39.0)*	*(5.0)*	*(100.0)*
N	358767					

Row Percentages in Parentheses

Table C2: Descriptive statistics of records per building period per stadium with target area 0-1500m

	Building periods							
Stadium	<1945	1945-1960	1961-1970	1971-1980	1981-1990	1991-2000	>2000	Total
MAC³PARK stadion	7769	1182	3963	3475	823	1648	1068	19928
	(39.0)	*(5.9)*	*(19.9)*	*(17.4)*	*(4.1)*	*(8.3)*	*(5.4)*	*(100.0)*
Cars Jeans Stadion	5414	2275	1757	453	1064	3089	4817	18869
	(28.7)	*(12.1)*	*(9.3)*	*(2.4)*	*(5.6)*	*(16.4)*	*(25.5)*	*(100.0)*
AFAS Stadion	7816	2412	4261	1140	1196	858	1114	18797
	(41.6)	*(12.8)*	*(22.7)*	*(6.1)*	*(6.4)*	*(4.6)*	*(5.9)*	*(100.0)*

Yanmar Stadion	**0**	**0**	**0**	**0**	8604	9456	1591	19651
	(0.0)	*(0.0)*	*(0.0)*	*(0.0)*	*(43.8)*	*(48.1)*	*(8.1)*	*(100.0)*
Hitachi Capital Mobility Stadion	9248	5393	4476	1770	2239	1046	1368	25540
	(36.2)	*(21.1)*	*(17.5)*	*(6.9)*	*(8.8)*	*(4.1)*	*(5.4)*	*(100.0)*
Stadion Galgenwaard	**21422**	3208	654	2741	3005	3678	1678	36386
	(58.9)	*(8.8)*	*(1.8)*	*(7.5)*	*(8.3)*	*(10.1)*	*(4.6)*	*(100.0)*
Parkstad Limburg Stadion	1986	1674	943	2625	2125	743	267	10363
	(19.2)	*(16.2)*	*(9.1)*	*(25.3)*	*(20.5)*	*(7.2)*	*(2.6)*	*(100.0)*
Frans Heesen Stadion	1027	2116	3125	4801	2984	1930	927	16910
	(6.1)	*(12.5)*	*(18.5)*	*(28.4)*	*(17.6)*	*(11.4)*	*(5.5)*	*(100.0)*
Erve Asito	3553	1622	2481	958	2630	2115	735	14094
	(25.2)	*(11.5)*	*(17.6)*	*(6.8)*	*(18.7)*	*(15.0)*	*(5.2)*	*(100.0)*
Fortuna Sittard Stadion	2682	4994	2435	2298	1707	1091	1021	16228
	(16.5)	*(30.8)*	*(15.0)*	*(14.2)*	*(10.5)*	*(6.7)*	*(6.3)*	*(100.0)*
De Grolsch Veste	2310	325	1893	1326	121	476	**61**	6512
	(35.5)	*(5.0)*	*(29.1)*	*(20.4)*	*(1.9)*	*(7.3)*	***(0.9)***	*(100.0)*
Gelredome	4895	3214	891	5925	5174	3955	1028	25082
	(19.5)	*(12.8)*	*(3.6)*	*(23.6)*	*(20.6)*	*(15.8)*	*(4.1)*	*(100.0)*
Stadion De Vliert	5907	3406	5596	5003	1440	1440	1206	23998
	(24.6)	*(14.2)*	*(23.3)*	*(20.8)*	*(6.0)*	*(6.0)*	*(5.0)*	*(100.0)*
Mandemakers Stadion	1429	1321	1942	2005	1985	1368	735	10785
	(13.2)	*(12.2)*	*(18.0)*	*(18.6)*	*(18.4)*	*(12.7)*	*(6.8)*	*(100.0)*
Rat Verlegh Stadion	6203	3354	3516	3438	6896	2855	1931	28193
	(22.0)	*(11.9)*	*(12.5)*	*(12.2)*	*(24.5)*	*(10.1)*	*(6.8)*	*(100.0)*
Topsportcentrum Rotterdam	8456	1479	7320	727	2954	4219	2092	27247
	(31.0)	*(5.4)*	*(26.9)*	*(2.7)*	*(10.8)*	*(15.5)*	*(7.7)*	*(100.0)*
Omnisport Apeldoorn	3425	1696	4208	8467	3520	3694	1702	26712
	(12.8)	*(6.3)*	*(15.8)*	*(31.7)*	*(13.2)*	*(13.8)*	*(6.4)*	*(100.0)*
Topsportcentrum Almere	**7**	**0**	**0**	100	167	2101	2314	4689
	(0.1)	*(0.0)*	*(0.0)*	*(2.1)*	*(3.6)*	*(44.8)*	*(49.3)*	*(100.0)*
Ziggo Dome	411	237	1278	1733	3317	951	856	8783
	(4.7)	*(2.7)*	*(14.6)*	*(19.7)*	*(37.8)*	*(10.8)*	*(9.7)*	*(100.0)*
Total	93960	39908	50739	48985	51951	46713	26511	358767
	(26.2)	*(11.1)*	*(14.1)*	*(13.7)*	*(14.5)*	*(13.0)*	*(7.4)*	*(100.0)*
N	358767							

Row Percentages in Parentheses

Table C3 : Descriptive statistics of in situ developed and relocated stadiums with target area 0-1500m

	In situ developed		**Relocated**	
	mean	**sd**	**mean**	**sd**
Transaction price (€x1000)	**212.067**	136.988	**183.581**	113.064
Floor size (m2)	111.756	48.414	108.456	41.129
Lot size (m2)	141.089	241.596	135.187	210.841
Apartment (1=yes)	0.341	0.474	0.383	0.486
Corner house (1=yes)	0.122	0.327	0.130	0.336
Semi-detached house (1=yes)	0.059	0.236	0.066	0.248
Terraced house (1=yes)	0.430	0.495	0.370	0.483
Detached house (1=yes)	0.047	0.212	0.051	0.221
<1945 (1=yes)	0.334	0.472	0.226	0.418
1945-1960 (1=yes)	0.109	0.312	0.112	0.316
1961-1970 (1=yes)	0.137	0.344	0.144	0.351
1971-1980 (1=yes)	0.174	0.380	0.118	0.322
1981-1990 (1=yes)	0.104	0.306	0.165	0.371
1991-2000 (1=yes)	0.091	0.288	0.149	0.356
>2000 (1=yes)	0.050	0.217	0.086	0.280
Near Train Subway Tram (1=yes)	0.510	0.500	0.473	0.499
Near highway (1=yes)	**0.000**	0.000	0.261	0.439
Near N-way (1=yes)	0.563	0.496	0.343	0.475
Not near way (1=yes)	0.437	0.496	0.395	0.489
Before crisis (1=yes)	0.555	0.497	0.538	0.499
Within crisis (1=yes)	0.170	0.376	0.172	0.378
After crisis (1=yes)	0.275	0.447	0.290	0.454
Population density (#/km2)	**6840.092**	4268.583	6220.438	3419.897

Average household size (#)	1.950	0.332	2.072	0.374
Non-western migrants (%)	**9.917**	6.923	**18.697**	16.308
Young people (%)	28.006	6.020	29.721	5.929
Elderly people (%)	16.239	7.984	15.334	6.957
N	118370		240397	

Table C4 : Descriptive statistics of records per house type per stadium with target area 0-1000m

	House types					
Stadium	Apartment	Corner house	Semi-detached house	Terraced house	Detached house	Total
MAC³PARK stadion	2437	1550	670	6312	471	11440
	(21.3)	(13.5)	(5.9)	(55.2)	(4.1)	(100.0)
Cars Jeans Stadion	1286	826	308	2411	202	5033
	(25.6)	(16.4)	(6.1)	(47.9)	(4.0)	(100.0)
AFAS Stadion	2564	1090	380	2715	474	7223
	(35.5)	(15.1)	(5.3)	(37.6)	(6.6)	(100.0)
Yanmar Stadion	534	1745	214	6386	365	9244
	(5.8)	(18.9)	(2.3)	(69.1)	(3.9)	(100.0)
Hitachi Capital Mobility Stadion	8909	497	241	2113	319	12079
	(73.8)	(4.1)	(2.0)	(17.5)	(2.6)	(100.0)
Stadion Galgenwaard	9709	979	96	7512	112	18408
	(52.7)	(5.3)	(0.5)	(40.8)	(0.6)	(100.0)
Parkstad Limburg Stadion	465	1039	634	2392	339	4869
	(9.6)	(21.3)	(13.0)	(49.1)	(7.0)	(100.0)
Frans Heesen Stadion	3461	1386	1337	2824	965	9973
	(34.7)	(13.9)	(13.4)	(28.3)	(9.7)	(100.0)
Erve Asito	952	2281	1993	4279	972	10477
	(9.1)	(21.8)	(19.0)	(40.8)	(9.3)	(100.0)
Fortuna Sittard Stadion	1065	1180	1130	2115	656	6146
	(17.3)	(19.2)	(18.4)	(34.4)	(10.7)	(100.0)
De Grolsch Veste	52	249	215	301	102	919
	(5.7)	(27.1)	(23.4)	(32.8)	(11.1)	(100.0)
Gelredome	2338	1392	284	4270	188	8472
	(27.6)	(16.4)	(3.4)	(50.4)	(2.2)	(100.0)
Stadion De Vliert	5445	1828	535	5611	344	13763
	(39.6)	(13.3)	(3.9)	(40.8)	(2.5)	(100.0)
Mandemakers Stadion	753	1084	621	2876	682	6016
	(12.5)	(18.0)	(10.3)	(47.8)	(11.3)	(100.0)
Rat Verlegh Stadion	3005	1402	406	5339	771	10923
	(27.5)	(12.8)	(3.7)	(48.9)	(7.1)	(100.0)
Topsportcentrum Rotterdam	6831	594	166	1475	100	9166
	(74.5)	(6.5)	(1.8)	(16.1)	(1.1)	(100.0)
Omnisport Apeldoorn	2339	2446	1367	7264	1243	14659
	(16.0)	(16.7)	(9.3)	(49.6)	(8.5)	(100.0)
Topsportcentrum Almere	819	151	58	560	148	1736
	(47.2)	(8.7)	(3.3)	(32.3)	(8.5)	(100.0)
Ziggo Dome	3393	89	11	387	13	3893
	(87.2)	(2.3)	(0.3)	(9.9)	(0.3)	(100.0)
Total	56357	21808	10666	67142	8466	164439
	(34.3)	(13.3)	(6.5)	(40.8)	(5.1)	(100.0)
N	164439					

Row Percentages in Parentheses

Table C5: Descriptive statistics of records per building period per stadium with target area 0-1000m

	Building periods							
Stadium	<1945	1945-1960	1961-1970	1971-1980	1981-1990	1991-2000	>2000	Total
MAC³PARK stadion	5831	1045	2287	1062	347	398	470	11440
	(51.0)	(9.1)	(20.0)	(9.3)	(3.0)	(3.5)	(4.1)	(100.0)
Cars Jeans Stadion	768	408	253	116	119	1129	2240	5033
	(15.3)	(8.1)	(5.0)	(2.3)	(2.4)	(22.4)	(44.5)	(100.0)
AFAS Stadion	2873	1439	1360	485	215	285	566	7223
	(39.8)	(19.9)	(18.8)	(6.7)	(3.0)	(3.9)	(7.8)	(100.0)
Yanmar Stadion	0	0	0	0	5116	3978	150	9244
	(0.0)	(0.0)	(0.0)	(0.0)	(55.3)	(43.0)	(1.6)	(100.0)
Hitachi Capital Mobility Stadion	4894	1697	2810	536	689	732	721	12079
	(40.5)	(14.0)	(23.3)	(4.4)	(5.7)	(6.1)	(6.0)	(100.0)
Stadion Galgenwaard	9781	2642	95	1743	1337	2233	577	18408
	(53.1)	(14.4)	(0.5)	(9.5)	(7.3)	(12.1)	(3.1)	(100.0)
Parkstad Limburg Stadion	943	432	215	1890	854	430	105	4869
	(19.4)	(8.9)	(4.4)	(38.8)	(17.5)	(8.8)	(2.2)	(100.0)
Frans Heesen Stadion	912	1680	2371	2727	1092	515	676	9973
	(9.1)	(16.8)	(23.8)	(27.3)	(10.9)	(5.2)	(6.8)	(100.0)

Erve Asito	2859	1131	1126	602	2328	1883	548	10477
	(27.3)	(10.8)	(10.7)	(5.7)	(22.2)	(18.0)	(5.2)	(100.0)
Fortuna Sittard Stadion	1054	1807	464	980	844	733	264	6146
	(17.1)	(29.4)	(7.5)	(15.9)	(13.7)	(11.9)	(4.3)	(100.0)
De Grolsch Veste	513	162	163	20	12	6	43	919
	(55.8)	(17.6)	(17.7)	(2.2)	(1.3)	(0.7)	(4.7)	(100.0)
Gelredome	1017	2020	309	2169	1820	741	396	8472
	(12.0)	(23.8)	(3.6)	(25.6)	(21.5)	(8.7)	(4.7)	(100.0)
Stadion De Vliert	3549	1777	4185	2605	257	722	668	13763
	(25.8)	(12.9)	(30.4)	(18.9)	(1.9)	(5.2)	(4.9)	(100.0)
Mandemakers Stadion	1014	786	1536	977	901	487	315	6016
	(16.9)	(13.1)	(25.5)	(16.2)	(15.0)	(8.1)	(5.2)	(100.0)
Rat Verlegh Stadion	3256	474	338	1066	3510	1550	729	10923
	(29.8)	(4.3)	(3.1)	(9.8)	(32.1)	(14.2)	(6.7)	(100.0)
Topsportcentrum Rotterdam	2295	630	3141	88	943	1384	685	9166
	(25.0)	(6.9)	(34.3)	(1.0)	(10.3)	(15.1)	(7.5)	(100.0)
Omnisport Apeldoorn	1446	514	1305	5362	1660	3116	1256	14659
	(9.9)	(3.5)	(8.9)	(36.6)	(11.3)	(21.3)	(8.6)	(100.0)
Topsportcentrum Almere	0	0	0	0	0	52	1684	1736
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(3.0)	(97.0)	(100.0)
Ziggo Dome	54	40	594	283	2057	392	473	3893
	(1.4)	(1.0)	(15.3)	(7.3)	(52.8)	(10.1)	(12.2)	(100.0)
Total	43059	18684	22552	22711	24101	20766	12566	164439
	(26.2)	(11.4)	(13.7)	(13.8)	(14.7)	(12.6)	(7.6)	(100.0)
N	164439							

Row Percentages in Parentheses

Table C6 : Descriptive statistics of in situ developed and relocated stadiums with target area 0-1000m

	In situ developed		**Relocated**	
	mean	**sd**	**mean**	**sd**
Transaction price (€x1000)	207.048	143.022	179.283	106.968
Floor size (m2)	110.295	48.521	108.466	39.757
Lot size (m2)	136.180	221.700	143.877	224.929
Apartment (1=yes)	0.345	0.476	0.341	0.474
Corner house (1=yes)	0.122	0.327	0.139	0.346
Semi-detached house (1=yes)	0.060	0.238	0.068	0.251
Terraced house (1=yes)	0.427	0.495	0.396	0.489
Detached house (1=yes)	0.045	0.208	0.056	0.229
<1945 (1=yes)	0.342	0.474	0.210	0.408
1945-1960 (1=yes)	0.130	0.336	0.103	0.304
1961-1970 (1=yes)	0.166	0.372	0.119	0.323
1971-1980 (1=yes)	0.171	0.376	0.117	0.322
1981-1990 (1=yes)	0.074	0.262	0.193	0.395
1991-2000 (1=yes)	0.074	0.262	0.160	0.366
>2000 (1=yes)	0.044	0.204	0.098	0.297
Near Train Subway Tram (1=yes)	0.499	0.500	0.458	0.498
Near highway (1=yes)	0.000	0.000	0.207	0.405
Near N-way (1=yes)	0.539	0.499	0.434	0.496
Not near way (1=yes)	0.461	0.499	0.359	0.480
Before crisis (1=yes)	0.560	0.496	0.530	0.499
Within crisis (1=yes)	0.167	0.373	0.171	0.376
After crisis (1=yes)	0.274	0.446	0.299	0.458
Population density (#/km2)	6489.369	3444.413	6105.101	3180.811
Average household size (#)	1.915	0.283	2.094	0.381
Non-western migrants (%)	9.962	5.921	19.929	17.256
Young people (%)	27.911	6.378	29.950	5.317
Elderly people (%)	16.922	7.503	14.574	6.764
N	64469		99970	

Table C7: Descriptive statistics with target area 0-1000m

	Total		Target		Control	
	mean	**sd**	**mean**	**sd**	**mean**	**sd**
Dependent variable						
Transaction price (€x1000)	190.168	123.124	186.576	114.554	191.168	125.386
Physical characteristics						
Floor size (m2)	109.183	43.414	108.109	42.333	109.482	43.705
Lot size (m2)	140.859	223.699	148.247	202.324	138.804	229.250
House type						
Apartment (1=yes)	0.343	0.475	0.317	0.465	0.350	0.477
Corner house (1=yes)	0.133	0.339	0.141	0.348	0.130	0.337
Semi-detached house (1=yes)	0.065	0.246	0.072	0.258	0.063	0.243
Terraced house (1=yes)	0.408	0.492	0.417	0.493	0.406	0.491
Detached house (1=yes)	0.051	0.221	0.053	0.224	0.051	0.220
Building period						
<1945 (1=yes)	0.262	0.440	0.230	0.421	0.271	0.444
1945-1960 (1=yes)	0.114	0.317	0.101	0.302	0.117	0.321
1961-1970 (1=yes)	0.137	0.344	0.192	0.394	0.122	0.327
1971-1980 (1=yes)	0.138	0.345	0.135	0.342	0.139	0.346
1981-1990 (1=yes)	0.147	0.354	0.153	0.360	0.145	0.352
1991-2000 (1=yes)	0.126	0.332	0.104	0.306	0.132	0.339
>2000 (1=yes)	0.076	0.266	0.083	0.276	0.074	0.263
Time period						
Before crisis (1=yes)	0.541	0.498	0.530	0.499	0.545	0.498
Within crisis (1=yes)	0.169	0.375	0.176	0.380	0.168	0.373
After crisis (1=yes)	0.289	0.453	0.295	0.456	0.288	0.453
Neighborhood characteristics						
Population density (#/km2)	6255.760	3292.021	5922.123	2890.986	6348.573	3389.348
Average household size (#)	2.024	0.357	2.081	0.342	2.008	0.359
Non-western migrants (%)	16.022	14.780	16.323	15.629	15.938	14.534
Young people (%)	29.151	5.842	29.715	5.842	28.994	5.832
Elderly people (%)	15.495	7.155	15.151	6.352	15.590	7.361
Building stock						
Single-family (%)	57.771	26.971	60.349	24.781	57.054	27.506
Multi-family (%)	42.229	26.971	39.651	24.781	42.946	27.506
Owner-occupied (%)	52.324	19.449	54.388	20.742	51.749	19.034
Rental house (%)	46.657	19.160	44.700	20.051	47.201	18.869
House association (%)	31.619	18.753	31.286	20.601	31.712	18.205
Vacant house (%)	3.903	2.941	3.411	2.491	4.040	3.040
N	164439		35787		128652	

APPENDIX D: REGRESSION RESULTS & CHOW TEST

Table D1: Baseline (1) including control variables with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE	-0.0343***	-0.00934***	-0.0177***	-0.00405**
	(0.00299)	(0.00201)	(0.00178)	(0.00173)
BETWEEN	-0.00840*	0.0113***	-0.0263***	-0.0140***
	(0.00467)	(0.00324)	(0.00257)	(0.00250)
AFTER	-0.0522***	-0.0432***	-0.0272***	-0.0145***
	(0.00206)	(0.00152)	(0.00117)	(0.00113)
1994	0.0587***	0.0767***	0.0810***	0.0825***
	(0.00609)	(0.00461)	(0.00434)	(0.00423)
1995	0.109***	0.137***	0.140***	0.140***
	(0.00602)	(0.00449)	(0.00416)	(0.00406)
1996	0.185***	0.222***	0.228***	0.233***
	(0.00590)	(0.00438)	(0.00406)	(0.00395)
1997	0.271***	0.312***	0.334***	0.337***
	(0.00580)	(0.00430)	(0.00392)	(0.00381)
1998	0.338***	0.385***	0.413***	0.419***
	(0.00577)	(0.00429)	(0.00389)	(0.00378)
1999	0.453***	0.511***	0.543***	0.552***
	(0.00577)	(0.00432)	(0.00392)	(0.00380)
2000	0.598***	0.658***	0.679***	0.685***
	(0.00587)	(0.00436)	(0.00397)	(0.00385)
2001	0.683***	0.750***	0.786***	0.794***
	(0.00580)	(0.00427)	(0.00384)	(0.00373)
2002	0.758***	0.826***	0.857***	0.867***
	(0.00566)	(0.00415)	(0.00375)	(0.00364)
2003	0.780***	0.864***	0.897***	0.908***
	(0.00569)	(0.00418)	(0.00377)	(0.00366)
2004	0.815***	0.897***	0.931***	0.942***
	(0.00567)	(0.00415)	(0.00373)	(0.00361)
2005	0.860***	0.940***	0.967***	0.978***
	(0.00556)	(0.00409)	(0.00367)	(0.00355)
2006	0.919***	0.985***	1.011***	1.021***
	(0.00564)	(0.00414)	(0.00370)	(0.00358)
2007	0.952***	1.021***	1.044***	1.053***
	(0.00575)	(0.00423)	(0.00376)	(0.00363)
2008	0.976***	1.050***	1.072***	1.083***
	(0.00588)	(0.00436)	(0.00381)	(0.00368)
2009	0.929***	1.017***	1.037***	1.049***
	(0.00631)	(0.00472)	(0.00409)	(0.00394)
2010	0.931***	1.013***	1.026***	1.036***
	(0.00644)	(0.00479)	(0.00411)	(0.00397)
2011	0.928***	0.989***	1.001***	1.011***
	(0.00667)	(0.00497)	(0.00427)	(0.00414)
2012	0.885***	0.934***	0.946***	0.957***
	(0.00676)	(0.00501)	(0.00435)	(0.00419)
2013	0.822***	0.874***	0.888***	0.897***
	(0.00684)	(0.00507)	(0.00442)	(0.00426)
2014	0.873***	0.921***	0.920***	0.929***
	(0.00621)	(0.00461)	(0.00405)	(0.00391)

2015	0.892***	0.941***	0.947***	0.957***
	(0.00608)	(0.00451)	(0.00396)	(0.00382)
2016	0.939***	0.996***	1.010***	1.020***
	(0.00585)	(0.00437)	(0.00385)	(0.00373)
2017	1.024***	1.074***	1.098***	1.107***
	(0.00574)	(0.00430)	(0.00378)	(0.00368)
2018	1.136***	1.177***	1.204***	1.214***
	(0.00581)	(0.00439)	(0.00383)	(0.00373)
2019	1.225***	1.255***	1.283***	1.295***
	(0.00573)	(0.00438)	(0.00381)	(0.00372)
2020	1.296***	1.314***	1.342***	1.353***
	(0.00675)	(0.00510)	(0.00430)	(0.00420)
Log floor size		0.676***	0.724***	0.696***
		(0.00250)	(0.00217)	(0.00212)
Corner house		0.0297***	0.0845***	0.102***
		(0.00201)	(0.00172)	(0.00170)
Semi-detached house		0.0633***	0.198***	0.201***
		(0.00291)	(0.00235)	(0.00231)
Terraced house		0.0319***	0.0440***	0.0618***
		(0.00155)	(0.00136)	(0.00137)
Detached house		0.306***	0.375***	0.376***
		(0.00361)	(0.00317)	(0.00312)
<1945		-0.129***	-0.178***	-0.233***
		(0.00250)	(0.00226)	(0.00234)
1945-1960		-0.278***	-0.229***	-0.276***
		(0.00263)	(0.00234)	(0.00233)
1961-1970		-0.302***	-0.244***	-0.276***
		(0.00234)	(0.00218)	(0.00220)
1971-1980		-0.228***	-0.199***	-0.250***
		(0.00234)	(0.00223)	(0.00224)
1981-1990		-0.191***	-0.126***	-0.167***
		(0.00230)	(0.00216)	(0.00215)
1991-2000		-0.0356***	0.00870***	-0.0197***
		(0.00229)	(0.00209)	(0.00207)
zwolle			-0.120***	-0.425***
			(0.00357)	(0.00360)
denhaag			0.0390***	-0.195***
			(0.00373)	(0.00362)
alkmaar			0.00306	-0.302***
			(0.00363)	(0.00370)
almere			-0.290***	-0.424***
			(0.00334)	(0.00301)
groningen			-0.226***	-0.570***
			(0.00352)	(0.00392)
utrecht			0.261***	-0.0442***
			(0.00350)	(0.00366)
kerkrade			-0.496***	-0.826***
			(0.00438)	(0.00451)
oss			-0.220***	-0.493***
			(0.00364)	(0.00358)
almelo			-0.501***	-0.741***
			(0.00384)	(0.00366)
sittard			-0.452***	-0.774***
			(0.00392)	(0.00398)
enschede			-0.365***	-0.659***
			(0.00440)	(0.00443)
arnhem			-0.218***	-0.453***

			(0.00347)	(0.00334)
denbosch			0.0549***	-0.250***
			(0.00362)	(0.00364)
waalwijk			-0.116***	-0.416***
			(0.00400)	(0.00399)
breda			-0.0707***	-0.346***
			(0.00346)	(0.00343)
rotterdam			-0.276***	-0.339***
			(0.00356)	(0.00305)
apeldoorn			-0.135***	-0.422***
			(0.00337)	(0.00341)
almere2			-0.183***	-0.291***
			(0.00457)	(0.00409)
Population density				1.22e-06***
				(1.87e-07)
Average household size				-0.0769***
				(0.00202)
young people				0.00208***
				(0.000135)
elderly people				0.00316***
				(0.000107)
Non western migrants				-0.00740***
				(4.77e-05)
Constant	11.25***	8.197***	8.045***	8.601***
	(0.00449)	(0.0121)	(0.0109)	(0.0120)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (14)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.328	0.659	0.783	0.802

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D2: Specification (2) including control variables with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE	0.368***	0.336***	0.142***	0.129***
	(0.0253)	(0.0157)	(0.0135)	(0.0134)
BEFORE*D	-0.000898***	-0.000731***	-0.000298***	-0.000247***
	(5.48e-05)	(3.50e-05)	(3.02e-05)	(2.97e-05)
BEFORE*D2	4.54e-07***	3.54e-07***	1.29e-07***	1.06e-07***
	(2.80e-08)	(1.82e-08)	(1.58e-08)	(1.54e-08)
BETWEEN	0.273***	0.228***	0.0503**	0.0290
	(0.0431)	(0.0301)	(0.0253)	(0.0255)
BETWEEN*D	-0.000533***	-0.000408***	-6.11e-05	2.42e-07
	(9.21e-05)	(6.44e-05)	(5.36e-05)	(5.38e-05)
BETWEEN*D2	2.33e-07***	1.78e-07***	-8.75e-09	-3.46e-08
	(4.63e-08)	(3.25e-08)	(2.68e-08)	(2.67e-08)
AFTER	0.271***	0.184***	0.106***	0.0882***
	(0.0173)	(0.0126)	(0.00945)	(0.00913)

AFTER*D	-0.000657***	-0.000479***	-0.000272***	-0.000191***
	(3.66e-05)	(2.70e-05)	(2.03e-05)	(1.97e-05)
AFTER*D2	3.07e-07***	2.31e-07***	1.27e-07***	8.24e-08***
	(1.84e-08)	(1.37e-08)	(1.03e-08)	(1.00e-08)
1994	0.0583***	0.0766***	0.0811***	0.0826***
	(0.00608)	(0.00461)	(0.00434)	(0.00422)
1995	0.109***	0.137***	0.140***	0.140***
	(0.00600)	(0.00448)	(0.00416)	(0.00406)
1996	0.185***	0.221***	0.227***	0.232***
	(0.00589)	(0.00438)	(0.00406)	(0.00394)
1997	0.271***	0.312***	0.334***	0.336***
	(0.00579)	(0.00430)	(0.00392)	(0.00381)
1998	0.337***	0.385***	0.413***	0.419***
	(0.00576)	(0.00429)	(0.00388)	(0.00378)
1999	0.453***	0.510***	0.543***	0.552***
	(0.00576)	(0.00432)	(0.00392)	(0.00380)
2000	0.599***	0.658***	0.679***	0.685***
	(0.00587)	(0.00436)	(0.00397)	(0.00385)
2001	0.683***	0.750***	0.786***	0.794***
	(0.00579)	(0.00427)	(0.00384)	(0.00373)
2002	0.758***	0.826***	0.856***	0.867***
	(0.00565)	(0.00415)	(0.00375)	(0.00364)
2003	0.780***	0.864***	0.897***	0.908***
	(0.00568)	(0.00418)	(0.00377)	(0.00366)
2004	0.815***	0.897***	0.931***	0.942***
	(0.00566)	(0.00415)	(0.00373)	(0.00361)
2005	0.860***	0.940***	0.967***	0.978***
	(0.00556)	(0.00409)	(0.00367)	(0.00355)
2006	0.918***	0.984***	1.010***	1.021***
	(0.00563)	(0.00413)	(0.00370)	(0.00358)
2007	0.952***	1.020***	1.043***	1.053***
	(0.00575)	(0.00423)	(0.00376)	(0.00363)
2008	0.976***	1.050***	1.071***	1.082***
	(0.00587)	(0.00435)	(0.00381)	(0.00368)
2009	0.929***	1.017***	1.037***	1.049***
	(0.00631)	(0.00472)	(0.00409)	(0.00393)
2010	0.931***	1.013***	1.026***	1.036***
	(0.00643)	(0.00479)	(0.00411)	(0.00397)
2011	0.927***	0.989***	1.001***	1.011***
	(0.00667)	(0.00496)	(0.00427)	(0.00414)
2012	0.885***	0.934***	0.946***	0.956***
	(0.00675)	(0.00500)	(0.00435)	(0.00419)
2013	0.822***	0.874***	0.888***	0.897***
	(0.00684)	(0.00507)	(0.00442)	(0.00426)
2014	0.873***	0.921***	0.920***	0.929***
	(0.00621)	(0.00461)	(0.00405)	(0.00391)
2015	0.891***	0.940***	0.947***	0.957***
	(0.00607)	(0.00450)	(0.00396)	(0.00382)
2016	0.938***	0.995***	1.009***	1.019***
	(0.00585)	(0.00436)	(0.00385)	(0.00373)
2017	1.023***	1.073***	1.097***	1.107***
	(0.00574)	(0.00430)	(0.00378)	(0.00368)
2018	1.135***	1.177***	1.203***	1.213***
	(0.00580)	(0.00439)	(0.00383)	(0.00373)
2019	1.224***	1.255***	1.283***	1.295***
	(0.00572)	(0.00438)	(0.00381)	(0.00372)
2020	1.296***	1.314***	1.342***	1.352***

	(0.00675)	(0.00510)	(0.00430)	(0.00419)
Log floor size		0.675***	0.723***	0.696***
		(0.00250)	(0.00217)	(0.00212)
Corner house		0.0303***	0.0850***	0.102***
		(0.00201)	(0.00172)	(0.00170)
Semi-detached house		0.0636***	0.198***	0.202***
		(0.00290)	(0.00235)	(0.00231)
Terraced house		0.0324***	0.0444***	0.0622***
		(0.00155)	(0.00136)	(0.00137)
Detached house		0.306***	0.376***	0.376***
		(0.00361)	(0.00317)	(0.00313)
<1945		-0.128***	-0.177***	-0.232***
		(0.00250)	(0.00226)	(0.00234)
1945-1960		-0.278***	-0.229***	-0.276***
		(0.00263)	(0.00234)	(0.00233)
1961-1970		-0.302***	-0.244***	-0.277***
		(0.00234)	(0.00218)	(0.00220)
1971-1980		-0.227***	-0.198***	-0.250***
		(0.00234)	(0.00223)	(0.00224)
1981-1990		-0.191***	-0.126***	-0.167***
		(0.00231)	(0.00216)	(0.00215)
1991-2000		-0.0355***	0.00901***	-0.0193***
		(0.00229)	(0.00209)	(0.00207)
zwolle			-0.122***	-0.427***
			(0.00356)	(0.00360)
denhaag			0.0384***	-0.194***
			(0.00373)	(0.00362)
alkmaar			0.00159	-0.303***
			(0.00363)	(0.00370)
almere			-0.291***	-0.423***
			(0.00333)	(0.00301)
groningen			-0.226***	-0.569***
			(0.00351)	(0.00392)
utrecht			0.260***	-0.0440***
			(0.00349)	(0.00366)
kerkrade			-0.496***	-0.824***
			(0.00438)	(0.00451)
oss			-0.222***	-0.495***
			(0.00363)	(0.00359)
almelo			-0.501***	-0.741***
			(0.00383)	(0.00366)
sittard			-0.452***	-0.774***
			(0.00392)	(0.00398)
enschede			-0.366***	-0.658***
			(0.00440)	(0.00443)
arnhem			-0.219***	-0.452***
			(0.00347)	(0.00334)
denbosch			0.0547***	-0.250***
			(0.00361)	(0.00364)
waalwijk			-0.119***	-0.418***
			(0.00401)	(0.00400)
breda			-0.0715***	-0.346***
			(0.00345)	(0.00343)
rotterdam			-0.277***	-0.340***
			(0.00355)	(0.00305)
apeldoorn			-0.137***	-0.422***
			(0.00337)	(0.00341)

almere2			-0.183***	-0.290***
			(0.00457)	(0.00409)
Population density				1.30e-06***
				(1.87e-07)
Average household size				-0.0772***
				(0.00203)
young people				0.00204***
				(0.000135)
elderly people				0.00321***
				(0.000107)
Non western migrants				-0.00737***
				(4.78e-05)
Constant	11.25***	8.201***	8.049***	8.602***
	(0.00449)	(0.0121)	(0.0109)	(0.0120)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.329	0.660	0.783	0.802

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table D3: Alternative specification (3) including control variables with target area 0-1500m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<3000 m	<3000 m	<3000 m	<3000 m
TARGET AREA	0-1500 m	0-1500 m	0-1500 m	0-1500 m
CONTROL AREA	1500-3000 m	1500-3000 m	1500-3000 m	1500-3000 m
BEFORE 0-500m	0.0643***	0.0868***	0.0240***	0.0232***
	(0.0104)	(0.00579)	(0.00516)	(0.00515)
BEFORE 500-1000m	-0.0666***	-0.0165***	-0.00974***	0.0102***
	(0.00483)	(0.00319)	(0.00273)	(0.00269)
BEFORE 1000-1500m	-0.0245***	-0.0139***	-0.0258***	-0.0143***
	(0.00374)	(0.00257)	(0.00226)	(0.00217)
BETWEEN 0-500m	0.0538***	0.0222*	-0.0177	-0.0298***
	(0.0203)	(0.0127)	(0.0112)	(0.0114)
BETWEEN 500-1000m	0.0447***	0.0255***	0.0126**	0.0119**
	(0.00952)	(0.00635)	(0.00517)	(0.00502)
BETWEEN 1000-1500m	0.0118*	0.0177***	-0.0180***	-0.0180***
	(0.00676)	(0.00475)	(0.00379)	(0.00367)
AFTER 0-500m	0.0564***	-0.0376***	-0.00146	-0.000988
	(0.0128)	(0.00807)	(0.00669)	(0.00654)
AFTER 500-1000m	-0.00771	-0.0351***	-0.0196***	-0.0173***
	(0.00576)	(0.00389)	(0.00325)	(0.00320)
AFTER 1000-1500m	-0.0307***	-0.0328***	-0.00469*	-0.00724***
	(0.00443)	(0.00313)	(0.00263)	(0.00253)
1994	0.0587***	0.0769***	0.0811***	0.0826***
	(0.00609)	(0.00461)	(0.00434)	(0.00422)
1995	0.109***	0.137***	0.140***	0.140***
	(0.00601)	(0.00448)	(0.00416)	(0.00406)
1996	0.186***	0.222***	0.227***	0.232***
	(0.00590)	(0.00438)	(0.00406)	(0.00394)
1997	0.271***	0.312***	0.334***	0.336***

	(0.00580)	(0.00430)	(0.00392)	(0.00381)
1998	0.338***	0.385***	0.413***	0.418***
	(0.00576)	(0.00429)	(0.00388)	(0.00378)
1999	0.453***	0.511***	0.543***	0.552***
	(0.00577)	(0.00432)	(0.00392)	(0.00380)
2000	0.599***	0.658***	0.679***	0.685***
	(0.00587)	(0.00436)	(0.00397)	(0.00385)
2001	0.683***	0.750***	0.786***	0.794***
	(0.00579)	(0.00427)	(0.00384)	(0.00373)
2002	0.758***	0.826***	0.856***	0.867***
	(0.00565)	(0.00415)	(0.00375)	(0.00364)
2003	0.781***	0.864***	0.897***	0.908***
	(0.00568)	(0.00418)	(0.00377)	(0.00366)
2004	0.815***	0.897***	0.931***	0.942***
	(0.00567)	(0.00415)	(0.00373)	(0.00361)
2005	0.860***	0.940***	0.967***	0.978***
	(0.00556)	(0.00409)	(0.00367)	(0.00355)
2006	0.919***	0.984***	1.011***	1.021***
	(0.00564)	(0.00413)	(0.00370)	(0.00358)
2007	0.952***	1.021***	1.043***	1.053***
	(0.00575)	(0.00423)	(0.00376)	(0.00363)
2008	0.976***	1.050***	1.071***	1.082***
	(0.00588)	(0.00435)	(0.00381)	(0.00368)
2009	0.929***	1.017***	1.037***	1.049***
	(0.00631)	(0.00472)	(0.00409)	(0.00393)
2010	0.931***	1.013***	1.026***	1.036***
	(0.00643)	(0.00479)	(0.00411)	(0.00397)
2011	0.927***	0.989***	1.001***	1.011***
	(0.00667)	(0.00496)	(0.00427)	(0.00413)
2012	0.885***	0.934***	0.946***	0.956***
	(0.00676)	(0.00500)	(0.00435)	(0.00419)
2013	0.822***	0.874***	0.888***	0.897***
	(0.00684)	(0.00507)	(0.00442)	(0.00426)
2014	0.874***	0.922***	0.920***	0.929***
	(0.00621)	(0.00461)	(0.00405)	(0.00391)
2015	0.891***	0.940***	0.947***	0.957***
	(0.00608)	(0.00450)	(0.00396)	(0.00382)
2016	0.938***	0.995***	1.009***	1.019***
	(0.00585)	(0.00436)	(0.00385)	(0.00373)
2017	1.024***	1.073***	1.097***	1.107***
	(0.00574)	(0.00430)	(0.00378)	(0.00368)
2018	1.135***	1.177***	1.203***	1.213***
	(0.00580)	(0.00439)	(0.00383)	(0.00373)
2019	1.224***	1.255***	1.283***	1.295***
	(0.00573)	(0.00438)	(0.00381)	(0.00372)
2020	1.296***	1.314***	1.342***	1.353***
	(0.00675)	(0.00510)	(0.00430)	(0.00419)
Log floor size		0.675***	0.723***	0.696***
		(0.00250)	(0.00217)	(0.00212)
Corner house		0.0300***	0.0848***	0.102***
		(0.00201)	(0.00172)	(0.00170)
Semi-detached house		0.0638***	0.198***	0.202***
		(0.00291)	(0.00235)	(0.00231)
Terraced house		0.0320***	0.0442***	0.0621***
		(0.00155)	(0.00136)	(0.00137)
Detached house		0.306***	0.376***	0.376***
		(0.00361)	(0.00317)	(0.00313)

<1945	-0.129***	-0.177***	-0.232***
	(0.00250)	(0.00226)	(0.00234)
1945-1960	-0.278***	-0.229***	-0.276***
	(0.00263)	(0.00234)	(0.00233)
1961-1970	-0.303***	-0.244***	-0.277***
	(0.00234)	(0.00218)	(0.00220)
1971-1980	-0.227***	-0.198***	-0.250***
	(0.00234)	(0.00223)	(0.00224)
1981-1990	-0.190***	-0.126***	-0.167***
	(0.00231)	(0.00216)	(0.00215)
1991-2000	-0.0359***	0.00877***	-0.0193***
	(0.00229)	(0.00209)	(0.00207)
zwolle		-0.122***	-0.427***
		(0.00357)	(0.00360)
denhaag		0.0388***	-0.194***
		(0.00373)	(0.00362)
alkmaar		0.00158	-0.303***
		(0.00363)	(0.00369)
almere		-0.291***	-0.423***
		(0.00333)	(0.00301)
groningen		-0.227***	-0.570***
		(0.00352)	(0.00392)
utrecht		0.260***	-0.0440***
		(0.00350)	(0.00365)
kerkrade		-0.496***	-0.825***
		(0.00438)	(0.00451)
oss		-0.221***	-0.495***
		(0.00363)	(0.00359)
almelo		-0.501***	-0.742***
		(0.00384)	(0.00366)
sittard		-0.452***	-0.774***
		(0.00392)	(0.00398)
enschede		-0.365***	-0.659***
		(0.00440)	(0.00443)
arnhem		-0.219***	-0.453***
		(0.00347)	(0.00334)
denbosch		0.0544***	-0.251***
		(0.00361)	(0.00364)
waalwijk		-0.118***	-0.419***
		(0.00400)	(0.00399)
breda		-0.0711***	-0.346***
		(0.00346)	(0.00343)
rotterdam		-0.277***	-0.339***
		(0.00356)	(0.00305)
apeldoorn		-0.136***	-0.423***
		(0.00337)	(0.00340)
almere2		-0.183***	-0.290***
		(0.00457)	(0.00409)
Population density			1.26e-06***
			(1.87e-07)
Average household size			-0.0775***
			(0.00202)
young people			0.00207***
			(0.000135)
elderly people			0.00321***
			(0.000107)
Non western migrants			-0.00739***

				(4.77e-05)
Constant	11.25***	8.202***	8.049***	8.602***
	(0.00449)	(0.0121)	(0.0109)	(0.0120)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	358,767	358,767	358,767	358,767
Adjusted R-squared	0.329	0.659	0.783	0.802

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D4: Baseline (1) including control variables with target area 0-1000m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m
BEFORE	-0.0285***	0.0211***	0.00678***	0.0138***
	(0.00463)	(0.00306)	(0.00261)	(0.00259)
BETWEEN	0.0187**	0.0425***	0.0207***	0.0253***
	(0.00767)	(0.00514)	(0.00414)	(0.00405)
AFTER	-0.0286***	-0.0203***	-0.000724	0.00900***
	(0.00322)	(0.00232)	(0.00179)	(0.00173)
1994	0.0482***	0.0712***	0.0751***	0.0771***
	(0.00902)	(0.00673)	(0.00626)	(0.00607)
1995	0.106***	0.126***	0.133***	0.134***
	(0.00896)	(0.00659)	(0.00607)	(0.00589)
1996	0.185***	0.219***	0.223***	0.227***
	(0.00876)	(0.00639)	(0.00587)	(0.00570)
1997	0.259***	0.306***	0.331***	0.333***
	(0.00853)	(0.00626)	(0.00560)	(0.00544)
1998	0.327***	0.375***	0.407***	0.414***
	(0.00856)	(0.00633)	(0.00561)	(0.00545)
1999	0.442***	0.497***	0.531***	0.539***
	(0.00850)	(0.00635)	(0.00562)	(0.00545)
2000	0.599***	0.651***	0.669***	0.676***
	(0.00861)	(0.00645)	(0.00582)	(0.00567)
2001	0.687***	0.751***	0.786***	0.793***
	(0.00847)	(0.00624)	(0.00553)	(0.00537)
2002	0.767***	0.827***	0.857***	0.867***
	(0.00831)	(0.00610)	(0.00542)	(0.00527)
2003	0.792***	0.865***	0.897***	0.907***
	(0.00841)	(0.00615)	(0.00548)	(0.00533)
2004	0.818***	0.899***	0.930***	0.942***
	(0.00826)	(0.00604)	(0.00535)	(0.00519)
2005	0.866***	0.942***	0.967***	0.976***
	(0.00818)	(0.00596)	(0.00527)	(0.00510)
2006	0.928***	0.994***	1.015***	1.025***
	(0.00831)	(0.00603)	(0.00532)	(0.00514)
2007	0.954***	1.027***	1.043***	1.052***
	(0.00844)	(0.00616)	(0.00540)	(0.00522)
2008	0.979***	1.053***	1.077***	1.087***
	(0.00868)	(0.00637)	(0.00546)	(0.00528)

2009	0.934***	1.021***	1.039***	1.050***
	(0.00936)	(0.00694)	(0.00592)	(0.00573)
2010	0.928***	1.015***	1.022***	1.031***
	(0.00941)	(0.00699)	(0.00596)	(0.00576)
2011	0.924***	0.988***	0.997***	1.005***
	(0.00978)	(0.00725)	(0.00615)	(0.00599)
2012	0.884***	0.937***	0.946***	0.954***
	(0.00995)	(0.00734)	(0.00630)	(0.00607)
2013	0.820***	0.875***	0.887***	0.896***
	(0.00991)	(0.00740)	(0.00635)	(0.00613)
2014	0.874***	0.923***	0.916***	0.926***
	(0.00913)	(0.00677)	(0.00586)	(0.00566)
2015	0.896***	0.945***	0.947***	0.956***
	(0.00886)	(0.00656)	(0.00568)	(0.00549)
2016	0.937***	0.997***	1.009***	1.018***
	(0.00854)	(0.00633)	(0.00548)	(0.00531)
2017	1.020***	1.070***	1.092***	1.101***
	(0.00842)	(0.00628)	(0.00545)	(0.00529)
2018	1.135***	1.175***	1.200***	1.208***
	(0.00844)	(0.00636)	(0.00547)	(0.00532)
2019	1.217***	1.251***	1.280***	1.290***
	(0.00836)	(0.00637)	(0.00545)	(0.00531)
2020	1.283***	1.308***	1.337***	1.346***
	(0.00985)	(0.00741)	(0.00609)	(0.00594)
Log floor size		0.660***	0.690***	0.663***
		(0.00389)	(0.00319)	(0.00317)
Corner house		0.00750**	0.101***	0.104***
		(0.00310)	(0.00261)	(0.00255)
Semi-detached house		0.0477***	0.225***	0.209***
		(0.00442)	(0.00350)	(0.00342)
Terraced house		0.0114***	0.0604***	0.0650***
		(0.00242)	(0.00212)	(0.00208)
Detached house		0.291***	0.408***	0.385***
		(0.00554)	(0.00468)	(0.00456)
<1945		-0.109***	-0.168***	-0.188***
		(0.00381)	(0.00359)	(0.00363)
1945-1960		-0.257***	-0.236***	-0.245***
		(0.00385)	(0.00360)	(0.00360)
1961-1970		-0.270***	-0.229***	-0.240***
		(0.00338)	(0.00340)	(0.00342)
1971-1980		-0.212***	-0.180***	-0.211***
		(0.00349)	(0.00349)	(0.00351)
1981-1990		-0.196***	-0.0960***	-0.130***
		(0.00340)	(0.00347)	(0.00347)
1991-2000		-0.0115***	0.0327***	0.0154***
		(0.00343)	(0.00337)	(0.00332)
zwolle			0.00663	-0.438***
			(0.00490)	(0.00660)
denhaag			0.153***	-0.190***
			(0.00608)	(0.00685)
alkmaar			0.143***	-0.291***
			(0.00521)	(0.00659)
almere			-0.195***	-0.462***
			(0.00451)	(0.00532)
groningen			-0.109***	-0.547***
			(0.00485)	(0.00700)
utrecht			0.371***	-0.0511***

			(0.00481)	(0.00668)
kerkrade			-0.438***	-0.903***
			(0.00623)	(0.00765)
oss			-0.110***	-0.531***
			(0.00505)	(0.00625)
almelo			-0.425***	-0.789***
			(0.00494)	(0.00613)
sittard			-0.330***	-0.785***
			(0.00567)	(0.00703)
enschede			-0.330***	-0.716***
			(0.00990)	(0.0109)
arnhem			-0.172***	-0.500***
			(0.00493)	(0.00569)
denbosch			0.118***	-0.312***
			(0.00479)	(0.00631)
waalwijk			-0.0145***	-0.451***
			(0.00556)	(0.00675)
breda			-0.0241***	-0.418***
			(0.00472)	(0.00628)
rotterdam			-0.170***	-0.372***
			(0.00489)	(0.00505)
apeldoorn			-0.0565***	-0.474***
			(0.00462)	(0.00616)
almere2			-0.0286***	-0.223***
			(0.00748)	(0.00739)
Population density				7.91e-07***
				(2.90e-07)
Average household size				-0.0191***
				(0.00316)
young people				0.000725***
				(0.000205)
elderly people				0.00327***
				(0.000166)
Non western migrants				-0.00716***
				(8.24e-05)
Constant	11.23***	8.251***	8.066***	8.657***
	(0.00665)	(0.0186)	(0.0158)	(0.0179)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	164,439	164,439	164,439	164,439
Adjusted R-squared	0.343	0.653	0.791	0.805

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D5: Specification (2) including control variables with target area 0-1000m

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m
BEFORE	0.290***	0.261***	0.00449	-0.0224
	(0.0564)	(0.0342)	(0.0284)	(0.0291)

BEFORE*D	-0.000463***	-0.000382***	0.000168*	0.000217**
	(0.000170)	(0.000106)	(8.77e-05)	(8.94e-05)
BEFORE*D2	4.64e-08	7.70e-08	-2.08e-07***	-2.13e-07***
	(1.21e-07)	(7.64e-08)	(6.34e-08)	(6.48e-08)
BETWEEN	0.372***	0.235***	-0.0798	-0.163***
	(0.0978)	(0.0717)	(0.0604)	(0.0598)
BETWEEN*D	-0.000653**	-0.000308	0.000374**	0.000595***
	(0.000297)	(0.000218)	(0.000183)	(0.000180)
BETWEEN*D2	2.20e-07	5.92e-08	-3.03e-07**	-4.32e-07***
	(2.12e-07)	(1.55e-07)	(1.31e-07)	(1.29e-07)
AFTER	0.611***	0.267***	0.132***	0.0910***
	(0.0344)	(0.0255)	(0.0189)	(0.0187)
AFTER*D	-0.00163***	-0.000674***	-0.000292***	-0.000166***
	(0.000105)	(7.69e-05)	(5.71e-05)	(5.64e-05)
AFTER*D2	9.67e-07***	3.63e-07***	1.43e-07***	7.05e-08*
	(7.56e-08)	(5.54e-08)	(4.12e-08)	(4.07e-08)
1994	0.0489***	0.0717***	0.0753***	0.0772***
	(0.00899)	(0.00671)	(0.00626)	(0.00607)
1995	0.105***	0.126***	0.133***	0.134***
	(0.00892)	(0.00656)	(0.00606)	(0.00589)
1996	0.184***	0.218***	0.222***	0.226***
	(0.00873)	(0.00638)	(0.00587)	(0.00570)
1997	0.259***	0.306***	0.331***	0.333***
	(0.00850)	(0.00624)	(0.00560)	(0.00544)
1998	0.326***	0.374***	0.406***	0.413***
	(0.00853)	(0.00631)	(0.00561)	(0.00545)
1999	0.442***	0.497***	0.531***	0.539***
	(0.00848)	(0.00634)	(0.00562)	(0.00545)
2000	0.599***	0.651***	0.669***	0.676***
	(0.00859)	(0.00643)	(0.00582)	(0.00567)
2001	0.687***	0.751***	0.786***	0.794***
	(0.00844)	(0.00622)	(0.00552)	(0.00536)
2002	0.767***	0.826***	0.857***	0.867***
	(0.00828)	(0.00608)	(0.00542)	(0.00527)
2003	0.792***	0.864***	0.897***	0.907***
	(0.00839)	(0.00614)	(0.00548)	(0.00533)
2004	0.818***	0.899***	0.930***	0.942***
	(0.00825)	(0.00603)	(0.00535)	(0.00519)
2005	0.866***	0.942***	0.966***	0.976***
	(0.00816)	(0.00595)	(0.00527)	(0.00510)
2006	0.927***	0.993***	1.014***	1.025***
	(0.00829)	(0.00602)	(0.00531)	(0.00514)
2007	0.953***	1.027***	1.043***	1.052***
	(0.00842)	(0.00615)	(0.00540)	(0.00522)
2008	0.979***	1.053***	1.077***	1.087***
	(0.00866)	(0.00636)	(0.00546)	(0.00528)
2009	0.933***	1.021***	1.038***	1.050***
	(0.00934)	(0.00693)	(0.00592)	(0.00573)
2010	0.927***	1.015***	1.022***	1.031***
	(0.00939)	(0.00697)	(0.00595)	(0.00576)
2011	0.923***	0.987***	0.997***	1.005***
	(0.00977)	(0.00724)	(0.00615)	(0.00599)
2012	0.883***	0.937***	0.945***	0.954***
	(0.00992)	(0.00733)	(0.00630)	(0.00607)
2013	0.819***	0.875***	0.887***	0.896***
	(0.00990)	(0.00740)	(0.00635)	(0.00613)
2014	0.874***	0.924***	0.916***	0.926***

	(0.00911)	(0.00676)	(0.00586)	(0.00566)
2015	0.895***	0.945***	0.946***	0.955***
	(0.00884)	(0.00655)	(0.00568)	(0.00549)
2016	0.936***	0.996***	1.009***	1.018***
	(0.00852)	(0.00632)	(0.00548)	(0.00531)
2017	1.018***	1.069***	1.091***	1.101***
	(0.00840)	(0.00627)	(0.00545)	(0.00529)
2018	1.133***	1.174***	1.199***	1.208***
	(0.00842)	(0.00635)	(0.00547)	(0.00532)
2019	1.216***	1.250***	1.279***	1.289***
	(0.00834)	(0.00636)	(0.00545)	(0.00531)
2020	1.282***	1.308***	1.337***	1.346***
	(0.00982)	(0.00740)	(0.00609)	(0.00593)
Log floor size		0.657***	0.688***	0.662***
		(0.00390)	(0.00320)	(0.00317)
Corner house		0.00812***	0.101***	0.104***
		(0.00310)	(0.00262)	(0.00255)
Semi-detached house		0.0483***	0.225***	0.209***
		(0.00442)	(0.00350)	(0.00342)
Terraced house		0.0115***	0.0603***	0.0650***
		(0.00242)	(0.00212)	(0.00209)
Detached house		0.291***	0.408***	0.386***
		(0.00554)	(0.00468)	(0.00456)
<1945		-0.108***	-0.167***	-0.187***
		(0.00381)	(0.00359)	(0.00363)
1945-1960		-0.257***	-0.235***	-0.245***
		(0.00384)	(0.00360)	(0.00360)
1961-1970		-0.271***	-0.228***	-0.240***
		(0.00339)	(0.00340)	(0.00342)
1971-1980		-0.210***	-0.178***	-0.210***
		(0.00349)	(0.00349)	(0.00351)
1981-1990		-0.195***	-0.0958***	-0.130***
		(0.00341)	(0.00347)	(0.00347)
1991-2000		-0.0116***	0.0330***	0.0157***
		(0.00343)	(0.00336)	(0.00331)
zwolle			0.00319	-0.437***
			(0.00492)	(0.00662)
denhaag			0.152***	-0.188***
			(0.00608)	(0.00687)
alkmaar			0.141***	-0.289***
			(0.00523)	(0.00661)
almere			-0.196***	-0.460***
			(0.00451)	(0.00533)
groningen			-0.109***	-0.544***
			(0.00486)	(0.00701)
utrecht			0.368***	-0.0498***
			(0.00482)	(0.00668)
kerkrade			-0.439***	-0.900***
			(0.00623)	(0.00767)
oss			-0.112***	-0.530***
			(0.00506)	(0.00626)
almelo			-0.426***	-0.786***
			(0.00494)	(0.00614)
sittard			-0.331***	-0.783***
			(0.00568)	(0.00705)
enschede			-0.328***	-0.712***
			(0.00989)	(0.0109)

arnhem			-0.174***	-0.499***
			(0.00494)	(0.00570)
denbosch			0.117***	-0.309***
			(0.00479)	(0.00633)
waalwijk			-0.0173***	-0.450***
			(0.00558)	(0.00676)
breda			-0.0252***	-0.415***
			(0.00473)	(0.00629)
rotterdam			-0.172***	-0.372***
			(0.00489)	(0.00506)
apeldoorn			-0.0580***	-0.472***
			(0.00462)	(0.00618)
almere2			-0.0287***	-0.220***
			(0.00749)	(0.00741)
Population density				9.33e-07***
				(2.91e-07)
Average household size				-0.0192***
				(0.00316)
young people				0.000726***
				(0.000205)
elderly people				0.00337***
				(0.000166)
Non western migrants				-0.00711***
				(8.29e-05)
Constant	11.23***	8.264***	8.074***	8.655***
	(0.00663)	(0.0186)	(0.0158)	(0.0180)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	164,439	164,439	164,439	164,439
Adjusted R-squared	0.347	0.655	0.791	0.805

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table D6: Regression results of the alternative model specification (3) with target area 0-1000m[6]

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m
BEFORE 0-250m	0.352***	0.0741	0.0467	0.0667*
	(0.106)	(0.0766)	(0.0399)	(0.0371)
BEFORE 250-500m	0.0808***	0.107***	0.0245***	0.0186***
	(0.0104)	(0.00587)	(0.00544)	(0.00536)
BEFORE 500-750m	0.0102	0.0581***	0.0368***	0.0398***
	(0.00762)	(0.00486)	(0.00426)	(0.00409)
BEFORE 750-1000m	-0.0799***	-0.0223***	-0.0157***	-0.00286
	(0.00622)	(0.00420)	(0.00346)	(0.00350)
BETWEEN 0-250m	-0.00873	-0.217	-0.187	-0.218
	(0.243)	(0.228)	(0.188)	(0.186)
BETWEEN 250-500m	0.0514**	0.0226*	-0.00914	-0.0193*
	(0.0203)	(0.0123)	(0.0112)	(0.0113)
BETWEEN 500-750m	0.0522***	0.0112	0.00672	0.00871
	(0.0156)	(0.0104)	(0.00844)	(0.00797)
BETWEEN 750-1000m	0.0394***	0.0261***	0.0251***	0.0226***
	(0.0119)	(0.00799)	(0.00640)	(0.00638)
AFTER 0-250m	0.0347	0.0152	0.0248	0.0209
	(0.110)	(0.0815)	(0.0443)	(0.0418)
AFTER 250-500m	0.0459***	-0.0405***	0.0146**	0.0158**
	(0.0130)	(0.00819)	(0.00698)	(0.00675)
AFTER 500-750m	-0.0606***	-0.0798***	-0.0319***	-0.0228***
	(0.00928)	(0.00604)	(0.00505)	(0.00482)
AFTER 750-1000m	0.0213***	-0.0196***	0.000656	-0.000241
	(0.00732)	(0.00509)	(0.00413)	(0.00414)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (19)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	164,439	164,439	164,439	164,439
Adjusted R-squared	0.347	0.655	0.791	0.805

Note: Dependent variable is log(transaction price) and physical characteristics include building period dummies. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

[6] Table D6 presents the coefficients and standard errors of our alternative model specification (3) and analyzes the robustness of our adjusted target- and control area. This time, the target area of 1,000 meters is divided into four distance rings, each with a radius of 250 meters. The control area remains the same. As can be seen in column (4), the coefficients of the distance rings until 750 meters before development show positive significant results, suggesting that houses located near the stadium even before the development of stadiums are sold for a premium relative to houses located in the control area. These results also imply that the negative insignificant result of the BEFORE variable in our model specification (2) from table 7 may be largely driven by the last distance ring, which also shows a negative insignificant result. The coefficient of the distance ring between 250 and 500 meters of the stadium is negative significant. This makes sense, since we found a negative effect in our precious model up to 300 meters. However, the coefficients of the last distance ring are positive significant, implying that houses between 750 and 1,000 meters are positively affected by the development period compared to the houses in the control area. Therefore, we could argue that the affected houses between the start and end of the stadium development are rather local and that our target area is still too large. One other possible explanation is that people expect that the houses located between 750 and 1,000 meters will be worth more when the development has taken place. Similar results are found when we analyze the coefficients after the completion of the development. Again, the positive effects of stadium development seem to be rather local when comparing the positive significant coefficient of the distance ring 250-500m with the negative significant coefficient of the distance ring 500-750m.

Table D7: In situ developed and relocated regression including control variables with target area 0-1000m

	(1)	(2)	(3)
	Total	In situ developed	Relocated
TARGET AREA	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m
BEFORE	-0.0224	-0.187***	-0.0300
	(0.0360)	(0.0544)	(0.0532)
BEFORE*D	0.000217**	0.000757***	0.000213
	(0.000107)	(0.000174)	(0.000150)
BEFORE*D2	-2.13e-07***	-5.86e-07***	-2.05e-07**
	(7.58e-08)	(1.30e-07)	(1.02e-07)
BETWEEN	-0.163***	-0.335***	-0.00691
	(0.0520)	(0.0689)	(0.0912)
BETWEEN*D	0.000595***	0.00113***	6.33e-05
	(0.000159)	(0.000219)	(0.000262)
BETWEEN*D2	-4.32e-07***	-7.84e-07***	-4.24e-08
	(1.15e-07)	(1.64e-07)	(1.81e-07)
AFTER	0.0910***	0.152***	-0.00462
	(0.0187)	(0.0279)	(0.0257)
AFTER*D	-0.000166***	-0.000227***	-5.98e-05
	(5.67e-05)	(8.71e-05)	(7.62e-05)
AFTER*D2	7.05e-08*	8.05e-08	5.94e-08
	(4.12e-08)	(6.46e-08)	(5.42e-08)
1994	0.0772***	0.0600***	0.0914***
	(0.00563)	(0.00879)	(0.00724)
1995	0.134***	0.133***	0.130***
	(0.00561)	(0.00883)	(0.00718)
1996	0.226***	0.237***	0.215***
	(0.00540)	(0.00849)	(0.00692)
1997	0.333***	0.368***	0.298***
	(0.00528)	(0.00852)	(0.00664)
1998	0.413***	0.451***	0.373***
	(0.00524)	(0.00847)	(0.00657)
1999	0.539***	0.600***	0.487***
	(0.00507)	(0.00815)	(0.00639)
2000	0.676***	0.737***	0.624***
	(0.00511)	(0.00822)	(0.00645)
2001	0.794***	0.858***	0.735***
	(0.00507)	(0.00823)	(0.00636)
2002	0.867***	0.909***	0.818***
	(0.00503)	(0.00821)	(0.00630)
2003	0.907***	0.951***	0.856***
	(0.00507)	(0.00826)	(0.00634)
2004	0.942***	1.002***	0.881***
	(0.00503)	(0.00823)	(0.00629)
2005	0.976***	1.033***	0.920***
	(0.00501)	(0.00816)	(0.00628)
2006	1.025***	1.087***	0.964***
	(0.00501)	(0.00811)	(0.00629)
2007	1.052***	1.113***	0.997***
	(0.00503)	(0.00821)	(0.00629)
2008	1.087***	1.170***	1.015***
	(0.00512)	(0.00834)	(0.00640)
2009	1.050***	1.126***	0.983***
	(0.00545)	(0.00892)	(0.00679)
2010	1.031***	1.102***	0.969***

	(0.00547)	(0.00897)	(0.00681)
2011	1.005***	1.095***	0.931***
	(0.00558)	(0.00924)	(0.00691)
2012	0.954***	1.037***	0.885***
	(0.00561)	(0.00919)	(0.00699)
2013	0.896***	0.974***	0.830***
	(0.00569)	(0.00937)	(0.00706)
2014	0.926***	1.006***	0.854***
	(0.00530)	(0.00856)	(0.00666)
2015	0.955***	1.051***	0.875***
	(0.00516)	(0.00837)	(0.00646)
2016	1.018***	1.119***	0.937***
	(0.00498)	(0.00813)	(0.00624)
2017	1.101***	1.182***	1.031***
	(0.00494)	(0.00809)	(0.00616)
2018	1.208***	1.283***	1.142***
	(0.00497)	(0.00813)	(0.00622)
2019	1.289***	1.364***	1.222***
	(0.00501)	(0.00825)	(0.00624)
2020	1.346***	1.415***	1.284***
	(0.00574)	(0.00957)	(0.00707)
Log floor size	0.662***	0.692***	0.635***
	(0.00215)	(0.00334)	(0.00283)
Corner house	0.104***	0.0771***	0.113***
	(0.00233)	(0.00395)	(0.00284)
Semi-detached house	0.209***	0.171***	0.233***
	(0.00304)	(0.00518)	(0.00370)
Terraced house	0.0650***	0.0383***	0.0673***
	(0.00185)	(0.00300)	(0.00233)
Detached house	0.386***	0.331***	0.408***
	(0.00346)	(0.00613)	(0.00413)
<1945	-0.187***	-0.0976***	-0.269***
	(0.00289)	(0.00553)	(0.00338)
1945-1960	-0.245***	-0.180***	-0.296***
	(0.00308)	(0.00572)	(0.00368)
1961-1970	-0.240***	-0.164***	-0.310***
	(0.00303)	(0.00567)	(0.00362)
1971-1980	-0.210***	-0.147***	-0.228***
	(0.00304)	(0.00567)	(0.00365)
1981-1990	-0.130***	-0.0805***	-0.142***
	(0.00306)	(0.00625)	(0.00344)
1991-2000	0.0157***	0.0203***	0.0116***
	(0.00298)	(0.00624)	(0.00327)
zwolle	-0.437***	-0.396***	
	(0.00640)	(0.00358)	
denhaag	-0.188***		0.163***
	(0.00659)		(0.00425)
alkmaar	-0.289***		0.0955***
	(0.00640)		(0.00374)
almere	-0.460***		-0.182***
	(0.00571)		(0.00338)
groningen	-0.544***		-0.147***
	(0.00657)		(0.00358)
utrecht	-0.0498***		
	(0.00631)		
kerkrade	-0.900***	-0.882***	
	(0.00703)	(0.00558)	

oss	-0.530***	-0.467***	
	(0.00615)	(0.00450)	
almelo	-0.786***		-0.434***
	(0.00602)		(0.00317)
sittard	-0.783***		-0.406***
	(0.00676)		(0.00392)
enschede	-0.712***		-0.371***
	(0.00978)		(0.00785)
arnhem	-0.499***		-0.195***
	(0.00582)		(0.00330)
denbosch	-0.309***	-0.266***	
	(0.00620)	(0.00376)	
waalwijk	-0.450***	-0.396***	
	(0.00657)	(0.00522)	
breda	-0.415***		
	(0.00617)		
rotterdam	-0.372***		-0.148***
	(0.00505)		(0.00346)
apeldoorn	-0.472***		-0.103***
	(0.00618)		(0.00304)
almere2	-0.220***		0.0126**
	(0.00779)		(0.00643)
Population density	9.33e-07***	2.34e-06***	-5.90e-06***
	(2.74e-07)	(4.65e-07)	(3.58e-07)
Average household size	-0.0192***	-0.00311	-0.0642***
	(0.00279)	(0.00508)	(0.00341)
young people	0.000726***	-0.00339***	0.00499***
	(0.000158)	(0.000241)	(0.000237)
elderly people	0.00337***	0.00112***	0.00743***
	(0.000150)	(0.000247)	(0.000191)
Non western migrants	-0.00711***	-0.0127***	-0.00205***
	(8.05e-05)	(0.000198)	(6.47e-05)
Constant	8.655***	8.527***	8.390***
	(0.0148)	(0.0223)	(0.0167)
Year fixed effects	YES	YES	YES
Physical characteristics	YES	YES	YES
Location fixed effects	YES	YES	YES
Neighborhood characteristics	YES	YES	YES
Adjusted R-squared	0.805	0.793	0.817

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table D8: Regression results of the alternative specification (3) based on the in situ developed sub dataset with target area 0-1,000m[7]

	(1)	(2)	(3)	(4)
SAMPLE SIZE	<2000m	<2000m	<2000m	<2000m
TARGET AREA	0-1000m	0-1000m	0-1000m	0-1000m
CONTROL AREA	1000-2000m	1000-2000m	1000-2000m	1000-2000m
BEFORE 0-250m	0.166	-0.0402	0.117**	0.0721*
	(0.105)	(0.0952)	(0.0477)	(0.0386)
BEFORE 250-500m	0.0899***	0.0481***	0.0629***	0.0119
	(0.0134)	(0.00847)	(0.00746)	(0.00803)
BEFORE 500-750m	0.115***	0.0622***	0.0796***	0.0533***
	(0.0151)	(0.0105)	(0.00894)	(0.00848)
BEFORE 750-1000m	-0.00728	-0.00402	0.0206***	0.0275***
	(0.0137)	(0.00921)	(0.00771)	(0.00729)
BETWEEN 0-500m	0.00219	0.0247	-0.0445***	-0.0391**
	(0.0264)	(0.0168)	(0.0156)	(0.0165)
BETWEEN 500-750m	0.0149	0.0141	0.00824	0.00897
	(0.0242)	(0.0169)	(0.0146)	(0.0136)
BETWEEN 750-1000m	0.0462**	0.0549***	0.0287**	0.0244**
	(0.0216)	(0.0142)	(0.0119)	(0.0110)
AFTER 0-250m	0.291**	0.218**	-0.0394	0.139**
	(0.116)	(0.107)	(0.0584)	(0.0566)
AFTER 250-500m	0.0692***	0.0621***	0.0135	0.0593***
	(0.0174)	(0.0113)	(0.00975)	(0.0101)
AFTER 500-750m	-0.127***	-0.0299**	-0.0213**	-0.00898
	(0.0172)	(0.0117)	(0.00995)	(0.00940)
AFTER 750-1000m	-0.0272*	0.00426	-0.0194**	-0.0142*
	(0.0152)	(0.0103)	(0.00865)	(0.00821)
Year fixed effects (18)	YES	YES	YES	YES
Physical characteristics (13)	NO	YES	YES	YES
Location fixed effects (6)	NO	NO	YES	YES
Neighborhood characteristics (6)	NO	NO	NO	YES
Observations	64,469	64,469	64,469	64,469
Adjusted R-squared	0.388	0.657	0.776	0.793

Note: Dependent variable is log(transaction price) and physical characteristics includes building period dummies. Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

7 Table D8 presents the coefficients and standard errors of the in situ developed sub dataset according to our alternative model specification (3) and analyzes the robustness of our adjusted target- and control area. The target area of 1,000 meters is divided into four distance rings, each with a radius of 250 meters. The variable between 0-500m is an exception. Here the radius is 500 meters which contain 334 records, since there were only 8 records within the first 250 meters of the in situ stadium development. The control area remains the same.

As can be seen in column (4) which is our preferred model, the coefficients of the distance rings 0-250m, 500-750m and 750-1,000m before in situ development show positive significant results, suggesting that houses located in each of those distance rings around the stadium are sold for a premium relative to houses located in the control area before the in situ development of stadiums. More specifically, the estimated price premium for houses within each of those distance rings is $\left(\exp^{(0.0721)} - 1\right) \cdot 100$ = 7.5% , $\left(\exp^{(0.0533)} - 1\right) \cdot 100$ = 5.5% and $\left(\exp^{(0.0275)} - 1\right) \cdot 100$ = 2.8% respectively compared to the houses in the control area. The results suggest that the old stadiums are already perceived as amenities and created positive spillovers for the surrounding neighborhood, as reflected in the transaction price of surrounding houses. This is in sharp contrast with the earlier results of our specification model (2) from table 9, where we estimated that the effect was negative up to 300 meters before the in situ development. The coefficient of the distance ring between 0-500m of the stadium is negative and significant. This makes sense, since we found a negative effect in our model specification (2) up to 300 meters. However, the coefficients of the last distance ring are positive significant, implying that houses between 750-1,000m are positively affected by the development period compared to the houses in the control area. The results show that houses which are located in the distance ring 0-500m are sold for $\left(\exp^{(-0.0391)} - 1\right) \cdot 100$ = 3.8% less than houses in the control area between the start and end of the in situ development. However, the coefficients of the last distance ring 750-1.000m are positive significant, implying that houses within the distance ring 750-1.000m are sold for $\left(\exp^{(0.0244)} - 1\right) \cdot 100$ = 2.5% more compared to the houses in the control area between the start and end of the in situ development. Therefore, we could argue that the effects of the affected houses by the development period are rather local. One other possible explanation is that people expect that the houses located between 750-1,000m will be worth more when the in situ development has taken place.

The positive significant coefficients of the distance ring 0-250m and the distance ring 250-500m after the in situ development took place indicate that the positive effects are rather local. This is in line with the results of our model specification (2) from table 9, where we estimated a positive effect up to 700 meters. Additionally, the magnitude of effects is very similar as well (see figure 5). Therefore, the results suggest that our earlier findings of the AFTER variable are robust. In the first distance ring 0-250m, houses after completion are sold for $\left(\exp^{(0.139)} - 1\right) \cdot 100$ = 14.9% more compared to the houses in the control area. This magnitude has decreased, but is still positive in the second distance ring of 250-500m. Here, houses located within that distance ring are sold for $\left(\exp^{(0.0593)} - 1\right) \cdot 100$ = 6.1% more compared to the houses located in the control area after completion. Again, the coefficient of the last distance ring of 750-1,000m is negative significant, implying that the positive effect is fairly local and that our target area could still be too large.

Table D9: Chow-test

	RSS
Pooled	9266,88642
In situ developed	4156,88499
Relocated	4942,21828
k	56
T	164401
F-statistic	54,0966297
F- Critical value 99% level	1,47 - 1,59
H0	Coefficients constant across sample
H1	Coefficients differ across sample
F-statistic > Fc	Reject H0

APPENDIX E: STATA DO-FILES

***GIJS BIEZE / MT-STADIUMS / TARGET AREA 0-1500m.**

**Starting a line of code with the asterisk (*) means that it only contains notes, not actual syntax codes.*

**Import selection of the housing transactions dataset Kadaster. The selection is created using ArcGIS - Different rings (up to 5000m) in close proximity of the selected stadiums. (217 vars, 602,949 records)*

clear all

import delimited "V:\GVA\MA_Maatwerk en Advies\Publicaties en Presentaties\2020\2020 - Stage Gijs Bieze\STATA\RINGBUURTVERSIE3.txt"

** Merge Stadium Characteristics DATA*

sort stadion

merge m:1 stadion using "V:\GVA\MA_Maatwerk en Advies\Publicaties en Presentaties\2020\2020 - Stage Gijs Bieze\STATA\StadionDataVERSIE2.dta"

** Starting dataset with 602,949 (_merge==3) records*

** Deleting variables and duplicate variables*

drop shape_area shape_length shape__length buurtcode simpgnflag inpoly_fid opp_tot motor_2w bedr_auto auto_land auto_hh auto_tot g_elek_tot g_elek_app g_elek_tus g_elek_hoe g_elek_21k g_elek_vry g_ele_hu g_ele_ko g_gas_tot g_gas_app g_gas_tus g_gas_hoek g_gas_21k g_gas_vry g_gas_hu g_gas_ko p_stadverw a_bed_ru a_bed_mn a_bed_kl a_bed_hj a_bed_gi a_bed_bf a_bed_a p_hh_m_k p_hh_z_k p_sterft sterft_tot p_geboo geboo_tot p_verweduw p_gescheid p_gehuwd p_ongehuwd aant_vrouw aant_man shape__area vbo_oppervlak grootte wto v13 lat bouw transactieprijs datumtransactie postcodehuisnummer ind_wbi water av5_podium av10podium av20podium av10attrac av20attrac av50attrac av5_bios av10_bios av20_bios av3_ondhv av5_ondhv av10_ondhv av3_ondvmb av5_ondvmb av10ondvmb av3_ondvrt av5_ondvrt av10ondvrt av1_ondbas av3_ondbas av5_ondbas av1_bso av3_bso av5_bso av1_kdv av3_kdv av5_kdv av5_hotel av10_hotel av20_hotel av1_restau av3_restau av5_restau av1_caftar av3_caftar av5_caftar av1_cafe av3_cafe av5_cafe av5_warenh av10warenh av20warenh av1_daglmd av3_daglmd av5_daglmd av1_superm av3_superm av5_superm av5_ziek_e av10ziek_e av20ziek_e av5_ziek_i av10ziek_i av20ziek_i av1_artspr av3_artspr av5_artspr p_wont2000 p_wonv2000 ao_uit_tot a_soz_ow a_lftj6j a_lfto6j a_bst_b a_bst_nb

encode bu_code, gen (buurtcode)
encode wk_code, gen (wijkcode)
encode gm_code, gen (Gemeentecode)
encode gm_naam, gen (gemeentenaam)
encode woningtype, gen (woningtypes)

drop bu_code bu_naam wk_code gm_code woningtype gemeente gm_naam

**Rename some of the variables*

rename dek_perc dekkingspercentage
rename oad omgevingsadressendichtheid
rename sted stedelijkheidscode
rename p_west_al percentagewesters
rename p_n_w_al percentagenietwesters
rename a_bedv aantalbedrijven
rename woningen woningvoorraad
rename Type typegebiedsontsluiting

** Based on literature only need transactions in distance 0-3000m: target and control - deleted 223.634 records*

drop if distance > 3000

** Labeling woningtype and drop woningtype "Onbekend" - deleted 14.506 records*

drop if woningtypes == 4

label define woningtypes 0 "Appartement" 1 "Hoekwoning" 2 "TweeEenKap" 3 "Onbekend" 4 "TussenGeschakeld" 5 "Vrijstaand", replace

** Check skewness and kurtosis*

tabstat koopsom vloeropp perceelgrootte, stat(n mean sd min med max skew kurt) col(stat)

**Normalize koopsom - deleted 19+5.417 = 5.166 records*

hist koopsom
summarize koopsom
drop if koopsom > 2000000
drop if koopsom < 40000
hist koopsom, kdensity normal
gen logkoopsom = ln(koopsom)
hist logkoopsom, kdensity normal

*Normalize vloeroppervlak - deleted 193+247 = 755 records

hist vloeropp
tabulate vloeropp
drop if vloeropp < 25
drop if vloeropp > 500
hist vloeropp, kdensity normal
gen logvloeropp = ln(vloeropp)
hist logvloeropp, kdensity normal

* Normalize perceelgrootte: --> 'Note that Woningtype "appartement" = Null values' and check multi-collinearity with "vloeropp" - deleted 56 + 110 = 166 records -- en let op: log x log is andere interpretatie. Correlatie is wel aan de hoge kant – moderate high (0,61), maar mag nog wel net r>= 0,68 is te hoge correlatie. Voer test uit later (VIF).

hist perceelgrootte
tabulate perceelgrootte
drop if perceelgrootte > 10000
drop if perceelgrootte > 0 & perceelgrootte < 25
hist perceelgrootte, kdensity normal
gen logperceelgrootte = ln(perceelgrootte+1)
hist logperceelgrootte, kdensity normal

correlate vloeropp perceelgrootte
correlate logvloeropp logperceelgrootte

* The dataset includes now 358.767 records, thus 244.272 removed records.

* Graphs for appendix

```
hist koopsom, kdensity normal
hist logkoopsom, kdensity normal
hist vloeropp, kdensity normal
hist logvloeropp, kdensity normal
hist perceelgrootte, kdensity normal
hist logperceelgrootte, kdensity normal

* Data check: Logisch positief verband koopsom met variabelen

twoway scatter logkoopsom vloeropp
twoway scatter logkoopsom logvloeropp
twoway scatter logkoopsom logperceelgrootte

* Generate new variable transactiejaar, maand en kwartaal

gen TJ = (ontvangstdatum/10000)
gen transactiejaar = int(TJ)

gen TM = (TJ-transactiejaar) *100
gen transactiemaand = int(TM)

recode transactiemaand (1 2 3 = 1)(4 5 6 = 2)(7 8 9 = 3)(10 11 12 = 4), generate (transactiekwartaal)

* Generate variable leeftijden

gen youngpeople = p_00_14_jr + p_15_24_jr
gen middleagedpeople = p_25_44_jr + p_45_64_jr
gen elderlypeople = p_65_eo_jr

* Generate dummies woningtype, bouwperiode, stadium characteristics dummies, tijdsvak, locatie

tabulate woningtypes, gen(wtype)

rename wtype1 appartement
rename wtype2 hoekwoning
rename wtype3 tweeondereen
rename wtype4 tussenofgeschakeld
rename wtype5 vrijstaand
```

```
tabulate distance, gen(distancerings)
rename distancerings1 vijfhonderd
rename distancerings2 duizend
rename distancerings3 vijftienhonderd
rename distancerings4 tweeduizend
rename distancerings5 drieduizend

gen bouwperiode = 0
replace bouwperiode = 1 if bouwjaar < 1945
replace bouwperiode = 2 if bouwjaar >= 1945 & bouwjaar <= 1960
replace bouwperiode = 3 if bouwjaar >= 1961 & bouwjaar <= 1970
replace bouwperiode = 4 if bouwjaar >= 1971 & bouwjaar <= 1980
replace bouwperiode = 5 if bouwjaar >= 1981 & bouwjaar <= 1990
replace bouwperiode = 6 if bouwjaar >= 1991 & bouwjaar <= 2000
replace bouwperiode = 7 if bouwjaar > 2000

tabulate bouwperiode, gen(bouwper)

label define bouwperiode 1 "eerderdan1945" 2 "tussen1945en1960" 3 "tussen1961en1970" 4 "tussen1971en1980" 5 "tussen1981en1990" 6 "tussen1991en2000" 7 "laterdan2000", replace

rename bouwper1 eerderdan1945
rename bouwper2 tussen1945en1960
rename bouwper3 tussen1961en1970
rename bouwper4 tussen1971en1980
rename bouwper5 tussen1981en1990
rename bouwper6 tussen1991en2000
rename bouwper7 laterdan2000

generate redeveloped = Insitu == "Yes"
generate metrotreintram = TTMstation == "Ja"

tabulate typegebiedsontsluiting, gen(type)

rename type1 snelweg
rename type2 Nweg
rename type3 geenhoofdweg

gen tijdsvak = 0
```

```
replace tijdsvak = 1 if transactiejaar >= 1993 & transactiejaar <=2007
replace tijdsvak = 2 if transactiejaar >= 2008 & transactiejaar <=2013
replace tijdsvak = 3 if transactiejaar > 2013

tabulate tijdsvak, gen(periode)

rename periode1 voorkrediet
rename periode2 tijdenskrediet
rename periode3 nakrediet

tabulate stadion, gen(locatiedummy)

rename locatiedummy1 zwolle
rename locatiedummy2 denhaag
rename locatiedummy3 alkmaar
rename locatiedummy4 almere
rename locatiedummy5 groningen
rename locatiedummy6 utrecht
rename locatiedummy7 kerkrade
rename locatiedummy8 oss
rename locatiedummy9 almelo
rename locatiedummy10 sittard
rename locatiedummy11 enschede
rename locatiedummy12 arnhem
rename locatiedummy13 denbosch
rename locatiedummy14 waalwijk
rename locatiedummy15 breda
rename locatiedummy16 rotterdam
rename locatiedummy17 apeldoorn
rename locatiedummy18 almere2
rename locatiedummy19 amsterdam

*Exact distance between stadium and transactions needed for regression

destring X, gen(xx)
destring Y, gen(yy)

gen Afstand = sqrt(( x_coord - xx)^2 + ( y_coord - yy)^2)
gen afstand = int(Afstand)
```

** compare distance rings with transaction price (within ring 500 most expensive houses, and 2nd place ring 2000-3000)*

```
summarize koopsom if distance == 500
summarize koopsom if distance == 1000
summarize koopsom if distance == 1500
summarize koopsom if distance == 2000
summarize koopsom if distance == 3000
```

** generate target and control group*

```
recode distance (500 1000 1500 = 1500)(2000 3000 = 3000), gen(targetcontrol)

tabulate targetcontrol, gen(tc)

rename tc1 TARGET
rename tc2 CONTROL

sum targetcontrol if targetcontrol == 1500
sum targetcontrol if targetcontrol == 3000
sum koopsom if targetcontrol == 1500
sum koopsom if targetcontrol == 3000
```

** Tabulate woningtype en stadion laat zien dat er veel 'appartementen' en 'tussen- of geschakelde woningen' zijn in gebieden waar stadions zich bevinden. Meeste woningen in categorie bouwperiode <1945. Check stadion 4 met nullen = almere*

```
tabulate stadion woningtypes
tabulate stadion bouwperiode
```

** DESCRIPTIVES - stadion x house type and stadion x building period - Making publicable tables*

```
ssc install estout

label define woningtypes 1 "Appartment" 2 "Corner house" 3 "Semi detached house" 4 "O" 5 "Terraced house" 6 "Detached house", replace

tabulate stadion woningtypes
```

estpost tab stadion woningtypes

esttab, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

esttab using stadionwoningtype3.rtf, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

tabulate stadion bouwperiode

estpost tab stadion bouwperiode

esttab, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

esttab using stadionbouwperiode2.rtf, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

** DESCRIPTIVES - Redeveloped vs relocated - making publicable tables*

gen transactionprice = koopsom/1000

sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 1

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 1

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivesredeveloped.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 0

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 0

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivesrelocated.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

**DESCRIPTIVES TOTAAL - TARGET - CONTROL - Making publicable tables*

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle
esttab using bijlagetotaal.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivestotaal2.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto totaal

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw if targetcontrol == 1500

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle
esttab using bijlagetarget.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using targetdescriptives2.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto target

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw if targetcontrol == 3000

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle
esttab using bijlagecontrol1.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using controldescriptives4.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto control

**Additional info descriptives*

summarize transactionprice if distance == 500
summarize transactionprice if distance == 1000
summarize transactionprice if distance == 1500
summarize transactionprice if distance == 2000
summarize transactionprice if distance == 3000

** Check all neighborhood variables skewness - winsorizen - SKEW < 1 en tussen 1 en 1.5 twijfel*

tabstat koopsom vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople

```
woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw, stat(n mean sd min med max skew kurt) col(stat)

hist p_leegsw
hist woningvoorraad
hist percentagenietwesters
ssc install winsor2
winsor2 p_leegsw, cuts(0 99)
hist p_leegsw_w

* generate before, in between and after completion

gen VOOR = transactiejaar < Start
gen TIJDENS = transactiejaar >= Start & transactiejaar <= End
gen NA = transactiejaar > End

summarize VOOR TIJDENS NA

gen VOORxTARGET = TARGET*VOOR
gen VOORxTARGETxAFSTAND = VOORxTARGET*afstand
gen VOORxTARGETxAFSTAND2 = VOORxTARGET*afstand^2

gen TIJDENSxTARGET = TARGET*TIJDENS
gen TIJDENSxTARGETxAFSTAND = TIJDENSxTARGET*afstand
gen TIJDENSxTARGETxAFSTAND2 = TIJDENSxTARGET*afstand^2

gen NAxTARGET = TARGET*NA
gen NAxTARGETxAFSTAND = NAxTARGET * afstand
gen NAxTARGETxAFSTAND2 = NAxTARGET *afstand^2

* Check: variables

gen VOORxAFSTAND = VOOR * afstand
gen NAxAFSTAND = NA * afstand
gen TARGETxAFSTAND = TARGET * afstand

gen AFSTAND2 = afstand *afstand
gen TARGETxAFSTAND2 = TARGET * AFSTAND2
```

**Basic Models, check if you understand interpretation - TIJDENS is reference.*

```
ssc install outreg2

reg logkoopsom TARGET, r
outreg2 using model1, excel replace

reg logkoopsom TARGET VOOR NA, r
outreg2 using model1, excel append

reg logkoopsom TARGET VOOR NA VOORTARGET NATARGET, r
outreg2 using model1, excel append

reg logkoopsom TARGET VOOR NA VOORTARGET NATARGET afstand, r
outreg2 using model1, excel append

reg logkoopsom TARGET VOOR NA VOORTARGET NATARGET afstand AFSTAND2, r
outreg2 using model1, excel append
```

** Niet lineaire effect van afstand wordt beoordeeld of het voor targets en niet- targets verschilt*

```
reg logkoopsom TARGET VOOR NA VOORTARGET NATARGET afstand AFSTAND2 TARGETxAFSTAND TARGETxAFSTAND2, r
outreg2 using model1, excel append
```

** Dat het niet nogmaals gesplitst wordt voor de drie perioden.*

```
reg logkoopsom VOOR NA TARGET VOORTARGET NATARGET afstand VOORxAFSTAND NAxAFSTAND TARGETxAFSTAND VOORTARGETAFSTAND NATARGETAFSTAND, r
```

**The following models stepwise including variables - Model 1*:

```
reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2, r
```

** Model 2: year fixed effects - 1993 is reference - adjusted r-squared hoger* reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar, r

** Model 3: physical characteristics - adjusted r-squared hoger*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp, r

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte, r

**Reference is appartement - adjusted r-squared hoger*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand, r

**Reference is later dan 2000 - adjusted r-squared hoger*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000, r

** Model 4: Location fixed effects - Amsterdam is reference - adjusted r-squared hoger*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r

** Model 5: neighborhood characteristics - adjusted r-squared hoger*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht, r

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr, r

**Reference is middle aged*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople, r

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp logperceelgrootte hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r

** Baseline model (1) - Scriptie - making publicable tables:*

```
reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar, r
outreg2 using BASELINE, excel replace adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 , r
outreg2 using BASELINE, excel append adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using BASELINE, excel append adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using BASELINE, excel append adjr2
```

** model specification (2) - scriptie - making publicable tables:*

```
reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar, r
outreg2 using SPECIFICATION, excel replace adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000, r
outreg2 using SPECIFICATION, excel append adjr2
```

```
reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using SPECIFICATION, excel append adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using SPECIFICATION, excel append adjr2

* Subcategorie VOOR TIJDENS NA

gen VOOR500 = 0
replace VOOR500=1 if distance==500
gen VOOR1000 = 0
replace VOOR1000=1 if distance==1000
gen VOOR1500 = 0
replace VOOR1500=1 if distance==1500

gen TUSSEN500 = 0
replace TUSSEN500 = 1 if distance==500 & TIJDENS
gen TUSSEN1000 = 0
replace TUSSEN1000 = 1 if distance==1000 & TIJDENS
gen TUSSEN1500 = 0
replace TUSSEN1500 = 1 if distance==1500 & TIJDENS

gen NA500 = 0
replace NA500 = 1 if distance == 500 & NA
gen NA1000 = 0
replace NA1000 = 1 if distance == 1000 & NA
```

```
gen NA1500 = 0
replace NA1500 = 1 if distance == 1500 & NA

* Alternative model (3) Scriptie - making publicable tables

reg logkoopsom VOOR500 VOOR1000 VOOR1500 TUSSEN500 TUSSEN1000 TUSSEN1500 NA500 NA1000 NA1500 i.transactiejaar, r
outreg2 using ALTERNATIVE, excel replace adjr2

reg logkoopsom VOOR500 VOOR1000 VOOR1500 TUSSEN500 TUSSEN1000 TUSSEN1500 NA500 NA1000 NA1500 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000, r
outreg2 using ALTERNATIVE, excel append adjr2

reg logkoopsom VOOR500 VOOR1000 VOOR1500 TUSSEN500 TUSSEN1000 TUSSEN1500 NA500 NA1000 NA1500 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using ALTERNATIVE, excel append adjr2

reg logkoopsom VOOR500 VOOR1000 VOOR1500 TUSSEN500 TUSSEN1000 TUSSEN1500 NA500 NA1000 NA1500 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using ALTERNATIVE, excel append adjr2
```

***GIJS BIEZE / MT-STADIUMS / REPEAT WITH TARGET AREA 0-1000m.**

**Starting a line of code with the asterisk (*) means that it only contains notes, not actual syntax codes.*

**Import selection of the housing transactions dataset Kadaster. The selection is created using ArcGIS - Different rings in close proximity of the selected stadiums. (217 vars, 602,949 records)*

clear all

import delimited "V:\GVA\MA_Maatwerk en Advies\Publicaties en Presentaties\2020\2020 - Stage Gijs Bieze\STATA\RINGBUURTVERSIE3.txt"

** Merge Stadium Characteristics DATA*

sort stadion

merge m:1 stadion using "V:\GVA\MA_Maatwerk en Advies\Publicaties en Presentaties\2020\2020 - Stage Gijs Bieze\STATA\StadionDataVERSIE2.dta"

** Starting dataset with 602,949 (_merge==3) records*

** Deleting variables and duplicate variables*

drop shape_area shape_length shape__length buurtcode simpgnflag inpoly_fid opp_tot motor_2w bedr_auto auto_land auto_hh auto_tot g_elek_tot g_elek_app g_elek_tus g_elek_hoe g_elek_21k g_elek_vry g_ele_hu g_ele_ko g_gas_tot g_gas_app g_gas_tus g_gas_hoek g_gas_21k g_gas_vry g_gas_hu g_gas_ko p_stadverw a_bed_ru a_bed_mn a_bed_kl a_bed_hj a_bed_gi a_bed_bf a_bed_a p_hh_m_k p_hh_z_k p_sterft sterft_tot p_geboo geboo_tot p_verweduw p_gescheid p_gehuwd p_ongehuwd aant_vrouw aant_man shape__area vbo_oppervlak grootte wto v13 lat bouw transactieprijs datumtransactie postcodehuisnummer ind_wbi water av5_podium av10podium av20podium av10attrac av20attrac av50attrac av5_bios av10_bios av20_bios av3_ondhv av5_ondhv av10_ondhv av3_ondvmb av5_ondvmb av10ondvmb av3_ondvrt av5_ondvrt av10ondvrt av1_ondbas av3_ondbas av5_ondbas av1_bso av3_bso av5_bso av1_kdv av3_kdv av5_kdv av5_hotel av10_hotel av20_hotel av1_restau av3_restau av5_restau av1_caftar av3_caftar av5_caftar av1_cafe av3_cafe av5_cafe av5_warenh av10warenh av20warenh av1_daglmd av3_daglmd av5_daglmd av1_superm av3_superm av5_superm av5_ziek_e av10ziek_e av20ziek_e av5_ziek_i av10ziek_i av20ziek_i av1_artspr av3_artspr av5_artspr p_wont2000 p_wonv2000 ao_uit_tot a_soz_ow a_lftj6j a_lfto6j a_bst_b a_bst_nb

encode bu_code, gen (buurtcode)
encode wk_code, gen (wijkcode)
encode gm_code, gen (Gemeentecode)
encode gm_naam, gen (gemeentenaam)
encode woningtype, gen (woningtypes)

drop bu_code bu_naam wk_code gm_code woningtype gemeente gm_naam

**Rename some of the variables*

rename dek_perc dekkingspercentage
rename oad omgevingsadressendichtheid
rename sted stedelijkheidscode
rename p_west_al percentagewesters
rename p_n_w_al percentagenietwesters
rename a_bedv aantalbedrijven
rename woningen woningvoorraad
rename Type typegebiedsontsluiting

** Based on analyses only need transactions in distance 0-2000m: target and control - deleted 429.197 records*

drop if distance > 2000

** Labeling woningtype and drop woningtype "Onbekend" - deleted 7.044 records*

drop if woningtypes == 4

label define woningtypes 0 "Appartement" 1 "Hoekwoning" 2 "TweeEenKap" 3 "Onbekend" 4 "TussenGeschakeld" 5 "Vrijstaand", replace

**Normalize koopsom - deleted 8+1.997 = 2.005 records*

hist koopsom
summarize koopsom
drop if koopsom > 2000000
drop if koopsom < 40000
hist koopsom, kdensity normal
gen logkoopsom = ln(koopsom)

hist logkoopsom, kdensity normal

*Normalize vloeroppervlak - deleted 109+118 = 227 records

hist vloeropp

tabulate vloeropp

drop if vloeropp < 25

drop if vloeropp > 500

hist vloeropp, kdensity normal

gen logvloeropp = ln(vloeropp)

hist logvloeropp, kdensity normal

* Normalize perceelgrootte: --> 'Note that Woningtype "appartement" = Null values' and check multi-collinearity with "vloeropp" - deleted 11 + 32 = 43 records -- en let op: log x log is andere interpretatie. Correlatie is wel aan de hoge kant, maar mag nog wel net r>= 0,68 is hoge correlatie. Voer VIF test uit later.

hist perceelgrootte

tabulate perceelgrootte

drop if perceelgrootte > 10000

drop if perceelgrootte > 0 & perceelgrootte < 25

hist perceelgrootte, kdensity normal

gen logperceelgrootte = ln(perceelgrootte+1)

hist logperceelgrootte, kdensity normal

correlate vloeropp perceelgrootte

correlate logvloeropp logperceelgrootte

* The dataset includes now 164.433 records, thus 438.516 removed records.

* Graphs for appendix

hist koopsom, kdensity normal

hist logkoopsom, kdensity normal

hist vloeropp, kdensity normal

hist logvloeropp, kdensity normal

hist perceelgrootte, kdensity normal

hist logperceelgrootte, kdensity normal

** Data check: Logisch positief verband koopsom met variabelen*

```
twoway scatter logkoopsom vloeropp
twoway scatter logkoopsom logvloeropp
twoway scatter logkoopsom logperceelgrootte
```

** Generate new variable transactiejaar, maand en kwartaal*

```
gen TJ = (ontvangstdatum/10000)
gen transactiejaar = int(TJ)

gen TM = (TJ-transactiejaar) *100
gen transactiemaand = int(TM)

recode transactiemaand (1 2 3 = 1)(4 5 6 = 2)(7 8 9 = 3)(10 11 12 = 4), generate (transactiekwartaal)
```

** Generate variable leeftijden*

```
gen youngpeople = p_00_14_jr + p_15_24_jr
gen middleagedpeople = p_25_44_jr + p_45_64_jr
gen elderlypeople = p_65_eo_jr
```

** Generate dummies woningtype, bouwperiode, stadium characteristics dummies, tijdsvak, locatie*

```
tabulate woningtypes, gen(wtype)

rename wtype1 appartement
rename wtype2 hoekwoning
rename wtype3 tweeondereen
rename wtype4 tussenofgeschakeld
rename wtype5 vrijstaand

gen bouwperiode = 0
replace bouwperiode = 1 if bouwjaar < 1945
replace bouwperiode = 2 if bouwjaar >= 1945 & bouwjaar <= 1960
replace bouwperiode = 3 if bouwjaar >= 1961 & bouwjaar <= 1970
replace bouwperiode = 4 if bouwjaar >= 1971 & bouwjaar <= 1980
replace bouwperiode = 5 if bouwjaar >= 1981 & bouwjaar <= 1990
replace bouwperiode = 6 if bouwjaar >= 1991 & bouwjaar <= 2000
```

```
replace bouwperiode = 7 if bouwjaar > 2000

tabulate bouwperiode, gen(bouwper)

label define bouwperiode 1 "eerderdan1945" 2 "tussen1945en1960" 3 "tussen1961en1970" 4 "tussen1971en1980" 5 "tussen1981en1990" 6 "tussen1991en2000" 7 "laterdan2000", replace

rename bouwper1 eerderdan1945
rename bouwper2 tussen1945en1960
rename bouwper3 tussen1961en1970
rename bouwper4 tussen1971en1980
rename bouwper5 tussen1981en1990
rename bouwper6 tussen1991en2000
rename bouwper7 laterdan2000

generate redeveloped = Insitu == "Yes"
generate metrotreintram = TTMstation == "Ja"

tabulate typegebiedsontsluiting, gen(type)

rename type1 snelweg
rename type2 Nweg
rename type3 geenhoofdweg

gen tijdsvak = 0
replace tijdsvak = 1 if transactiejaar >= 1993 & transactiejaar <=2007
replace tijdsvak = 2 if transactiejaar >= 2008 & transactiejaar <=2013
replace tijdsvak = 3 if transactiejaar > 2013

tabulate tijdsvak, gen(periode)

rename periode1 voorkrediet
rename periode2 tijdenskrediet
rename periode3 nakrediet

tabulate stadion, gen(locatiedummy)

rename locatiedummy1 zwolle
rename locatiedummy2 denhaag
```

```
rename locatiedummy3 alkmaar
rename locatiedummy4 almere
rename locatiedummy5 groningen
rename locatiedummy6 utrecht
rename locatiedummy7 kerkrade
rename locatiedummy8 oss
rename locatiedummy9 almelo
rename locatiedummy10 sittard
rename locatiedummy11 enschede
rename locatiedummy12 arnhem
rename locatiedummy13 denbosch
rename locatiedummy14 waalwijk
rename locatiedummy15 breda
rename locatiedummy16 rotterdam
rename locatiedummy17 apeldoorn
rename locatiedummy18 almere2
rename locatiedummy19 amsterdam

*Exact distance between stadium and transactions needed for regression

destring X, gen(xx)
destring Y, gen(yy)

gen Afstand = sqrt(( x_coord - xx)^2 + ( y_coord - yy)^2)
gen afstand = int(Afstand)

* generate target and control group

recode distance (500 1000 = 1000)(1500 2000 = 2000), gen(targetcontrol)

tabulate targetcontrol, gen(tc)

rename tc1 TARGET
rename tc2 CONTROL

sum targetcontrol if targetcontrol == 1000
sum targetcontrol if targetcontrol == 2000
sum koopsom if targetcontrol == 1000
sum koopsom if targetcontrol == 2000
```

** DESCRIPTIVES - stadion x house type and stadion x building period - Making publicable tables*

ssc install estout

label define woningtypes 1 "Appartment" 2 "Corner house" 3 "Semi detached house" 4 "O" 5 "Terraced house" 6 "Detached house", replace

tabulate stadion woningtypes

estpost tab stadion woningtypes

esttab, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

esttab using STADIONWONINGTYPE1000.rtf, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

tabulate stadion bouwperiode

estpost tab stadion bouwperiode

esttab, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

esttab using STADIONBOUWPERIODE1000.rtf, cell(b rowpct(fmt(%5.1f) par)) note(Row Percentages in Parentheses) unstack nonumber nomtitle collabels(none) eqlabels(, lhs("Stadion")) varwidth(15)

** DESCRIPTIVES - Relocated vs redeveloped - Making publicable tables*

gen transactionprice = koopsom/1000

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 1

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivesredeveloped1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople if redeveloped == 0

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivesrelocated1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

**DESCRIPTIVES TOTAAL - TARGET - CONTROL - Making publicable tables*

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle
esttab using bijlagetotaal_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using descriptivestotaal_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto totaal

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw if targetcontrol == 1000

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle esttab using bijlagetarget_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using targetdescriptives_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto target

estpost sum transactionprice vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw if targetcontrol == 2000

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle
esttab using bijlagecontrol_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)) min(fmt(%9.0f)) max(fmt(%9.0f)))) nonumber nomtitle

esttab, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle
esttab using controldescriptives_1000.rtf, cell((mean(fmt(%9.3f)) sd(fmt(%9.3f)))) nonumber nomtitle

est sto control

** Check alle variabelen skewness - anders winsorizen - SKEW < 1 tussen 1 en 1.5 twijfel*

tabstat koopsom vloeropp perceelgrootte appartement hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 laterdan2000 redeveloped metrotreintram snelweg Nweg geenhoofdweg voorkrediet tijdenskrediet nakrediet bev_dicht gem_hh_gr percentagenietwesters youngpeople elderlypeople woningvoorraad p_1gezw p_mgezw p_koopwon p_huurwon p_huurcorp p_leegsw, stat(n mean sd min med max skew kurt) col(stat)

hist p_leegsw
hist percentagenietwesters
ssc install winsor2
winsor2 p_leegsw, cuts(0 99)
hist p_leegsw_w

```
* generate before, in between and after completion

gen VOOR = transactiejaar < Start
gen TIJDENS = transactiejaar >= Start & transactiejaar <= End
gen NA = transactiejaar > End

gen VOORxTARGET = TARGET*VOOR
gen VOORxTARGETxAFSTAND = VOORxTARGET*afstand
gen VOORxTARGETxAFSTAND2 = VOORxTARGET*afstand^2

gen TIJDENSxTARGET = TARGET*TIJDENS
gen TIJDENSxTARGETxAFSTAND = TIJDENSxTARGET*afstand
gen TIJDENSxTARGETxAFSTAND2 = TIJDENSxTARGET*afstand^2

gen NAxTARGET = TARGET*NA
gen NAxTARGETxAFSTAND = NAxTARGET * afstand
gen NAxTARGETxAFSTAND2 = NAxTARGET *afstand^2

* Baseline model (1) - Scriptie - making publicable tables:

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar, r
outreg2 using BASELINE1000, excel replace adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 , r
outreg2 using BASELINE1000, excel append adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using BASELINE1000, excel append adjr2

reg logkoopsom VOORxTARGET TIJDENSxTARGET NAxTARGET i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda
```

rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using BASELINE1000, excel append adjr2

** Model specification (2) - scriptie - making publicable tables:*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar, r
outreg2 using SPECIFICATION1000, excel replace adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000, r
outreg2 using SPECIFICATION1000, excel append adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using SPECIFICATION1000, excel append adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using SPECIFICATION1000, excel append adjr2

* Subcategorie VOOR TIJDENS NA

```
gen VOOR250=0
replace VOOR250=1 if afstand<250
gen VOOR500=0
replace VOOR500=1 if afstand>250 & afstand<500
gen VOOR750=0
replace VOOR750=1 if afstand>500 & afstand<750
gen VOOR1000=0
replace VOOR1000=1 if afstand>750 & afstand<1000

gen TUSSEN250=0
replace TUSSEN250=1 if afstand<250 & TIJDENS
gen TUSSEN500=0
replace TUSSEN500=1 if afstand>250 & afstand<500 & TIJDENS
gen TUSSEN750=0
replace TUSSEN750=1 if afstand>500 & afstand<750 & TIJDENS
gen TUSSEN1000=0
replace TUSSEN1000=1 if afstand>750 & afstand<1000 & TIJDENS

gen NA250=0
replace NA250=1 if afstand<250 & NA
gen NA500=0
replace NA500=1 if afstand>250 & afstand<500 & NA
gen NA750=0
replace NA750=1 if afstand>500 & afstand<750 & NA
gen NA1000=0
replace NA1000=1 if afstand>750 & afstand<1000 & NA

* Alternative model (3) - Scriptie - Making publicable tables

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN250 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar, r
outreg2 using ALTERNATIVE1000, excel replace adjr2

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN250 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000, r
outreg2 using ALTERNATIVE1000, excel append adjr2
```

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN250 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2, r
outreg2 using ALTERNATIVE1000, excel append adjr2

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN250 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters, r
outreg2 using ALTERNATIVE1000, excel append adjr2

**CHOW-test redeveloped yes or no - No robust - Calculate F statistic - check critical value for F statistic*

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle denhaag alkmaar almere groningen utrecht kerkrade oss almelo sittard enschede arnhem denbosch waalwijk breda rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters

gen redevelopedsub = 0
replace redevelopedsub=1 if redeveloped==1

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle kerkrade oss denbosch waalwijk bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters if redevelopedsub==1
outreg2 using CHOW, excel replace adjr2

reg logkoopsom VOORxTARGET VOORxTARGETxAFSTAND VOORxTARGETxAFSTAND2 TIJDENSxTARGET TIJDENSxTARGETxAFSTAND TIJDENSxTARGETxAFSTAND2 NAxTARGET NAxTARGETxAFSTAND NAxTARGETxAFSTAND2 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 denhaag alkmaar almere groningen almelo sittard enschede arnhem rotterdam apeldoorn almere2 bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters if redevelopedsub==0
outreg2 using CHOW, excel append adjr2

* Subcategorie VOOR TIJDENS NA – merge BETWEEN <250 en <500: - summarize geeft aan dat BETWEEN <250m te weinig records

drop TUSSEN250 TUSSEN500

gen TUSSEN500=0
replace TUSSEN500=1 if afstand<500 & TIJDENS

* Redeveloped 250-1000

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar if redevelopedsub==1, r
outreg2 using REDEVELOPED2501000, excel replace adjr2

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 if redevelopedsub==1, r
outreg2 using REDEVELOPED2501000, excel append adjr2

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980 tussen1981en1990 tussen1991en2000 zwolle kerkrade oss denbosch waalwijk if redevelopedsub==1, r
outreg2 using REDEVELOPED2501000, excel append adjr2

reg logkoopsom VOOR250 VOOR500 VOOR750 VOOR1000 TUSSEN500 TUSSEN750 TUSSEN1000 NA250 NA500 NA750 NA1000 i.transactiejaar logvloeropp hoekwoning tweeondereen tussenofgeschakeld vrijstaand eerderdan1945 tussen1945en1960 tussen1961en1970 tussen1971en1980

tussen1981en1990 tussen1991en2000 zwolle kerkrade oss denbosch waalwijk bev_dicht gem_hh_gr youngpeople elderlypeople percentagenietwesters if redevelopedsub==1, r
outreg2 using REDEVELOPED2501000, excel append adjr2