Urban Revival: Store Location Dynamics and Cultural Heritage

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Abstract. In this paper we study the location behaviour of retail stores on the neighbourhood level. The choice of store location is one of the most important aspects in the retail marketing strategy. A good location can lead to competitive advantages and higher profits. What aspects are of importance for a store to locate at a certain location? This is important to know for policymakers to determine what is needed to provide, in terms of local amenities, to attract the desired retail mix to their appointed shopping areas. We study this behaviour in relation to local amenities and we focus especially on the presence of built cultural heritage, in the form of protected cityscape[1] areas and monuments. Comparing both heritage rich and heritage poor shopping areas, we determine if cultural heritage has a distinctive effect on store location dynamics, and what the direction of this effect is. We focus on the differences with respect to number of stores, vacancy rates, and different types of stores. We give insight into which factors play a role on the location dynamics of retail stores. We use data on all the stores in the Netherlands over a period of 10 years (2003-2012) from Locatus, data on the population of the research area from Statistics Netherlands (CBS), and data on the locations and types of built cultural heritage from the Netherlands Institute of Cultural Heritage (RCE).

Key words: Retail location, cultural heritage, urban revival, vacancy rates, neighbourhood amenities
JEL classifications: L81, R12, R33, Z1

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[1] In the US a protected cityscape area is called a conservation area.

1   Introduction

Urban areas are very dynamic and therefore change continuously. This is easily observed in the change in neighbourhood's income and demographics. This implies that the change in income and demographics shift the demand and supply for retail, and likely vice versa. This means that choosing a location – which is one of the most important decisions of each store that seeks to maximize its profit – is not straightforward. In times of economic booms and, definitely, in busts it is important to identify how the changes in neighbourhood characteristics effect store location behaviour. In this paper we study store location behavior where we focus on the relationship with cultural heritage.

Cultural heritage gives a special identity and is considered to be an important amenity for an urban area and its residents. Earlier research by Van Duijn & Rouwendal (2013) argues that the presence of cultural heritage has a substantial positive impact on the attractiveness of cities. In this research the term cultural heritage is used for listed built monuments and protected historic city centres or protected cityscape. This status withholds that the buildings are maintained at a certain level and remain of value and attractiveness to live in. Our hypothesis is that the growth of the total stock of stores and typical 'upscale' retail establishments is more persistent in neighbourhoods within a protected cityscape. Or the other way around, meaning that the growth of vacancy rates is lower in neighbourhoods within a protected cityscape. This suggests that the presence of cultural heritage is an important factor for urban revival, and consequently stimulates gentrification.

The last couple of decades there has been much attention for and interest in gentrification of cities and urban revival (Brueckner et al., 1999; Brueckner and Rosenthal (2009); Butler, 2007; Rosenthal (2008); Schaffer and Smith, 1986). Brueckner et al. (2009) relate the age of the housing stock to residential location choice of high-income households. Their hypothesis is that high-income households generally have higher demand on the quality of housing, which is found in newer houses, and the housing stock is younger in the suburbs. With the housing stock in the city centres aging, redevelopment is eventually necessary. This creates a younger housing stock in the centre that attracts high-income households. For US cities, they conclude that if the housing age distribution were made uniform across space, meaning, reducing average dwelling ages in the central city and raising them in the suburbs, then neighbourhood economic status would shift in response by rising in the centre and falling in the suburbs. If improving the housing stock attracts higher income households to a neighbourhood, the question arises what this means for the retail activity in that neighbourhood.

In the following section, we discuss the relevant theoretical and empirical literature. Section 3 describes our unique datasets on retail stores, cultural heritage and other

neighbourhood amenities, and our estimation strategy. The estimation results are discussed in Section 4. Section 5 concludes and discusses the most important policy implications.

2   Literature

When studying retail location behaviour the seminal work by Hotelling (1929), where he developed a simple spatial model of firm location in a linear city, is cited in most studies. Many modifications of this model have followed for example by Salop (1979) who models the product space as a circle, by Stern (1972) and by d'Aspremont et al. (1979), where the latter wrote a more critical note on Hoteling's paper. The Hotelling model and its modifications suggest that store density in an area depends on customer density, store fixed costs, and transportation costs, all of which can vary by neighbourhood economic conditions. Store density will be higher in neighbourhoods with higher residential and employment densities. But level of density is also dependent on the type of store and the product or service it is selling. For each type of good (inferior, normal, luxury), there is a different market area that is served. More recent theoretical studies on store location choice and market area include Karamychev and Reeven's (2009) work on location choice by retail chains, Chen and Lai's (2008) work on location choice and optimal zoning, and Gupta et al. (2006) on location choice in a circular city.

Empirical studies on store location and the dynamics of the retail trade industry are mostly focused on the US. A study by Alwitt and Donley (1997) on retail stores in poor urban neighbourhoods for the Chicago area, found that poor neighbourhoods had fewer and smaller retail outlets than non-poor areas. And after controlling for purchasing power this effect was smaller for banks and supermarkets. Chapple and Jacobus (2009) studied retail trade and neighbourhood revitalization and propose that there are three types of neighbourhood revitalization from a residents perspective: increased access tot services and opportunities for low-income populations; changes from a low-income neighbourhood to a mixed income neighbourhood; and gentrification that gradually replaces existing low-income residents by more richer newcomers. They find that retail changes are closely related to neighbourhood changes, with increases in middle-income residents most closely associated with retail revitalization. Although their study gives insight in what defines neighbourhood change and factors that play a role, their methods leave out important controls for neighbourhood characteristics that might influence both retail and residential revitalization. Berry and Waldfogel (2010) conclude in their paper about product quality and market size (measured in number of inhabitants) that in the restaurant industry, markets fragment, and the number of varieties increases, as they become larger. And, that also the number of high-quality products increases with market size. Waldfogel (2008) did a similar study about the restaurant industry,

concerning local private goods and population composition, and found corresponding results. He found a strong relationship between restaurants and the population size at the zip code level.

More recent studies by for example Meltzer and Schuetz (2012) analysed how retail services vary over time and across New York City neighbourhoods by income and racial composition. They find that lower income and minority neighbourhoods have fewer retail establishments, smaller average establishments, a higher proportion of restaurant that serve 'unhealthy' food, and less diversity across retail subsectors in some cases. In relation to this, Scheutz et al. (2012) study the relationship between neighbourhood income and retail activities. They conclude that high poverty neighbourhoods have lower employment density for retail overall, and that average establishments size increases with median income for all types of retail. And neither income levels nor poverty rates consistently predict employment growth in retail. But, their results do indicate that neighbourhoods that experience income upgrading have larger gains in retail employment, and thus increased retail activity. Scheutz et al. (2012) also include a variable for percentage of the housing stock built before 1940. Their results indicate that if the percentage of housing stock built before 1940 is higher, there is in general lower retail employment per square meter of retail. But their results also indicate that neighbourhoods that have a higher increase in the share of the housing stock built before 1940, have an higher average annual employment growth than the ones with lower levels of increase in the share of the housing stock built before 1940.

Another important subject in retail industry studies is the ratio and relationship between small storeowners and (big) retail chains. Haltiwanger et al. (2010) studied if single unit or small chain store and Big-Box stores are complements or substitutes? They focus on the impact of Big-Box store entry and growth on nearby single unit and local chain stores, and find a negative impact of Big-Box entry and growth on the employment growth at both single unit and smaller chain stores. This finding only holds up when the Big-Box activity is both in the immediate area and in the same detailed industry as the single unit or smaller chain store.

In the above, we mentioned important factors in studying retail development: gentrification; the age of housing stock; neighbourhood changes with respect to income, resident and employment density; neighbourhoods' racial composition; and small storeowners vs. retail chains. All of these topics play a role in an areas' dynamic and determine store location behavior. A relevant question is what comes first: store location choices, resident location choice, or developer location choice? But that is not the topic of this study; in this study we especially focus on the role of built cultural heritage in store location behavior, and what the differences in retail dynamics are between heritage rich and poor neighbourhoods.

3   Data and methodology

We analyse the relationship between the presence of cultural heritage and stores for a number of industries. The basic estimation techniques that we use are levels on levels, changes on levels, and changes on changes.

Table 1 provides definitions and sources for the variables that we use in this analysis. The data on retail stores is obtained from Locatus. These data contain information on each store in the Netherlands from 2003 to 2011. This includes the type of store, the store space, vacancy rates, et cetera. We aggregate this information on the neighbourhood level. Neighbourhoods in the Netherlands count, on average, 1450 residents per neighbourhood. Our sample includes 5232 neighbourhoods, which covers more than half of the Netherlands.

Data on cultural heritage is made publicly available by the Netherlands Institute for Cultural Heritage (from now on RCE).[2] This information counts more than 60,000 national listed built monuments and more than 450 national conservation areas. Conservation areas are designated by the national government for its architectural and historic value. Becoming a conservation area involves a long bureaucratic process that involves many institutions, such as the municipality and the RCE. In the US, these conservation areas are called historic districts. These are listed on the National Register of Historic Places under the authority of the National Park Service.[3] It is important to note that from the perspective of the retailers, the designation of conservation areas in the Netherlands is exogenously determined. Also, the boundaries of the conservation areas do not correspond to the boundaries of the neighbourhoods. Moreover, these conservation areas provide a specific atmosphere to a neighbourhood that presumably is the main attraction of cultural heritage for specific residents, retailers and other economic agents. The data on listed built monuments is used for sensitivity analyses.

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[2] 'Rijksdienst voor het Cultureel Erfgoed' (RCE) in Dutch. This institute is part of the Ministry of Education, Culture and Science of the Netherlands.
[3] Note that the criteria of designation to become a conservation area could differ between countries.

Table 1:Variable definition and sources

Variable	Definition	Source
Cityscape (km^2)	Area of protect cityscape	RCE
National monuments (#)	A National monument building	RCE
Distance to main train station	The Euclidian distance to a main train station	
No. stores	Number of occupied stores	Locatus
No. Empty stores	Number of vacant stores	Locatus
Clothing / fashion stores (#)	Number of clothing/fashion stores	Locatus
Catering stores (#)	Number of restaurants, bars, cafes, etc.	Locatus
% independent stores	Percentage of independent establishments	Locatus
Income	Median disposable household income	RIO-CBS
% low income	Percentage of income recipients that earn below €14,000	RIO-CBS
% high income	Percentage of income recipients that earn above €25,000	RIO-CBS
Population	Number of inhabitants in neighbourhood	kwb-CBS
% single households	Percentage of single households	kwb-CBS
% household no kids	Percentage of households without kids	kwb-CBS
% household with kids	Percentage of households with kids	kwb-CBS
Average household size	The average size of the household	kwb-CBS
Property value	Average neighbourhood property value	kwb-CBS
% western immigrants	Percentage of population that is a western immigrant	kwb-CBS
% non-western immigrants	Percentage of population that is a non-western immigrant	kwb-CBS

Other neighbourhood characteristics include data on residents like income, age, sex, population size, and data on the quantity of built heritage. Summary statistics for each of the variables are reported in Table 2.

Table 2. Summary statistics on the neighbourhood level

Variables	Mean	Std. Dev.	Min.	Max.
Cityscape (km^2)	0,017	0,1	0	1,97
National monuments (#)	9,2	45,7	1	1.347
Distance to main train station (meter)	12.861	9.699	306	69.230
Stores (#)	30,9	65,9	0	1.318
Empty stores (#)	1,6	4,6	0	91
Clothing / fashion stores (#)	2,8	11,1	0	216
Catering stores (#)	6,0	16,7	0	472
Independent stores (#)	23,6	50,0	0	1.049
Independent stores (%)	81%	21%	0%	100%
Income (euro)	€18.255	€5.251	€1.100	€90.900
Low income (%)	40,3	7,2	9	85
High income (%)	20,7	9,2	1	76
Population (#)	2.255	2.470	90	29.300
Single households (%)	30,9	13,9	3	90
Household without children (%)	31,8	6,5	5	66
Household with children (%)	37,3	11,7	0	83
Average household size (#)	2,3	0,6	0,2	4,2
Western migrants (%)	7,9	5,0	0	57
Non-western migrants (%)	6,7	10,4	0	91
Property value (in thousands of euro's)	€241,4	€117,4	€36	€2.019

As described in Section 1, we believe that the growth of retail stores is higher in neighbourhoods where cultural heritage is present. On the contrary, because of the economic crisis, we believe the vacancy rates in conservation areas grew less compared to other areas. We use the total stock of (vacant) stores as a dependent variable to examine whether there are differences between conservation areas and other areas. Presumably, the hypotheses are not viable for each retail industry. Therefore, we focus on two specific retail industries that are potentially linked with attracting residents and tourists: Clothing / fashion stores and catering stores.

Levels-on-levels

For the levels-on-levels models, where we examine the cross-sectional relationship between cultural heritage and retail, we regress the number of stores on the presence of a protected cityscape area, while controlling for other neighbourhood characteristics. We first approach the data as a pooled dataset, and we add year and municipality dummies to estimate an approximation of a fixed effects model, using an ordinary least square dummy variable model approach. Here each dummy is absorbing the year and municipality specific effects. This results in the following equation for the pooled cross-sectional analysis,

$$\#Stores_{ijt} = \alpha C_{it} + \beta X_{it} + \delta N_i + \gamma Y_t + \varepsilon_{ijt}, \tag{1}$$

where i,j and t are the neighbourhood, retail industry and years, respectively. *#Stores* is the number of stores, C is a continuous variable for the size of protected cityscape within a neighbourhood, and X is a vector of neighbourhood characteristics that are time-variant. And in equation (2) N is a set of fixed effects for each neighbourhood and Y is a set of fixed effects for each year. The number of stores refers to the total number of occupied stores, vacant stores, clothing/fashion stores or catering stores. As a sensitivity analysis, we also use the number of listed built monuments as a proxy for cultural heritage, instead of the presence of a protected cityscape area. See Appendix A for the estimation results.

Changes-on-levels

For the changes-on-levels models, where we examine the cross-sectional relationship between cultural heritage and retail, we regress the year-on-year changes in the number of stores on the presence of a protected cityscape area, while controlling for other neighbourhood characteristics. We add year and municipality dummies to estimate an approximation of a fixed effects model, using an ordinary least square dummy variable model approach. Here each dummy is absorbing the year and municipality specific effects. This results in the following equation,

$$\Delta\#Stores_{ijt,t-1} = \alpha C_{it-1} + \beta X_{it-1} + \delta N_i + \gamma Y_t + \varepsilon_{ijt}, \tag{3}$$

where i,j and t are the neighbourhood, retail industry and years, respectively. *#Stores* is the number of stores, C is a continuous variable for the size of protected cityscape within a neighbourhood, X is a vector of neighbourhood characteristics that are time-variant, N is a set of fixed effects for each neighbourhood and Y is a set of fixed effects for each year. As a sensitivity analysis, we also use the number of listed built monuments as a proxy for cultural heritage, instead of the presence of a protected cityscape area. See Appendix A for the estimation results.

Changes-on-changes

For the changes-on-changes models, where we examine the cross-sectional relationship between cultural heritage and retail in a dynamic model, we regress the year-on-year changes in the number of stores on the presence of a conservation area while controlling for other year-on-year changes in neighbourhood characteristics. We estimate a fixed model, with neighbourhood as the panel variable, and year as the time variable, with delta at 1 year. This results in the following equation,

$$\Delta\#Stores_{ijt,t-1} = \alpha\Delta C_{it,t-1} + \beta\Delta X_{it,t-1} + \gamma_i + \mu_t + \varepsilon_{ijt}, \tag{4}$$

where i,j and t are the neighbourhood, retail industry and years, respectively. *#Stores* is the number of stores, C is a continuous variable for the size of protected cityscape within a neighbourhood interacted with the year dummies, X is a vector of neighbourhood characteristics that are time-variant, γ_i and μ_t are the unknown intercepts for each entity controlling for year and location fixed effects. As a sensitivity analysis, we also use the number of listed built monuments as a proxy for cultural heritage, instead of the presence of a protected cityscape area. See Appendix A for the estimation results.

In the models above we weigh estimations with the mean neighbourhood population size, due to large variation in neighbourhood size, and this reduces distortion of the results by very large or very small neighbourhoods in terms of population size.

4 Results

In this section we explain the estimation results and illustrate the different modelling approaches we use. As described in section 3, we estimate a levels-on-levels model, a changes-on-levels model and a changes-on-changes, or fixed effects model. First in Table 3 the results of the levels-on-levels model are given, these results are estimated using an OLS regression for the relation between the presence of cultural heritage and the number of stores. We have included year and municipality area dummies in the regressions to account for year and municipality area specific (fixed) effects. We separate four different estimations, by using four independent variables: one for the total number of stores, one for the total number of vacant or empty stores, one for clothing and fashion stores, and one for catering (bars, restaurants, cafes, etc.) stores.

Table 3. OLS: Relation between the presence of cultural heritage and the number of stores by industry

Variables	(1) Total stores	(2) Empty stores	(3) Clothing / Fashion stores	(4) Catering stores
Protected cityscape (km^2)	197.1***	6.204***	26.28***	59.87***
	(3.880)	(0.288)	(0.701)	(1.040)
Log (Distance to main train station)	-17.93***	-0.954***	-0.900***	-5.958***
	(1.170)	(0.0867)	(0.211)	(0.314)
Log of Population (#)	35.98***	1.762***	3.582***	5.324***
	(0.658)	(0.0488)	(0.119)	(0.176)
Single households (%)	1.413*	0.239***	0.101	-0.0643
	(0.781)	(0.0579)	(0.141)	(0.209)
Household without children (%)	-1.115	0.0514	-0.293**	-0.718***
	(0.782)	(0.0580)	(0.141)	(0.210)
Household with children (%)	-2.394***	-0.0215	-0.494***	-0.785***
	(0.781)	(0.0579)	(0.141)	(0.209)
Average household size (#)	6.676***	0.485***	0.883***	2.577***
	(1.056)	(0.0783)	(0.191)	(0.283)
Log of Income (euro's)	-3.029***	-0.0290	-0.357**	-0.681***
	(0.983)	(0.0728)	(0.177)	(0.263)
Low income (%)	0.175	-0.0164*	-0.0883***	0.242***
	(0.113)	(0.00835)	(0.0204)	(0.0302)
High income (%)	-0.163	0.0344***	0.00861	0.000165
	(0.131)	(0.00968)	(0.0236)	(0.0350)
Log of Property value (euro's)	61.91***	2.040***	8.589***	12.82***
	(3.284)	(0.243)	(0.593)	(0.880)
Western migrants (%)	-12.56	-13.90***	-11.41***	74.71***
	(16.96)	(1.257)	(3.064)	(4.547)
Non-western migrants (%)	-11.55**	3.841***	0.334	-10.99***
	(5.209)	(0.386)	(0.941)	(1.396)
Fixed effects	Year & Municipality	Year & Municipality	Year & Municipality	Year & Municipality
Constant	-294.8***	-20.47***	-30.07**	-3.991
	(81.58)	(6.048)	(14.74)	(21.87)
Observations	32,218	32,218	32,218	32,218
R-squared	0.493	0.356	0.288	0.460

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

The results in Table 3 show that there is a positive relationship between the presence of protected cityscape and the number of total stores. And that both the number of clothing/fashion stores, and the number of catering stores are higher when a neighbourhood, or part of a neighbourhood, is a protected cityscape. Also the number of empty stores is positively related to the presence of protected cityscape in the neighbourhood. This is probably because the total number of retail buildings is higher in neighbourhoods with a protected cityscape, and this consequently results in an above average number of empty stores. But if we look ahead to the results in Table 4 and Table 5, we see that the growth in the number of empty stores is smaller in neighbourhoods with a protected cityscape.

Furthermore, distance to a main train station is negatively related to the number of stores. This parameter is a proxy for city centres and the negative sign indicates that stores prefer to be located in or near the city centre. Next, size of the neighbourhood population, and the average household size are significantly positive related to the total number of stores in a neighbourhood. The income variable is significantly negative related to the total number of stores. This means that with an increase in average household income of a neighbourhood, there is a decrease in the total number, as well the number of clothing and number of catering stores in a neighbourhood. This is probably because in 'richer' neighbourhoods the residential function is more dominant, and consequently there is less space or need for retail facilities. And looking at the property value, we see an opposite effect. Property value is positive significantly related to the total number of stores, and the number of clothing and catering stores. This effect is probably found because of the high property values found in the centres of the largest cities in the Netherlands. Cities like Amsterdam, Utrecht and The Hague have city centres with high property values and a large number of stores. The opposite effects of property value and income are probably because the large percentage of social housing in largest Dutch city (centres). In these city centres the average income is lower, but the average property value higher because of the relatively low percentage of owner-occupied houses. Looking at the variable estimates for percentage of Western migrants and non-Western migrants, we see that a higher percentage of migrants relate to fewer stores in general, and for neighbourhoods where the share of Western migrants is relatively larger (insignificant for total number of stores), there are fewer stores than in the case of a higher share of non-Western migrants. There is an exception for catering stores in neighbourhoods with a relatively large share of Western migrants. In these neighbourhoods there are relatively more catering stores.

Table 4. OLS: Relation between the presence of cultural heritage and the year-to-year changes of stores by industry

Variables	(1) Δ Total stores	(2) Δ Empty stores	(3) Δ Clothing / Fashion stores	(4) Δ Catering stores
Protected cityscape (km^2)	0.0204***	-0.00783***	0.00735***	-0.00167***
	(0.00192)	(0.00132)	(0.000612)	(0.000615)
Log(Distance to main train station)	-0.000542	-0.000465	0.000288	-0.000457**
	(0.000579)	(0.000399)	(0.000185)	(0.000186)
Log of Population (#)	0.00193***	-2.88e-05	0.000897***	0.000556***
	(0.000327)	(0.000225)	(0.000104)	(0.000105)
Single households (%)	-0.00150***	-0.000258	-1.37e-05	0.000188
	(0.000387)	(0.000267)	(0.000123)	(0.000124)
Household without children (%)	-0.00133***	-0.000211	-8.45e-05	0.000176
	(0.000388)	(0.000267)	(0.000123)	(0.000124)
Household with children (%)	-0.00139***	-0.000210	-0.000138	0.000164
	(0.000387)	(0.000267)	(0.000123)	(0.000124)
Average household size (#)	-0.00152***	-0.000354	0.000425**	-0.000107
	(0.000523)	(0.000360)	(0.000167)	(0.000168)
Log of Income (euro's)	-0.000863*	-0.000618*	-0.000388**	-0.000498***
	(0.000486)	(0.000335)	(0.000155)	(0.000156)
Low income (%)	-1.79e-05	4.70e-05	-2.91e-05	-3.13e-05*
	(5.59e-05)	(3.85e-05)	(1.78e-05)	(1.79e-05)
High income (%)	0.000109*	5.79e-05	1.24e-05	-5.95e-06
	(6.48e-05)	(4.47e-05)	(2.07e-05)	(2.08e-05)
Log of Property value (euro's)	-0.000149	-0.00131	0.00203***	0.000547
	(0.00163)	(0.00112)	(0.000519)	(0.000523)
Western migrants (%)	-0.0430***	-0.00152	0.00236	-0.0151***
	(0.00840)	(0.00579)	(0.00268)	(0.00269)
Non-western migrants (%)	0.0118***	0.00201	-0.00131	-0.000443
	(0.00258)	(0.00178)	(0.000822)	(0.000827)
Fixed effects	Year & Municipality	Year & Municipality	Year & Municipality	Year & Municipality
Constant	0.136***	0.0343	-0.0101	-0.0135
	(0.0404)	(0.0278)	(0.0129)	(0.0130)
Observations	31,984	31,984	31,984	31,984
R-squared	0.042	0.021	0.036	0.029

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

In Table 4 above the results for the second modelling approach, changes-to-levels, are displayed. In this approach we also have included year and municipality area dummies in the regressions to account for year and municipality area specific (fixed) effects. The results show that in neighbourhoods with protected cityscape the change in the total number of stores, and the number of clothing/fashion stores is positively related to the presence of this cultural heritage indicator. And the change in the number of empty stores and catering stores is negatively related to protected cityscape. The results indicate that the presence of cultural heritage thus has a positive relation with change in the number of stores in general. Population size also has a significantly positive effect on the change of the number of stores; this is true for total number of stores, for clothing/fashion stores and for catering stores. Average household size shows a negative relation to the change in the number of stores, except for clothing/fashion stores, where the relation is positive. The income variable has four negative coefficients; meaning change in the total number of stores and the number of empty

stores is negatively related to increases in neighbourhood income levels. Next to this percentage of high incomes, and the percentage of non-western migrants have a positive relation to the change of total number of stores in a neighbourhood. A higher percentage of Western migrants, relate significantly negative to the total number of stores. Looking at the property value variable, the results indicate that higher property values only relate significantly positive to the change in the number of clothing/fashion stores.

Table 5. Fixed effects: Relation between the presence of cultural heritage and the number of stores by industry

Variables	(1) Total stores	(2) Empty stores	(3) Clothing / Fashion stores	(4) Catering stores
Protected cityscape (km^2) * year	0.732***	-0.230***	1.011***	-0.367***
	(0.0877)	(0.0492)	(0.0307)	(0.0265)
Log(Dist to main train station)*year	0.00709***	0.0174***	0.00688***	-0.00326***
	(0.00225)	(0.00126)	(0.000787)	(0.000678)
Log of Population (#)	6.419***	0.581**	0.574***	0.485***
	(0.405)	(0.227)	(0.142)	(0.122)
Single households (%)	-0.0197	0.0295	-0.000879	0.0461***
	(0.0447)	(0.0251)	(0.0157)	(0.0135)
Household without children (%)	0.0164	0.0368	0.0173	0.0270**
	(0.0449)	(0.0252)	(0.0157)	(0.0135)
Household with children (%)	-0.0935**	0.0542**	0.000238	0.0327**
	(0.0448)	(0.0251)	(0.0157)	(0.0135)
Average household size (#)	-0.182***	0.0880**	0.00842	-0.0583***
	(0.0654)	(0.0367)	(0.0229)	(0.0197)
Log of Income (euro's)	-0.0745	0.0407	0.0155	-0.0182
	(0.0543)	(0.0305)	(0.0190)	(0.0164)
Low income (%)	-0.0190*	0.0379***	0.00514	-0.00482
	(0.0107)	(0.00601)	(0.00375)	(0.00323)
High income (%)	-0.0254*	0.0216***	0.00641	0.00299
	(0.0135)	(0.00755)	(0.00471)	(0.00406)
Log of Property value (euro's)	-0.560***	-0.869***	0.0909	0.443***
	(0.179)	(0.100)	(0.0627)	(0.0540)
Western migrants (%)	-26.84***	8.435***	3.980***	0.330
	(3.320)	(1.863)	(1.163)	(1.002)
Non-western migrants (%)	-5.915***	-8.147***	-0.947	1.304**
	(2.166)	(1.215)	(0.759)	(0.654)
Constant	-106.9***	-314.5***	-124.0***	60.22***
	(39.69)	(22.26)	(13.90)	(11.98)
Observations	32,218	32,218	32,218	32,218
Number of neighbourhoods	5,232	5,232	5,232	5,232
R-squared	0.015	0.013	0.064	0.012
Fixed effects	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

Table 5 shows the results for the third modelling approach, changes-to-changes, modelled in a fixed effects model to control for unobserved heterogeneity. We use neighbourhood fixed effects here, as opposed to municipality fixed effect use in the two previous approaches. In this third approach year-to-year changes in number of stores, empty stores, clothing/fashion stores, and catering stores are regressed with year-to-year changes for every independent variable shown in Table 5. We crossed the cultural heritage indicator and the distance to a

main train station parameter with time, to let these variables vary over time and be included in the model. The estimates show that the cultural heritage variable, protected cityscape, is significantly positive related to the total number of stores and number of clothing/fashion stores, and significantly negative related to number of empty stores and catering stores. The change in the total number of stores is thus positively related to cultural heritage present in neighbourhoods, especially the change in the number of clothing/fashion stores. This retail segment has apparently a preference to be located in a cultural heritage rich environment. Not surprisingly, neighbourhoods that experience population growth also have larger growth in the number stores. The distance to a main train station coefficients are all positive except for catering stores. Meaning that with increasing distance to a main train station there is a positive relation to the change in the number of stores, except for catering stores. The population coefficient estimates are significantly positive for each dependent variable, including the change in the number of empty stores. Household specific effects show that growth in the percentage of households without children has a positive effect on the change in the number of catering stores. And that growth in the percentage of households with children has a positive effect on the change in the number of catering and the number of empty stores, and a negative effect on the change in the total number of stores. Growth in the percentage of households with children has a significant negative effect on the change in the number of total stores. And a significantly positive effect on the change in the number of catering stores. But the household size variable coefficient is negative for the change in the number of catering stores, and this suggests that at a certain level more children in a household has a negative effect on the change in the number of catering stores. An increase in average neighbourhood household size is also negatively related to the change in the total number of stores. The income variables show no significant results. An increase in the percentage of high income is negatively related to the change in the total number of stores, and related positively to the change in the number of empty stores. This is probably because the neighbourhood retail demand shifts and we observe a relatively small time period, to short to see the retail sectors' response to this shift in demand. Looking at changes in average neighbourhood property values, we see that there is a negative relation with the change in the total number of stores, and change in number of empty stores. And a positive relation to change in the number of catering stores. The number of catering stores thus increases with property value. An increase in the percentage of migrants has a negative relation to the change in the total number of stores. But an increase in the percentage of Western migrants is positively related to the change in the number of clothing/fashion stores.

5   Conclusions

This study used a large sample of stores and neighbourhood data for the Netherlands to provide estimates of the impact of cultural heritage on store location dynamics. Our results suggest that retail dynamics vary by neighbourhood characteristics like the presence of protected cityscape, neighbourhood income, population size, origin of the residents, and household composition. Neighbourhoods that have cultural heritage, in the form of protected cityscape or national monuments, within their boundaries have more stores, have a more positive change in the number of stores, have less vacancy, and have a lower growth in vacancy rates. Especially the change in the number of clothing/fashion stores is positively related to the presence of protected cityscape in a neighbourhood. Storeowners or retail entrepreneurs apparently have a preference for cultural heritage richer locations. Population size and growth have in general a significantly positive relation to the number of shops, and the change in the number of shops in a neighbourhood. More people mean more stores, and a higher growth in the number people, is related to a higher growth in the number of shops. The direction of the effects of household composition is less clear, but we can conclude that in neighbourhoods with more households with children, are a higher growth in the households with children, there are fewer stores, and is the growth in the number of stores smaller. And in neighbourhoods with larger households, the number of stores is higher, but the growth lower. And to an increasing average household size, the change in the number of stores is negatively related. When focussing on income, we see that in neighbourhoods with relatively higher incomes the number of stores is relatively smaller, and that the change in het number of stores is also lower in higher income neighbourhoods. The third model estimations show that the change in the number of stores is related negatively to an increase in neighbourhood income, although not significantly, except for clothing/fashions stores, for which the growth is relatively higher. Clothing and fashion stores are apparently more sensitive to increases in neighbourhood income. If we look at neighbourhood income distribution we see no clear direction of the relationships, this probably means that when one group is larger than the other there are relatively more stores focussed on low-income or high-income households specifically, than when they are divided more equally. Focussing on the third model estimations we see that with increases in low-income households, the growth in the number of empty stores is significantly higher, and also significantly higher with an increase in the percentage of high-income households in a neighbourhood. Property value is significantly positive related to the total number of stores, and especially to the number of clothing/fashion and catering stores. Also with in increase in the average neighbourhood property value, the change in the number of clothing/fashion (not significantly) and catering stores (significantly) is affected positive. This is probably related to the relatively high property value in Dutch city

centres, where there are also relatively more stores. But apparently storeowners, or retail entrepreneurs have a preference for these higher valued and costlier locations.

Finally, to address the main goal of this study: to determine the role of cultural heritage in story dynamics, once more, we have shown that storeowners are generally more keen on heritage rich locations to do business. If local governments want to encourage more retail activity, then they should preserve and maintain their cultural heritage. Policymakers should incorporate the role of cultural heritage when developing zoning plans, and should also consider the negative externalities associated with more retail activities, such as more where and tear on the cultural heritage that is not receiving the benefits of investments by retail entrepreneurs, and increased noise, pollution and traffic pressure on the neighbourhoods residents.

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Appendix A

Table A1: OLS: Relation between the presence of cultural heritage and the year-to-year changes of stores by industry

Variables	(1) Total stores	(2) Empty stores	(3) Clothing / Fashion stores	(4) Catering stores
Monuments (#)	0.547***	0.0142***	0.0726***	0.173***
	(0.00527)	(0.000431)	(0.00100)	(0.00134)
Log(Distance to main train station)	-13.84***	-0.854***	-0.358*	-4.647***
	(1.052)	(0.0860)	(0.200)	(0.267)
Log of Population (#)	33.32***	1.704***	3.231***	4.455***
	(0.592)	(0.0484)	(0.113)	(0.150)
Single households (%)	2.335***	0.267***	0.224*	0.217
	(0.702)	(0.0574)	(0.134)	(0.178)
Household without children (%)	0.227	0.0863	-0.115	-0.294*
	(0.703)	(0.0574)	(0.134)	(0.178)
Household with children (%)	-1.172*	0.0123	-0.331**	-0.403**
	(0.702)	(0.0574)	(0.134)	(0.178)
Average household size (#)	4.711***	0.434***	0.623***	1.953***
	(0.949)	(0.0775)	(0.181)	(0.240)
Log of Income (euro's)	-0.484	0.0368	-0.0195	0.126
	(0.883)	(0.0722)	(0.168)	(0.224)
Low income (%)	-0.113	-0.0231***	-0.126***	0.149***
	(0.101)	(0.00828)	(0.0193)	(0.0257)
High income (%)	-0.116	0.0362***	0.0149	0.0136
	(0.117)	(0.00959)	(0.0223)	(0.0297)
Log of Property value (euro's)	50.53***	1.858***	7.094***	8.941***
	(2.944)	(0.241)	(0.560)	(0.746)
Western migrants (%)	-111.9***	-15.62***	-24.48***	41.16***
	(15.19)	(1.241)	(2.892)	(3.850)
Non-western migrants (%)	11.12**	4.371***	3.333***	-3.668***
	(4.688)	(0.383)	(0.892)	(1.188)
Fixed effects	Year & Municipality	Year & Municipality	Year & Municipality	Year & Municipality
Constant	-371.6***	-23.34***	-40.38***	-26.28
	(73.26)	(5.986)	(13.94)	(18.56)
Observations	32,218	32,218	32,218	32,218
R-squared	0.591	0.368	0.362	0.610

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

Table A2: OLS: Relation between the presence of cultural heritage and the year-to-year changes of stores by industry

Variables	(1) Δ Total stores	(2) Δ Empty stores	(3) Δ Clothing / Fashion stores	(4) Δ Catering stores
Monuments (#)	5.19e-05***	-2.00e-05***	2.81e-05***	-8.65e-06***
	(2.89e-06)	(1.99e-06)	(9.12e-07)	(9.28e-07)
Log(Distance to main train station)	-0.000166	-0.000610	0.000514***	-0.000531***
	(0.000578)	(0.000399)	(0.000183)	(0.000186)
Log of Population (#)	0.00169***	6.23e-05	0.000733***	0.000613***
	(0.000326)	(0.000225)	(0.000103)	(0.000105)
Single households (%)	-0.00141***	-0.000294	2.14e-05	0.000180
	(0.000386)	(0.000266)	(0.000122)	(0.000124)
Household without children (%)	-0.00120***	-0.000260	-1.60e-05	0.000155
	(0.000386)	(0.000267)	(0.000122)	(0.000124)
Household with children (%)	-0.00127***	-0.000256	-8.10e-05	0.000147
	(0.000386)	(0.000266)	(0.000122)	(0.000124)
Average household size (#)	-0.00171***	-0.000282	0.000322*	-7.54e-05
	(0.000522)	(0.000360)	(0.000165)	(0.000168)
Log of Income (euro's)	-0.000622	-0.000711**	-0.000256*	-0.000539***
	(0.000485)	(0.000335)	(0.000153)	(0.000156)
Low income (%)	-4.43e-05	5.72e-05	-4.60e-05***	-2.56e-05
	(5.58e-05)	(3.85e-05)	(1.76e-05)	(1.79e-05)
High income (%)	0.000114*	5.59e-05	1.32e-05	-5.85e-06
	(6.46e-05)	(4.46e-05)	(2.04e-05)	(2.08e-05)
Log of Property value (euro's)	-0.00104	-0.000960	0.00116**	0.000880*
	(0.00162)	(0.00112)	(0.000512)	(0.000521)
Western migrants (%)	-0.0510***	0.00162	-0.00494*	-0.0123***
	(0.00835)	(0.00576)	(0.00263)	(0.00268)
Non-western migrants (%)	0.0139***	0.00122	9.00e-06	-0.000879
	(0.00258)	(0.00178)	(0.000813)	(0.000827)
Fixed effects	Year & Municipality	Year & Municipality	Year & Municipality	Year & Municipality
Constant	0.127***	0.0376	-0.0118	-0.0135
	(0.0403)	(0.0278)	(0.0127)	(0.0129)
Observations	31,984	31,984	31,984	31,984
R-squared	0.048	0.023	0.059	0.032

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A3: Fixed effects: Relation between the presence of cultural heritage and stores by industry

Variables	(1) Total stores	(2) Empty stores	(3) Clothing / Fashion stores	(4) Catering stores
Monuments (#)*year	0.00260***	-0.000435***	0.00315***	-0.000928***
	(0.000138)	(7.78e-05)	(4.57e-05)	(4.16e-05)
Log(Dist to main train station)*year	0.00492**	0.0176***	0.00444***	-0.00265***
	(0.00224)	(0.00126)	(0.000741)	(0.000675)
Log of Population (#)	6.468***	0.575**	0.630***	0.470***
	(0.402)	(0.227)	(0.133)	(0.121)
Single households (%)	-0.0162	0.0295	0.00258	0.0454***
	(0.0445)	(0.0251)	(0.0147)	(0.0134)
Household without children (%)	0.00534	0.0384	0.00432	0.0306**
	(0.0447)	(0.0252)	(0.0148)	(0.0135)
Household with children (%)	-0.102**	0.0550**	-0.00956	0.0352***
	(0.0445)	(0.0251)	(0.0147)	(0.0134)
Average household size (#)	-0.204***	0.0912**	-0.0177	-0.0508***
	(0.0650)	(0.0367)	(0.0215)	(0.0196)
Log of Income (euro's)	-0.0944*	0.0424	-0.00677	-0.0127
	(0.0541)	(0.0305)	(0.0179)	(0.0163)
Low income (%)	-0.0171	0.0375***	0.00759**	-0.00557*
	(0.0107)	(0.00601)	(0.00353)	(0.00322)
High income (%)	-0.0294**	0.0216***	0.00223	0.00382
	(0.0134)	(0.00755)	(0.00443)	(0.00404)
Log of Property value (euro's)	-0.612***	-0.873***	0.0430	0.448***
	(0.178)	(0.100)	(0.0589)	(0.0537)
Western migrants (%)	-28.43***	8.335***	2.485**	0.533
	(3.297)	(1.859)	(1.091)	(0.994)
Non-western migrants (%)	-5.484**	-8.189***	-0.461	1.180*
	(2.155)	(1.215)	(0.713)	(0.650)
Constant	-67.57*	-318.0***	-79.96***	49.21***
	(39.53)	(22.29)	(13.09)	(11.92)
Observations	32,218	32,218	32,218	32,218
Number of neighbourhoods	5,232	5,232	5,232	5,232
R-squared	0.025	0.013	0.172	0.023
Fixed effects	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

Table . Fixed effects: Relation between the presence of cultural heritage and stores by industry

Variables	(1) Log(Total stores)	(2) Log(Empty stores)	(3) Log(Clothing / Fashion stores)	(4) Log(Catering stores)
Protected cityscape (km^2) * year	-0.00393	-0.0205**	0.0187***	-0.00866***
	(0.00354)	(0.00894)	(0.00385)	(0.00312)
Log(Dist to main train station)*year	0.000913***	0.00263***	0.000177*	5.96e-05
	(9.05e-05)	(0.000229)	(9.87e-05)	(7.98e-05)
Log of Population (#)	0.341***	0.209***	0.0473***	0.0938***
	(0.0163)	(0.0412)	(0.0178)	(0.0144)
Single households (%)	0.00206	0.00212	-0.000295	0.00183
	(0.00180)	(0.00456)	(0.00196)	(0.00159)
Household without children (%)	0.000755	0.00344	-0.00133	0.00140
	(0.00181)	(0.00457)	(0.00197)	(0.00159)
Household with children (%)	-0.000306	0.00236	-0.00317	0.000278
	(0.00180)	(0.00456)	(0.00197)	(0.00159)
Average household size (#)	0.000884	0.0195***	-0.00732**	-0.00109
	(0.00263)	(0.00666)	(0.00287)	(0.00232)
Log of Income (euro's)	-0.000372	0.00176	0.00570**	-0.00347*
	(0.00219)	(0.00554)	(0.00239)	(0.00193)
Low income (%)	-0.00102**	0.00513***	-0.000322	-0.000866**
	(0.000432)	(0.00109)	(0.000471)	(0.000380)
High income (%)	0.00478***	0.00303**	2.04e-05	0.00149***
	(0.000542)	(0.00137)	(0.000591)	(0.000478)
Log of Property value (euro's)	-0.0368***	-0.114***	0.0163**	0.0279***
	(0.00721)	(0.0182)	(0.00786)	(0.00635)
Western migrants (%)	-0.644***	1.025***	-0.105	-0.0180
	(0.134)	(0.338)	(0.146)	(0.118)
Non-western migrants (%)	-0.341***	-1.505***	0.0757	0.129*
	(0.0873)	(0.221)	(0.0951)	(0.0769)
Constant	-15.76***	-47.86***	-2.727	-0.517
	(1.599)	(4.044)	(1.743)	(1.409)
Observations	32,218	32,218	32,218	32,218
Number of neighbourhoods	5,232	5,232	5,232	5,232
R-squared	0.029	0.010	0.006	0.007
Fixed effects	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood

Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

Table . Fixed effects: Relation between the presence of cultural heritage and stores by industry

Variables	(1) Log(Total stores)	(2) Log(Empty stores)	(3) Log(Clothing / Fashion stores)	(4) Log(Catering stores)
Monuments (#)*year	-4.59e-06	-2.09e-05	5.57e-05***	-1.12e-05**
	(5.59e-06)	(1.41e-05)	(6.09e-06)	(4.93e-06)
Log(Dist to main train station)*year	0.000913***	0.00262***	0.000135	6.06e-05
	(9.06e-05)	(0.000229)	(9.87e-05)	(7.99e-05)
Log of Population (#)	0.341***	0.209***	0.0482***	0.0937***
	(0.0163)	(0.0412)	(0.0177)	(0.0144)
Single households (%)	0.00207	0.00217	-0.000239	0.00184
	(0.00180)	(0.00456)	(0.00196)	(0.00159)
Household without children (%)	0.000767	0.00348	-0.00155	0.00143
	(0.00181)	(0.00458)	(0.00197)	(0.00159)
Household with children (%)	-0.000307	0.00234	-0.00334*	0.000282
	(0.00180)	(0.00456)	(0.00196)	(0.00159)
Average household size (#)	0.000912	0.0196***	-0.00778***	-0.00102
	(0.00263)	(0.00666)	(0.00287)	(0.00232)
Log of Income (euro's)	-0.000376	0.00169	0.00532**	-0.00347*
	(0.00219)	(0.00554)	(0.00238)	(0.00193)
Low income (%)	-0.00102**	0.00511***	-0.000278	-0.000877**
	(0.000432)	(0.00109)	(0.000470)	(0.000381)
High income (%)	0.00477***	0.00298**	-4.86e-05	0.00147***
	(0.000542)	(0.00137)	(0.000590)	(0.000478)
Log of Property value (euro's)	-0.0370***	-0.115***	0.0156**	0.0274***
	(0.00720)	(0.0182)	(0.00784)	(0.00635)
Western migrants (%)	-0.650***	0.988***	-0.128	-0.0299
	(0.134)	(0.338)	(0.145)	(0.118)
Non-western migrants (%)	-0.341***	-1.504***	0.0841	0.129*
	(0.0873)	(0.221)	(0.0950)	(0.0769)
Constant	-15.76***	-47.77***	-1.973	-0.532
	(1.601)	(4.050)	(1.743)	(1.411)
Observations	32,218	32,218	32,218	32,218
Number of neighbourhoods	5,232	5,232	5,232	5,232
R-squared	0.029	0.010	0.009	0.007
Fixed effects	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood	Year & neighbourhood

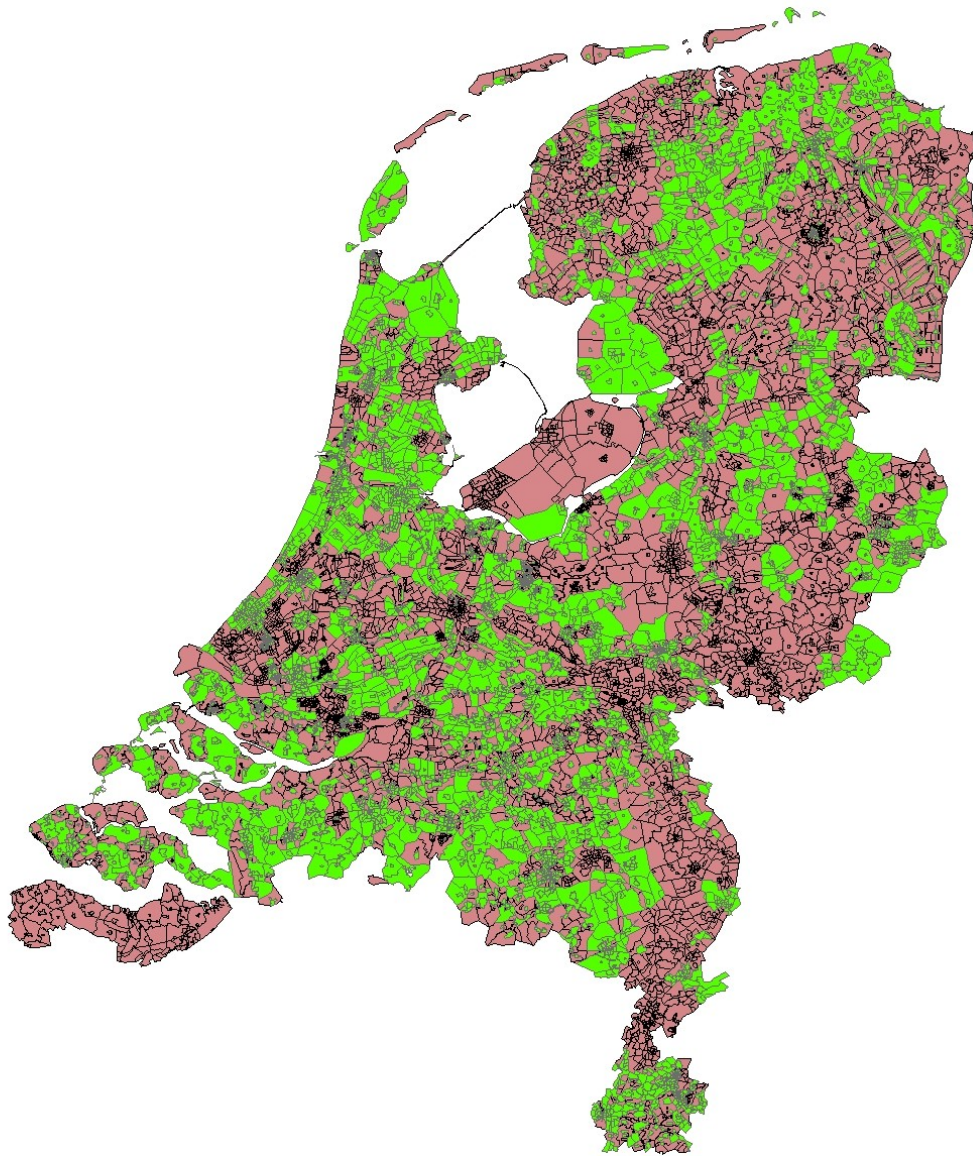Standard errors in parentheses   {Preliminary results – Please do NOT quote}
*** p<0.01, ** p<0.05, * p<0.1

Figure B1: coverage of neighbourhoods in sample.