

Assessing the principles of spatial competition between stores within a retail network

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Abstract

This study investigates the impact of driving time and retail agglomerations on consumer store choice within a retail network. A pairwise comparison of confluencing store trade areas is conducted based on loyalty card information and exit questionnaires for six retailers operating in different product categories in Belgium. Results show that there is a stronger emphasis in the preference hierarchy on driving time towards a store for the daily goods retailer. Moreover, there is varying intra-network spatial competition depending on the type of location strategy pursued by the different retailers. Results show that for some retailers retail agglomeration effects are more outspoken than for others. However, impact of driving time on consumer intra-network store choice was independent of retail agglomeration size. Finally, results indicate that opening stores outside the pursued location strategy should be approached with care as significant impacts on sales cannibalization can emerge within the store network. These findings are important for crafting an overall expansion strategy for expansion managers as well as for marketing managers occupied with network changes at operational level.

Keywords:

retail agglomerations, retail management, spatial competition, store location strategy, sales cannibalization, empirical comparative study

1. Introduction

Retailers in expansion are often faced with the challenge of assessing the impact of a store network extension on the performance of their existing stores within the network. To accurately understand this impact, it is advisable to look at the shopping behavior of customers and how it is affected when faced with a modified retail landscape. Academic research already revealed a wide variety of insights in drivers of store choice and resulting theoretic choice models. However, these models and frameworks largely ignored specific spatial competitive dynamics of store within a retail network, often referred to as sales

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cannibalization [1]. Recently, more research has been conducted on this topic, focusing on the relevant spatial and non-spatial drivers to accurately assess shifting store choice and cannibalization of sales within a retail network [2, 3]. Knowledge around these specific drivers within a retail network can aid expansion managers with their expansion location choice, in order to avoid, for example, heavy cannibalization of sales on existing stores nearby.

This study focuses on the specific impact and spatial dynamics of driving time and retail agglomerations on intra-network consumer store choice and hence cannibalization of sales within a retail network. Knowledge about, for example, consumer tendency to prefer a multipurpose shopping trip to a large retail agglomeration over multiple single-purpose store trips to smaller retail agglomerations, is vital for a retailer to accurately assess the impact of a modified store network. If consumers will find a higher utility in combining shopping trips in one big trip to a large agglomeration, then a planned new store opening in a big, attractive retail agglomeration will have a widespread cannibalizing impact across multiple stores of the network located in smaller retail agglomerations.

Most academic studies have researched such impacts from the consumer's point of view in a well-defined regional scope or through controlled lab-experiments in order to reveal the drivers for store choice. However, assessing drivers for store choice within a retail network from a retailer's point of view requires a broader geographic scope to ensure the representativeness of the results and, desirably, a benchmark with different retailers to assess the relative impact for these drivers. This study is, to the best of our knowledge, the first that compares the spatial competitive intra-network dynamics for multiple retailers. To this end, loyalty card information and exit questionnaires are used to detect spatial patterns in consumer intra-network store choice preferences. With the use of loyalty card and exit questionnaire information, it is possible to construct store trade areas which can confluence in certain *competitive areas*. By comparing the sales distributions in these competitive areas, the spatial competitive dynamics blueprint of a retailer can be assessed. Data from six retailers selling products from three different product categories, each with their unique location strategy are examined to allow for a cross-market, cross-location strategy comparison of the spatial dynamics blueprints within their retail network. In doing so, this study aims to extend literature in two ways. Firstly, geographic sales data of retailers offering a variety of product categories are compared for the first time in regard to their unique intra-network spatial competitive blueprint. Secondly, this study also compares the competitive trade areas of retailers offering the same category of products but following a different store location strategy. A location strategy aimed at standalone stores will arguably yield different spatial competitive dynamics between stores than a retailer aiming at opening stores in high streets. In this study, the impact of agglomerations is assessed in relation to the retailer's expansion strategy.

The remainder of this paper is structured as follows. First, the current state-of-art in literature on assessing trade areas is reviewed and the vast research around multipurpose shopping is summarized. Next, the methodology and test design sections describe how the geographic sales data of the different retailers are used to assess the spatial competition within their store networks. The results section then unfolds the different forms of spatial

competition between the studied retailers. Last, conclusions and managerial implications are discussed.

2. Literature overview

Due to the increasing interest in objective optimization of retail network performance, research has begun to emerge around this topic. Pancras et al. [2] look into the case of a fast-food chain where they investigate the varying impact of network changes, pricing and customer satisfaction on the sales of existing restaurants. The model that was presented also included a parameter related to the distance from census tracts to the different restaurants to incorporate spatial competitive dynamics. The authors however lacked sales data at census level to verify the spatial dynamics used in the presented model.

Agglomeration effects have been the subject of much more research, albeit mostly from a consumer point of view. From this perspective, a consumer seeks to maximize its shopping utility by engaging in multipurpose shopping trips. Arentze et al. [4] investigated the influence of offer diversity in retail agglomerations to assess the increased willingness of consumers to include these stores in a one-stop multipurpose shopping trip. This research was extended by Dellaert et al. [5] and Arentze et al. [6]. Also, Brooks et al. [7] assessed the impact of varying driving times and offer configurations on store choice in a controlled lab experiment. The increased utility due to travel cost minimization by combining shop purposes in one trip has also been investigated by Dellaert et al. [8]. Rotem-Mindali [9], in turn, found that retail centers that accommodate multipurpose shopping are not necessarily located in close proximity to major residential concentrations. However, the resulting downside of longer travel times are largely compensated when having a good road-based accessibility.

A first empirical application of multipurpose shopping dynamics in the grocery market can be found in Popkowski Leszczyc et al. [10] where the authors also take the location and price strategy of the retailers into account. Next to derived consumer benefits, agglomeration effects are also induced by benefits for retailers and real estate developers. Increased competition in larger retail environments puts downward pressure on prices but this is at least partially offset by increased volumes sold [11, 12, 13]. To avoid extreme price competition however, clustering of retailers mainly occurs between retailers that can sufficiently differentiate their offering from competitors within the same retail agglomeration [14]. This is especially necessary as larger retail agglomerations tend to have higher rental prices [15], putting even more pressure on the retailer's profit margins.

Applied to a retail network, agglomeration effects have been included in various predictive analytic models. Roig-Tierno et al. [16] included a measure of passing trade in their analytical hierarchy process (AHP) for retail site location decisions. In spatial interaction models, Huff [17] developed a gravity model to predict the trade area of shopping centers. This model was later extended to accommodate for measuring agglomeration effects on store attractiveness [18, 19]. Applications of this type of spatial interaction models where agglomeration effects are explicitly accounted for can be found in Satani

et al. [20], Li and Liu [21] and Orpana and Lampinen [22].

Moreover, spatial competition drivers within a retail network are known to be very important in a franchiser-franchisee case. The effects of sales cannibalization or *encroachment* of an expansion case within a franchise firm has been assessed by Kalnins [23]. Also, literature contains a fair amount of research around models to resolve these expansion conflicts. Cox and Mason [24] investigated how a model can contribute in delineating store trade areas and geographic trade rights. Also, different expansion strategies can be crafted based on what objective the franchisees seek to maximize with their retail network configuration, like minimizing sales cannibalization or maximizing total market share [25, 26, 27, 28, 29, 30]. This paper contributes to this discussion in a way that spatial competition patterns can be assessed using known geographical sales within the network and that impact of retail agglomerations can be assessed in an objective way to include this factor correctly in a conflict resolution model and in the discussion around expansion within the franchise chain.

3. Methodology

This section explains how spatial competitive dynamics of intra-network store choice is assessed. Such an assessment can yield insights in how customers value drivers for store choice when choosing between different stores of the same brand to make a purchase [31]. This in turn, leads to valuable knowledge for the retailer on how stores compete for the same customers. In other words, they gain insights in the spatial intra-network competitive dynamics. Through loyalty card information, it is possible to investigate such customer behavior as it links a geographically located customer with its behavior towards different stores from the same brand. Moreover, loyalty card information and exit questionnaires provide such information on a large scale, which is necessary to discover valuable insights in a real life, non-controlled environment where a vast set of drivers influence intra-network store choice. Isolating the unique impact of driving time and retail agglomerations for this study thus requires eliminating many other influencing factors. These co-influencing factors can be found at both brand and store level. On brand level, time depending factors like nationally changing spending, competition and branch recognition have to be taken into account. For this study, however, geographic sales data within a timespan of one and the same year was available. This forgoes the need to implement brand level factors as all data for one retailer are consistent in time. On store level, this study aims to assess the impact of drivers as driving time and retail agglomeration synergies. This implies that all other store level drivers of store choice-like varying net sales surface, number of checkouts or availability of parking- should be abstracted as much as possible. Luckily, due to the large number of observations, it is possible to abstract these other drivers, which results in a unique assessment of the impact of driving time and retail agglomerations. To achieve these clear comparisons, a spatial assessment of sets of confluencing trade areas within a store network is conducted. More specifically, the achieved market shares on store level in census blocks where there is direct competition for its consumers between two stores from the same brand are compared to one another. This comparison is constructed as follows: As a first step, the average trade area extension of each focal retailer is examined. The focal retailer selling

daily goods (see Section 4) has the smallest average trade area, extending on average 15 kilometers (see Table 1). A uniform boundary of 30 Euclidean kilometers between two stores of the same retailer is set for all focal retailers. This ensures optimal results comparability between the focal retailers while also achieving maximum probability of having confluent trade areas between the two stores in a pair.

	Average trade area extension (kilometers)
Food retailer	15
DIY retailer	18
Fashion retailer	20
Footwear retailer	21
Fashion accessories retailer	22
Media retailer	27

Table 1: Average extension of each focal retailer’s trade areas.

Figure 1 displays such competitive pairs for one of the six studied retailers.

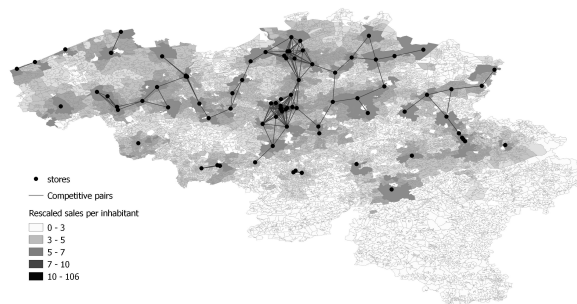


Figure 1: Competitive pairs of stores for an example retailer on the Belgian market.

To accurately measure direct competition between both stores within a pair, only the census blocks where consumers are likely to have both stores in their choice set are withheld. To emulate this zone of direct competition, a rhombus between both stores within a pair is constructed, as shown in Figure 2.

Figure 2 shows an example rhombus with an angle α that determines the width of the zone of direct competition between both stores. For the analyses in this research an angle α of 35° was used. For this angle, the cumulative sales per square km in the average corresponding rhombus are maximal (Figure 3) and thus is the competition between both stores on average maximal.

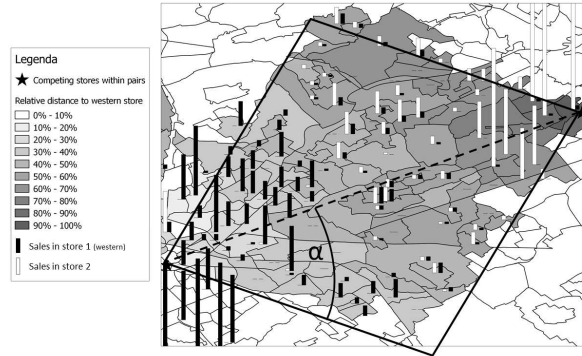


Figure 2: Example zone of direct competition.

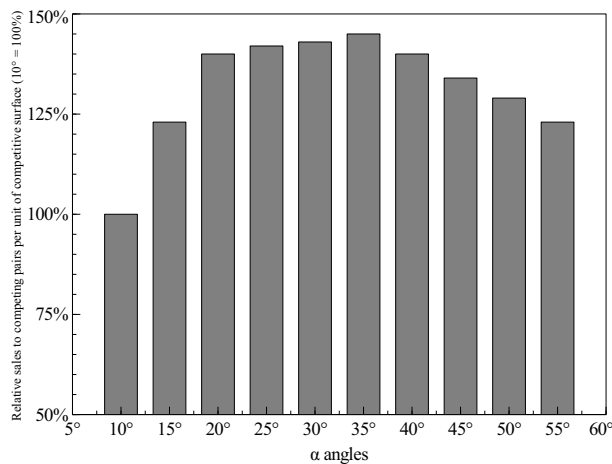


Figure 3: Assessment of the optimal value for angle α .

Next, for these pairs, the union of census blocks that have registered sales for at least one of the two stores is withheld. These data are supplemented with corresponding driving times from the census block to both stores within the pair.

Each focal retailer has multiple pairs of competing stores, each with their own unique store related and environment related features. This makes a comparison between pairs of competing stores very difficult when the aim is only to assess the impact of retail agglomerations and driving times. To obtain the most comparable pair-based results of the direct spatial competition for customers, variations in the spatial component (varying dis-

tances between both stores and varying road network based accessibility between pairs) and the resulting monetary allocations (different competitive landscape in proximity to the pair and spatial consumer heterogeneity leading to spatially fluctuating spending potential in the zones of direct competition) have to be rescaled to a uniform, comparable denominator. This is achieved as follows: Take d_{j1} as the shortest-path driving time between store 1 and the centroid of census block j located within the rhombus between store 1 and 2. d_{j2} is then the shortest-path driving time between the centroid of census block j and store 2. The relative driving time to store 1 for each census block j can then be expressed as $d_{j1}/(d_{j1} + d_{j2})$ or, in other words, the relative amount of time it takes to drive from store 1 to the centroid of census block j when driving from store 1 to store 2, over census block j , holding the assumption of an undirected road network. A relative travel time of 50% then corresponds with a census block which has an equal driving time to store 1 as to store 2. For the corresponding allocations, an equal approach is applied. Take F_{j1} and F_{j2} as the monetary allocations from census block j to store 1 and store 2, respectively. The relative monetary allocation to store 1 is then $F_{j1}/(F_{j1} + F_{j2})$. Doing so eliminates influences entered by internal competition (other competing stores within the same retail network) and external competition and a varying sales potential resulting from different socio-demographic environments around pairs. By only taking pairs of stores, the influence of other stores within the same network that also compete for these geographic blocks are indeed explicitly left out. We argue however, that these other alternatives have no influence on the *relative* preference between the two stores in the studied pair. This property is also known in literature as the independence of irrelevant alternatives (IIA-property) [32]. Finally, the relative allocations are averaged per relative driving time point over a whole set of pairs, each pair containing two stores with their unique store level features that drive store choice. Averaging over multiple pairs mitigates the impact of these features, unless they are explicitly taken into account when selecting pairs. Selecting certain pairs based on store features is thoroughly used in the research questions from Section 5. Figure 4 gives a graphical overview of these allocation distributions between two stores, visualizing the average relative allocation to store 1 over all pairs (y-axis) for blocks at every relative driving time point (x-axis).

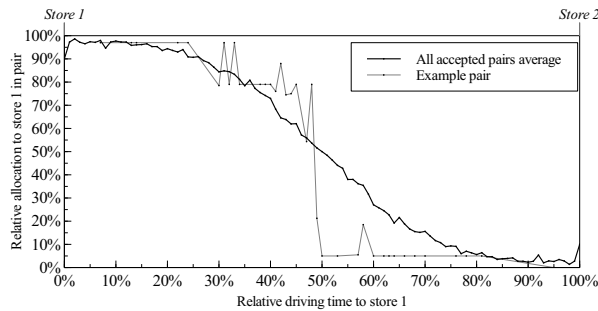


Figure 4: Example of relative allocations to store 1 as a function of the relative travel time ($\alpha=35^\circ$).

It is important to note that the set of accepted pairs for the graph in Figure 4 also contains mirror pairs. That means that next to pair (A, B) , pair (B, A) is also taken into account. When allowing this, store level drivers of store choice, except for relative driving time, are eliminated in the best way possible. Because of this property, such graphs will act as a benchmark for future comparisons. As a result, the graph for the set of accepted pairs is symmetric around the $[50\%, 50\%]$ point. It is indeed rational behavior to spend an equal amount in both stores if these stores are located at an equal driving time, all other influences on store choice being equal for both stores. Figure 4 also shows the relative competition between two stores within a randomly chosen competitive pair for the same focal retailer. The relative allocation graph for the example pair shows there can indeed be significant case specific differences compared to the mirrored total average for all pairs, because all store choice influencing factors are still reflected in this graph. On the other hand, as shown before, all influences of store characteristics and retail agglomerations remain hidden in the symmetric graph, except for relative driving time.

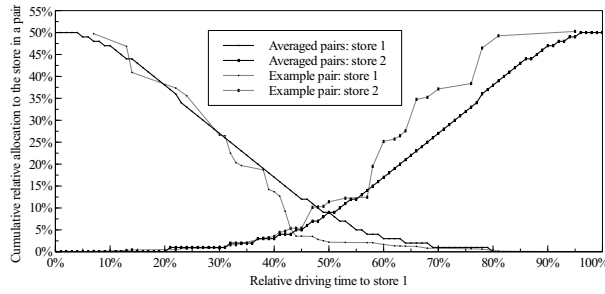


Figure 5: Example of relative cumulative allocations towards store 1 and 2.

Figure 5 shows the relative cumulative allocations towards stores 1 and 2 for the example pair as well as for all accepted pairs for the same retailer. At the 0% relative driving time mark, store 1's share in the total sales in the competitive area for both stores can be seen. At the 100% relative driving time mark, store 2's share in the total sales within the same scope can be verified. Since mirrored pairs are also included in the averaged pairs, relative cumulative sales to both store 1 and store 2 totals at 50%. This is not necessarily the case for an individual pair of competing stores. A shift in spatial competitiveness due to relatively better store features, like a bigger retail agglomeration, can increase the cumulative relative sales of this store above 50%, all else being equal. The stores in the example pair, however, seem to attract an equal total amount of sales from their competitive zone.

4. Test Design

In this study, loyalty card information and exit questionnaires for six different retailers in Belgium are used. The six focal retailers all operate in different product categories and follow different store location strategies. The product categories reflect the type of

product offered by the retailer. Three main categories are usually distinguished: daily goods, exceptional goods and periodic goods, as shown in Table 2. Daily goods like food and personal hygiene are characterized by a high purchase frequency. Exceptional purchases, like electronics, furniture and DIY are generally known to be destination-driven purchases. Finally, periodic goods mainly feature fashion related purchases and are known to be very susceptible to be included in purpose-combining shopping trips. For the store location strategy, three retailers clearly opt for peripheral locations while one explicitly opts to be present in high streets only. The two remaining retailers follow a hybrid strategy of aiming at both high streets and peripheral locations.

	Daily	Exceptional	Periodic
Peripheral	Food retailer	DIY retailer	Fashion retailer
Peripheral and High Street	<i>Not</i>	Media retailer	Footwear retailer
High Street	<i>many stores in general</i>		Fashion Accessories retailer

Table 2: distribution of focal retailers around 2 axes: product category and location strategy.

To objectively measure the extent of retail agglomeration, the Belgian shopping areas are categorized based on their size (see Table 3). The cutoff rules are set arbitrarily while a minimum number of shopping areas within each category is ensured. The top 35 shopping areas in Belgium are characterized by having at least 70 stores at walking distance from one another and are classified as major retail agglomerations. All major high streets in Belgium are included in this category. Medium shopping areas on the other hand contain between 30 and 70 stores at walking distance from one another and can be seen as locally well-known shopping areas. Shop areas with less than 30 stores at walking distance from one another are labeled as small and are spread numerously throughout the country.

agglomeration type	Number of stores at walking distance
Small retail agglomeration	less than 30
Medium retail agglomeration	between 30 and 70
Large retail agglomeration	more than 70

Table 3: The classification of different retail agglomeration sizes.

The first retailer is a supermarket chain with 79 stores in Belgium (see Table 4). It opts to be present in smaller retail agglomerations in order to be generally well accessible to its customers. The second retailer is a major DIY retailer with 84 stores in Belgium. While it primarily aims to be located in smaller retail agglomerations, it also has some stores in medium retail agglomerations. The third retailer sells middle segment fashion with 70 stores across Belgium. Unlike most fashion retailers, its location strategy aims at major traffic axes towards cities rather than city centers, which is reflected in their main presence in smaller retail agglomerations. Two retailers follow a hybrid location strategy: a multimedia and book retailer with 132 stores in Belgium is both active in big city high streets and in minor cities or larger villages. The second retailer is active in the

middle segment footwear market with 69 stores. Lastly, the Fashion accessories retailer has 100 stores across Belgium and focuses primarily on big city high streets, which is reflected in its presence in all large retail agglomerations in Belgium with at least one store. Due to their presence in all large retail agglomerations, they also have a major share of their stores in medium sized retail agglomerations.

	Nr of stores	Stores per agglomeration classification		
		small	medium	large
Food Retailer	79	79 (100%)	0	0
DIY Retailer	84	71 (85%)	13 (15%)	0
Fashion Retailer	70	60 (86%)	9 (13%)	1 (1%)
Footwear Retailer	69	39 (56%)	13 (19%)	17 (25%)
Media Retailer	132	71 (54%)	34 (26%)	27 (20%)
Fashion Accessories Retailer	100	7 (7%)	55 (55%)	38 (38%)

Table 4: Overview of store distribution among the focal retailers.

For the comparison of the spatial competition dynamics between pairs of stores, loyalty card information and exit questionnaires are examined. For privacy reasons, the geocoded customer location from the loyalty card is abstracted to the zone the provided address is located in. Exit questionnaires consist of a simple inquiry at the checkout for the customer’s postal code. The provided geographic information was formatted as annual figures, from 2010 data for the Food retailer to 2013 data for the Footwear retailer. Data from each retailer is however consistent in time, with all data for each retailer covering the same entire year. The geographic allocations resulting from the loyalty cards and exit questionnaires were proportionally adjusted to match the annual store sales. The driving times in turn were calculated using OpenStreetMap data and a shortest-path routing algorithm, PgRouting.

Retail agglomeration data were acquired from Locatus, an on-the-field data supplier with a market-leading database of more than 200.000 retail and service stores in Belgium. They also provide a classification of the retail agglomeration every store belongs to, based on the rule of thumb that all stores within the agglomeration are at walking distance from one another.

Figure 6 depicts the different research questions that will be investigated. The first comparison that can be made covers the specific spatial competitive patterns for customers along the product category axis. This research question mainly concerns the impact of relative driving time on intra-network store choice for consumers. In the second research question the focus shifts towards the impact of retail agglomerations on store choice. For this research question, the retailers with a hybrid location strategy are in scope. The third and final research question, on the other hand, investigates the other retailers with a clear location preference focusing on either peripheral or high street locations. They do however sometimes expand to locations outside their core store location strategy. This research question then investigates the impact of the differentiating retail agglomeration sizes on the intra-network store preference for their customers.

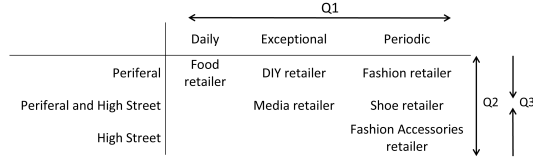


Figure 6: Visual representation of the research questions.

5. Results

In this section the results for the pairwise comparison of intra-network store choice along the two axes of the matrix (Figure 6) are presented, and answers to the relative impact of driving time and retail agglomerations on consumer intra-network store choice are provided through the three research questions.

Q1: The impact of driving times on intra-network store choice along the product category axis

The first comparison that can be made is to compare the spatial competition between pairs of stores for retailers that offer products from different categories: daily, periodic and exceptional goods. Table 5 shows the number of accepted competitive pairs for each retailer for this research question. As the research focus is on the impact of relative driving time, other influences -like brand, store and environment related influences- should be abstracted from the results as much as possible. This implies the inclusion of all pairs, including mirror pairs.

	Nr of accepted pairs
Food retailer	1094
DIY retailer	360
Fashion retailer	186
Footwear retailer	320
Media retailer	1328
Fashion accessories retailer	466

Table 5: Number of accepted competitive store pairs for Q1.

Figure 7 then shows the relative sales distribution to store 1 for every pair of stores for the three retailers with a peripheral location strategy. As mirror pairs are also included, Figure 7 is symmetric along the 50% points of relative driving time and relative allocations. All retailers but the food retailer follow a similar curve for the relative allocation of sales, while the food retailer has a more expressed sigmoid function, with a steeper descent along blocks at almost equal driving time to both stores. The impact of driving on intra-network store choice is clearly a lot more significant for the food retailer. As the frequency of purchasing at stores selling daily goods is much higher than for stores

selling products from other categories, the impact of driving time on intra-network store choice logically carries more weight. Furthermore, as the focal food retailer only has stores in small retail agglomerations, a possible attenuating effect of purpose-combing shop tripping on the impact of driving time is virtually non-existing for this retailer. These findings are also in line with findings by Rhee [33], who discovered that 94% of all grocery purchases are effectuated in the same grocery store. They find that, among others, a convenient location is vital for consumers when choosing their most-preferred grocery store. A similar clear preference pattern for one particular grocery store can also be seen in Figure 7. Ellickson and Grieco [34] found that a Wal-Mart entry in a local US grocery market has an observable spatial effect on competitors up to just 2 miles, again confirming that proximity to the customer is an important driver for store choice specifically in the grocery market.

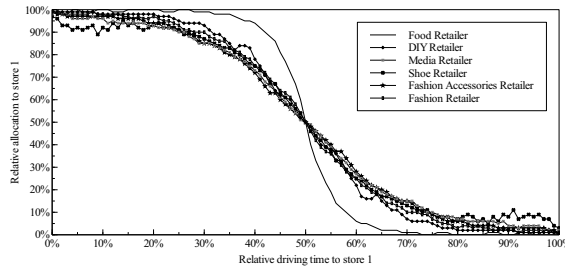


Figure 7: Cross-product category pairwise comparison of relative sales for all focal retailers.

Q2: Spatial competition for retailers with hybrid location strategies

Retail agglomerations can induce multipurpose shop tripping and thus alter store choice. Including an otherwise lower utility yielding store - due to longer driving time - can now yield a higher utility when its visit is combined with visiting other stores in the same retail agglomeration. This means that retailers that opt to be present in both small and large retail agglomerations can witness different forms of spatial competition for customers between stores, depending on the size of retail agglomerations the stores are located in. In the first part of the second research question, Q2a, the spatial competition for customers between a store located in a larger retail agglomeration and a store in a small retail agglomeration is investigated. There might also be a different pattern of spatial competition between stores that are located within approximately the same size of retail agglomerations. The impact on spatial competition for pairs of stores in these cases is investigated in the second part of this research question, Q2b.

Q2a: The impact of retail agglomerations on spatial competition

The focal retailers following a hybrid location strategy, in this case the Media and Footwear retailer, have both a fair share of their stores located in small and large retail agglomerations. This means that their brand strength and the kind of products sold enables them to be successfully active in both types of agglomerations. For exam-

ple, the Media retailer is a well-known brand that also sells newspapers and magazines, which generates enough daily traffic in smaller retail agglomerations to be viable. Spatial competition, however, can be quite disturbing for those stores in small agglomerations having a competing store from the same brand in a large retail agglomeration nearby. The increased utility for a customer due to multipurpose shopping possibilities in larger shopping agglomerations leads indeed to an increased willingness to travel further to these larger agglomerations, resulting in a larger trade areas. These larger trade areas in turn have an increased possibility of confluenting with trade areas of other stores within the network, thus resulting in increased spatial competition for the same customers. This possible issue is investigated in this section.

Table 6 shows the number of pairs of stores for both retailers that witness direct spatial competition for customers where store 1 is located in a major retail agglomeration and store 2 is located in a minor retail agglomeration. These results are compared to the symmetric benchmark situation where also mirror pairs are included, resulting in the abstraction of the impact of retail agglomerations on store choice within pairs (see Figure 8).

	Nr of accepted pairs
Footwear retailer	59
Media retailer	168

Table 6: Nr of pairs in direct competition with store 1 located in a large retail agglomeration and store 2 in a small retail agglomeration.

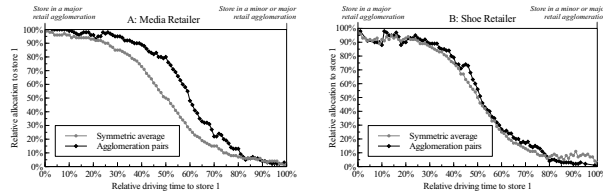


Figure 8: Different spatial competition patterns with varying retail agglomeration magnitudes for the Media and Footwear retailer.

The results from Figure 8 imply that for the Media retailer, relative sales and thus store choice in the region of direct competition is much more shifted towards the store in a major agglomeration than in a similar case for the Footwear retailer. This could indicate that buying shoes in stores of the Footwear retailer is much less likely to be included in a one-stop, multi-purpose shopping trip. However, a more likely explanation would be that the Footwear retailer, due to a strong brand name, benefits marginally less from retail agglomerations, because their customers are attracted to the brand rather than to the retail agglomeration. The Media retailer on the other hand should be more wary about the effects of opening a store in a major retail agglomeration on the sales of existing outlets in smaller retail agglomerations located in the vicinity.

Figure 9 shows the average cumulative relative sales to both stores in the accepted pairs for both retailers. For the Media retailer, a store in the large retail agglomeration captures on average 60% of the total sales to both stores in the zone of direct competition. The store in the smaller retail agglomeration thus captures on average 40% of the total sales to both stores in the same area. The benchmark graph, on the other hand, including all pairs and mirror pairs, results in a logical fifty-fifty split. The major shift in store preference towards a store in a larger retail agglomeration can be seen for consumers that are located closer to the smaller retail agglomeration (i.e. past the 50% relative driving time mark). In this area, there is a clear difference in steepness of the curves for the benchmark and the agglomeration pairs. For the Footwear retailer, the difference between both curves is minimal, which corresponds to the results in panel B from Figure 8.

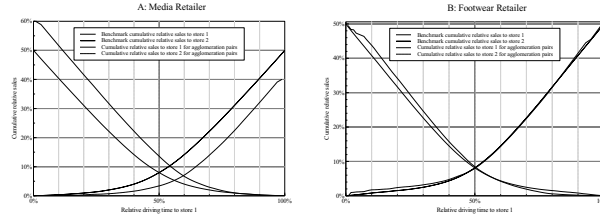


Figure 9: Average cumulative relative sales to both stores 1 and 2 within the accepted pairs for varying retail agglomeration sizes for the Media and Footwear retailer.

Q2b: Spatial competition between stores in similar retail agglomeration sizes

While Q2a answered the question on how spatial competition manifested itself for stores in varying retail agglomeration sizes, spatial competition for customers can also differ between pairs of stores located both in about the same size of retail agglomeration, and which thus yield equal utility from purpose-combining shop tripping. To assess this, the sales data of the retailers with a hybrid location strategy are used, as they possess the most equal spread of stores across retail agglomeration sizes. Table 7 shows the number of pairs that satisfy the condition for this part of the research question.

	Nr of accepted pairs		
	small	medium	large
Footwear retailer	98	12	18
Media retailer	336	98	54

Table 7: Number of accepted pairs for both retailers following a hybrid location strategy.

Figure 10 shows that there is no different spatial competition pattern for pairs of stores who are located in retail agglomerations of about the same size. This implies that

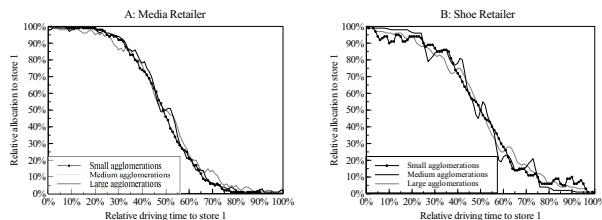


Figure 10: Spatial competition for pairs within the same retail agglomeration size for the Media and Footwear retailer.

the impact of driving time on store choice does not change if two stores in about the same retail agglomeration size are in a customer’s choice set, which can be explained by the equal derived utility of the retail agglomerations for both stores.

Q3: Effects on spatial competition outside the retailer’s core location strategy

Each retailer has chosen its location strategy very careful as a function of their product offering, brand strength and overall strategy. However, large retail agglomerations are scarce and it is not likely many more will be allowed to be constructed in an already saturated retail market. For further growth, it is then necessary for retailers strategically focusing on these large retail agglomerations for expansion to move down to smaller retail agglomerations. On the other hand, retailers focusing on peripheral, smaller retail agglomerations have a more abundant choice set for expansion. However, they sometimes get an opportunity to test their concept within larger retail agglomerations. In these cases it is then interesting to see how their store concepts work outside their core location strategy. In Table 4 we can see that the DIY and Fashion retailer already have some stores outside their core location strategy of opening peripheral stores. Comparing the spatial competition between stores located outside and inside their core focus of small retail agglomerations allows to assess what the cannibalization effects of moving outside the core location strategy are. Table 4 also shows the Fashion accessories retailer has opened stores in medium and smaller retail agglomerations while its core location strategy is to open stores in major retail agglomerations. By assessing the spatial competition between stores in major agglomerations versus those in smaller agglomerations, it is possible to determine the cannibalization risks of further expansion towards smaller retail agglomerations.

	Agglomeration size		Nr of accepted pairs
	Store 1	Store 2	
DIY retailer	> 30	≤ 30	54
Fashion retailer	> 30	≤ 30	23

Table 8: Number of accepted pairs for Q3 for the DIY and Fashion retailer.

Table 8 shows the number of accepted pairs based on which can be investigated how the DIY retailer and Fashion retailer benefit from being located in increasing sizes of retail agglomerations.

Figure 11 shows how spatial competition patterns between stores can differ when one store (store 2) is located in a retail agglomeration outside the general store location strategy of the retailer, while store 1 is located within the core location strategy. The benchmark graph shows the spatial competition patterns when both stores of a pair are located within the core location strategy. Part A clearly indicates that for the DIY retailer, very few agglomeration effects can be noted when a store (store 2) is opened in a medium agglomeration. For this retailer, this is an important conclusion, for commercial real estate rental prices are often higher in larger retail agglomerations [15], while there is no clear evidence the store also benefits from synergy effects with other retailers in these agglomerations. In part B of Figure 11 some small differences in spatial competition can be noted for the Fashion retailer in favor of the store located in the larger retail agglomeration. This might give an indication for the retailer to further investigate the viability of opening stores in larger retail agglomerations.

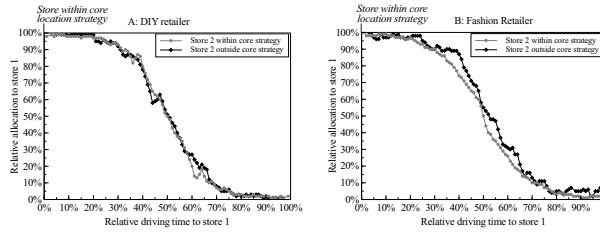


Figure 11: Comparison of spatial competition patterns within and outside the general location strategy for the DIY and Fashion retailer.

Figure 12 shows the average cumulative relative sales to both stores in the accepted pairs. Panel A shows there is no clear difference between the pairs of DIY-stores that are both located within the core strategy of peripheral locations and pairs of stores with one store (store 2) located outside and one (store 1) located within the location strategy. In both cases, on average 50% of the total sales to both stores in the area of direct competition goes to either store. Panel B on the other hand shows that for the Fashion retailer, there is a minor shift in preference and thus in total accumulated sales towards store 1, located in a larger retail agglomeration. On average up to 5% of the total sales to both stores within a pair shifts to the store in the larger retail agglomeration. Comparable to panel A of Figure 9, the increase in curve steepness and thus shift in store preference can mainly be seen for customers past the 50% relative driving time mark, i.e. for customers located closer to the store in the small retail agglomeration (store 2). They will derive more utility from combining shopping purposes in the larger retail agglomeration which offsets the additional time cost compared to a visit to the store in a smaller retail agglomeration.

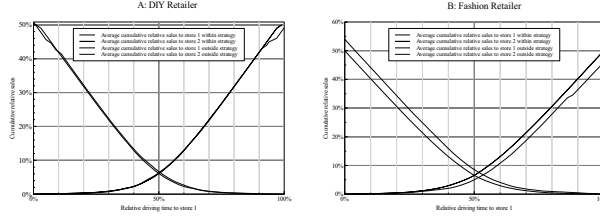


Figure 12: Comparison of the average cumulative relative sales for pairs with store 2 within or outside the general location strategy for the DIY and Fashion retailer.

To facilitate further growth and expansion, the Fashion accessories retailer has to expand towards smaller retail agglomerations as it is already present in all major retail agglomerations in Belgium. However, spatial competition for customers located between a store in a smaller retail agglomeration and a store in a larger retail agglomeration might be settled in favor of the store in the larger retail agglomeration if purchasing in a store of this brand is largely susceptible to be included in one-stop multipurpose shopping trips. In this case the viability of opening a store in a smaller retail agglomeration could become questionable. Table 9 shows that the retailer has already expanded towards smaller retail agglomerations.

	Agglomeration size		Nr of accepted pairs
	Store 1	Store 2	
Fashion accessories retailer	≥ 70	< 70	116

Table 9: Number of accepted pairs for Q3 for the DIY and Fashion accessories retailer.

Figure 13 shows the spatial competition pattern for pairs of stores for the Fashion accessories retailer. Pairs of stores where both stores are located in major agglomerations are compared to pairs of stores where store 1 is situated in a major retail agglomeration and store 2 is situated in a small or medium retail agglomeration. The figure clearly shows that stores in smaller retail agglomerations that are in direct competition with larger neighbors suffer from the customer's preference for a one-stop, multi-purpose shopping trip to the larger retail agglomeration. The retailer, planning a new opening in a smaller agglomeration in the vicinity of a large retail agglomeration where he is already present, should thus be very wary of the vast existing influence from the large retail agglomeration.

Figure 14 indicates that if there is direct spatial competition for customers between a store in a smaller retail agglomeration and an existing store in the network located in a larger retail agglomeration, on average up to 8% of sales to both stores in the zone of direct competition will shift towards the store in a major retail agglomeration due to increased utility for customers in combining shopping purposes in the large retail agglomeration. Comparable to panel A of Figure 9 or inversely to panel B of Figure 12 ,

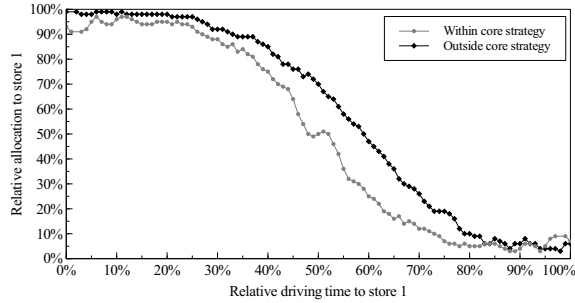


Figure 13: Comparison of the spatial competition between pairs of stores within and outside the general location strategy of the Fashion accessories retailer.

the major shift of store preference compared to the situation where store 2 is also in a major retail agglomeration, can be found for customers located closer to store 2.

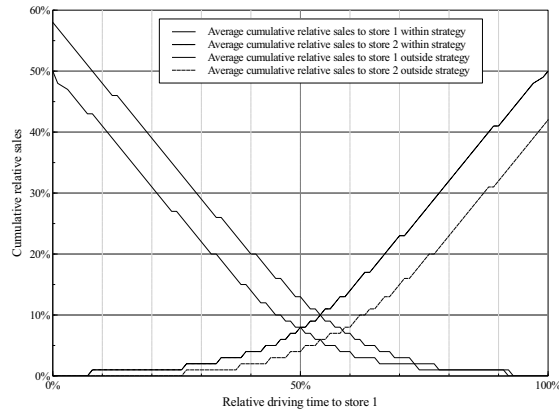


Figure 14: Comparison of the average cumulative relative sales for pairs with store 2 within and outside the general location strategy of the Fashion accessories retailer.

6. Discussion and Conclusions

From the above presentation of results, it is clear that the spatial dynamics of internal competition for customers is different for varying product categories and store location strategies. Consumers are much more driving time sensitive for the super market retailer in the daily goods category than for the other studied retailers in periodic or exceptional goods. Furthermore, this research has also shown that there is a different impact of unequal retail agglomeration size for competing stores of different retailers. However, there was no clear evidence that driving time had a varying impact for competing stores in

retail agglomerations of about the same size. Finally, there was also a varying impact of retail agglomeration size on spatial competition for customers between two stores when retailers move outside their core location strategy.

These conclusions have a significant managerial impact for both expansion strategies as well as marketing strategies. In expansion strategy, it is vital that the retailer's specific spatial competitive blueprint is taken into account, with specific attention to the varying impact of driving time and a varying impact of retail agglomeration sizes. For the Daily goods retailer, the expansion strategy should for example be focused on a geographic spread of stores to avoid high cannibalization of sales of existing stores, which is clearly driven by driving time. In this case delineating future trade areas could be based on closest proximity to the customer. While other retailers, mainly strategically focusing on high streets and with a similar spatial competitive blueprint as the Fashion accessories retailer in our study, should be very cautious about expanding to smaller retail agglomerations and maintain a focus on purpose-combining shoppers in larger retail agglomerations. For them, an expansion strategy focusing on geographic spread would be inferior as derived utility and thus willingness to travel further to a larger retail agglomeration will clearly be much higher. Expansion to larger consumer attraction poles is then advisable as cannibalization of sales within the network will then be minimized.

Moreover, geographic marketing strategies such as leaflet distribution can be optimized using findings of this research. For the Food retailer, geographically separated store-tailored folders are advisable as there is a clear division line between trade areas based on driving time. For the other retailers, this division line is much less present, and it can be advisable to cluster folders in areas where pairs of stores are competing directly for the same customers. Furthermore, the cost of a joined folder can also be divided according to their relative share of sales in these areas of direct competition. Also, for any franchise chain, investigating the spatial competition between stores is of major importance. In such an environment, much discussion around expansion involves concerns of incumbent franchisees on the cannibalization of their sales by a possible network extension. Using the findings of this research, a well-founded answer can be given to this concern and tailored steering actions can be undertaken to mitigate the negative effects for the incumbent franchisees.

Moreover, it is a common phenomenon in franchise chains to operate within judicially defined geographic zones. With the findings of this research, these zones can either be delineated objectively if there is clear geographic competition based on driving time, or if existing judicial zones already exist and there is no clearly separated geographic competition, as was the case for most retailers, these zones can be reevaluated and their added value can even be questioned.

Lastly, during the development of new retail agglomerations, it is vital to predict its impact on local consumer behavior in order to assess the continued viability of neighboring retail agglomerations [35, 36]. In this light, this study allows for a detailed, store-based assessment of the cannibalizing effects on neighboring retail agglomerations, especially when retailers are already involved in the planning stage of such new retail agglomerations.

This study is however limited to the assessment that driving times and retail agglomerations can have a varying impact for different retailers. Therefore, future research could shed some light on the influence of other store and environment related drivers for store choice. Next to that, it cannot give an indication on how much sales will be cannibalized on existing stores in case of a network expansion. To this end, a model like presented in Pancras et al. [2] can be used, with the findings of this research as relevant input parameters. Any predictive model taking the spatial component into account should thus take its own specific intra-network spatial competition parameters into account in the right way. In doing so, these models are able to accurately assess the net impact of a modified store network on geographic block, store and network level. Future research should indicate how these dynamics may be taken into account in such a model. Also, the pairwise comparison strategy followed in this paper can also be extended in case the sales data of (some) competitors are known. In this way, the competitive strength, expressed in a geographical competitive blueprint, can be assessed and taken into account for future expansion and market share capturing strategies. Furthermore, the definition of retail agglomeration environments could be specified on a more fine-grained level. Rather than taking the total set of neighboring retail outlets, it is possible to detect retailer-specific clustering and avoidance patterns with certain types of retail categories [37, 38, 39] and linked retail agglomerations [9]. Clustering with complementary retailers while avoiding neighbouring non-complementary retailers leads to even higher utility for consumers, reinforcing attraction of the store and thereby increasing intra-network sales cannibalization in its trade area.

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