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Hengstermann, A. H., Jehling, M., & Guimarães, P. (Ed.) (2023). Understanding Private Preferences in Urban Development—Analysing Spatial Patterns of Food Discount Stores Locations in Switzerland. *Sustainability*, 15(7), [6015]. <https://doi.org/10.3390/su15076015>

[Link to publication record in Ulster University Research Portal](#)

**Published in:**  
Sustainability

**Publication Status:**  
Published online: 30/03/2023

**DOI:**  
[10.3390/su15076015](https://doi.org/10.3390/su15076015)

**Document Version**  
Publisher's PDF, also known as Version of record

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## Article

# Understanding Private Preferences in Urban Development—Analysing Spatial Patterns of Food Discount Stores Locations in Switzerland

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**Abstract:** This paper examines the spatial pattern of food discount stores in Switzerland, where private actors made location decisions without interference from planning regulations until 2016. Using aerial images and a classification scheme with functional and morphological attributes, the study shows that the majority of discount stores were built in peripheral commercial areas or greenfield sites as solitary buildings, indicating a preference for minimal land acquisition costs and car orientation. Some integrated central locations were also chosen. The average density measured by floor area ratio was low. The results suggest that without planning intervention, private actors' decisions would lead to sprawled settlement patterns with high ecological and societal costs. Further research is needed to explore the potential role of planning in mitigating this effect.

**Keywords:** planning law; retail planning; planning legitimacy; aerial images analysis; patterns of urban sprawl; effect-of-cause study



**Citation:** Hengstermann, A.H.; Jehling, M. Understanding Private Preferences in Urban Development—Analysing Spatial Patterns of Food Discount Stores Locations in Switzerland. *Sustainability* **2023**, *15*, 6015. <https://doi.org/10.3390/su15076015>

Academic Editor: Pedro Guimarães

Received: 9 March 2023

Revised: 23 March 2023

Accepted: 27 March 2023

Published: 30 March 2023



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## 1. Introduction

“Everyone has the right to own, use, dispose of and bequeath his or her lawfully acquired possessions. [...] The use of property may be regulated by law in so far as is necessary for the general interest” (Art. 17 CFR) [1]. In many countries, the goal of compact settlement structures represents a primary public justification for allowing planning's intervention into private property [2–4]. National planning laws and building codes explicitly state the importance of preventing urban sprawl, e.g., Switzerland (Art. 75 para. 1 SC) [5], Germany (§ 1a para. 2 BauGB) [6], and France (Art. L101-2 para. 6 CU) [7]. The legally defined objectives unveil an implicit paradigm rooted in the very idea of planning. Suppose planning does not interfere with private property rights, private actors will allocate land uses efficiently in terms of their individual preferences and—in sum—would cause inefficient settlement patterns [8,9]. The resulting urban sprawl is considered a significant threat to sustainability [10–12]. It is thus the role of planning to coordinate building activities, using various instruments of public policies [13] to influence private decisions towards coordinated, denser, urban patterns [14,15].

The contradiction of the assumed role of planning to ensure density and the contrasting reality of settlement development becomes particularly visible in the debate about retail development in the planning discourse [16–18]. The last decades showed an apparent erosion of an intra-urban hierarchical model while out-of-town development became the new normal in many Western countries [12,19–22]. Following this spatial trend, shopping centres and grocery shops were allocated to locations that best suit actors' business models [23]. Existing retailers in inner-urban locations have come under pressure and become inferior to the new competitors on the greenfield [24–26]. As grocery shops often serve as anchors within the local retail structure, shopping malls or discount stores can

jeopardise traditional businesses' survival in the traditional centres [27] and contribute to the decline of small-town centres [28–30]. Additional trip length and car dependency are directly related to urban sprawl [12,31]. Further, car-based traffic, the subsequent change of urban structures and catchment areas, and the advent of online shopping have dramatically changed the status quo—this was true even before COVID, but has accelerated since [21,31–33].

Apparently, retail location decision are heavily contradicting compact settlement structures with strong central places as advocated by planning practice and theory [20,34,35]. Given the importance of this opposing development, however, the planning discourse is still rooted in arguments, empirical evidence, and interventions elaborated decades ago, based on the knowledge at the time [36–38]. Hence, we argue that one of the most basic assumptions of planning—private actors will allocate land uses efficiently in terms of their individual preferences and thereby cause inefficient settlement patterns—requires up-to-date empirical proof.

It is the aim of this paper to develop and apply an approach to advance empirical knowledge of private actor's preferences for planning research. In focussing on retail development, we propose a planning system perspective to empirical research on intra-urban or regional retail location choices [39], which so far mainly focusses on findings based on national policies [27,40], cities as case studies [19,21], individual projects [41], transport issues [42], neighbourhoods [16], or town centre paradigm [25,43]. This allows us to add to the discourse, and to determine whether interferences on property rights by planning is required to prevent urban sprawl and thus justified.

Methodological questions need to be solved to reach the aim. Testing empirically holds potential pitfalls of evidence-based research in general and due to planning's omnipresence [44,45]. A pure setting for analysing what private actors prefer if there was no planning at all cannot be provided, as modern states always have some kind of planning and building regulation in place, even if a traditional zoning approach is absent [46]. Subsequently, most planning research is focused on plausible argumentation in terms of reasoning, often using ethical or moral considerations [47–49]. Adding an empirical analysis to this strand of research requires a robust case study design that allows us to test the paradigm in terms of a hypothesis [50]. At first, the effect of planning on private location decisions needs to be controlled for, in terms of framing planning as a distinguishable cause (explanatory variable). Second, the case requires clear boundary conditions. We argue that this can be reached through the following three criteria that are to be met in a quasi-experimental setting: (a) public and private interests in location decisions are distinguishable and (ideally) stand opposed; (b) to be meaningful, the number of cases of location decisions must be high without significant change of relevant internal variables, e.g., private actor's interest; and (c) public planning's influence is as minimal as possible. This setting allows us to empirically test the following hypothesis: the lower the planning intervention, the more private actors will prioritise their assumed main interests in cost reduction, which results in a spatial pattern characterised by peripheral and green field locations, i.e., urban sprawl.

To test this hypothesis, we make use of an exceptional situation: the absence of specific planning regulations for food discount stores in Switzerland built between 2005 and 2016. While the German food discount chains *Aldi* and *Lidl* entered the Swiss market in 2005 and 2009, respectively [32], the planning system barely regulated them until major legal reforms in 2016. In using this, we are able to set the absence of public planning (or to be precise, a very low degree of concrete public-law planning regulations) as a cause and ask about its effect on spatial patterns emerging from private actors' location decisions. Taking such an effect-of-cause perspective [50] enables us to test the hypothesis by analysing the discount stores' emergent spatial patterns, which were created in the respective period (following [51,52]). The underlying understanding of causality follows an INUS concept, applied in political sciences. The cause of interest, i.e., absence of public planning, is considered an "insufficient, but necessary part of an unnecessary but sufficient condition"

(Mackie, 1965 in [53]). It is insufficient, as it is only in combination with the food discount chains' interests that it explains the location of a discounter. However, it is a necessary cause for development, as without it, the actors would have been restricted in their decision.

## 2. Methodological Background

The research design follows a case-based approach, operationalising the criteria mentioned above for the empirical analysis of the emergent food discounter stores in Switzerland. (1) Food discount companies' defining business model is based on the uncompromising reduction of costs [36,53–56], primarily by a radical increase in efficiency and the elimination of unnecessary comfort. This approach also includes reducing costs for construction and land as much as possible [32]. Therefore, the assumed effect (location outside traditional centres) should occur more clearly than similar entities, such as ordinary grocery shops. Discount stores' location decisions are diametrically opposed to the demands from public planning [20,34], as they are known for requiring non-central and not built-up locations [28,57]. Public and private interests are clearly distinguishable. (2) Given the large number of stores, conclusions can be drawn on a broad basis [50,57,58], reducing the influence of individual factors in the respective circumstances of a case. Food discount stores can be seen as an everyday business, best illustrating and comparing working mechanisms and serving as a quasi-experiment [59]. (3) Finally, our particular focus on Switzerland during a specific period allows us to analyse a situation with very little planning influence. Planning authorities could only apply rather general planning regulations (zoning, building code) but no specific retail regulations (e.g., excluding discount stores from specific zones or assigning them to suitable locations by regional planning coordination). Consequently, we have minimal planning influence and the absence of specific retail regulation.

As the companies are very restrictive on publishing information [60,61] and efforts to approach them for this study were unsuccessful, the research design takes spatial locations as the object of analysis. Through locations, we can infer the decisions' taken by the two companies. The empirical analysis consists of a complete survey of all food discount stores in Switzerland built during the period. The spatial patterns are analysed by visual interpretation of aerial images for each food discount store built before the legal changes in 2016. To identify a general trend, a structured interpretation is conducted to reveal spatial patterns through a two-dimensional classification scheme with morphological and functional attributes is applied.

## 3. Empirical Approach

An empirical approach was developed to test the hypothesis to describe the stores' spatial characteristics (spatial distribution and attributes) resulting from landowners' and companies' decisions in a structured way. We therefore developed a classification that defines the visual interpretation of aerial images based on morphological and functional attributes. The classification of stores thus shows the general distribution of locations.

### 3.1. Classification of Food Discount Stores

The location characteristics of stores are operationalised for spatial, empirical analysis. Following a market-led logic and an optimisation paradigm of their business model for reducing costs, companies would opt for building land that fits their predefined spatial parameters such as floor space and parking space, even neglecting typical aspects such as potential clients and existing competitors. Contrary to planning policy's preference of compact urban development and the functional integration of new commercial uses to existing centres [20,25], they would further favour peripheral locations with low land values but high accessibility by car. This is in line with Adeniyi et al. [62], who analyse locations of food discount stores with the theoretical understanding that location is primarily influenced by socioeconomic characteristics and planning and zoning constraints.

For this study, discount stores are thus characterised by their functional integration in an urban context (macro level) and the morphological context of the building itself

(micro level). Macro-attributes focus on the location of the store within the spatial urban context. Here, central place, bid rent, or minimum differentiation theories are often used to explain food discount stores' locations [62–64]. The conceptualisation of central place as a modelling hierarchy of centres with higher-tier centres offering a broader range of goods remains essential for planning, although its overarching theoretical elements are to be questioned [65]. However, while the economic assumptions of the theory do not hold in many terms for today's shopping behaviour, the aspect of reducing car traffic is still valid [21,31]. For example, Black et al. [66] use density and use of public transport as a proxy parameter to describe food stores' location within an urban context. Due to its high relevance for planning, we adapt the central place concept [21] and, following Bleyer [67], differentiate degrees of centrality to describe the stores' locations. From a retail perspective, this allows us to refer to the integration of a location in functional terms. From a municipal perspective, it has been shown that centrality decreases from high street to peripheral locations on the urban fringe [67,68].

The centrality of a store is determined, indicating the macro-level (Table 1). We distinguish along a gradient from stores with a high centrality level to those with a low level outside traditional supply centres (*peripheral*). Central stores are assigned to *high-order* (e.g., main shopping streets in larger cities), *medium-level* (e.g., centres of districts or smaller towns), and *basic centres* (e.g., neighbourhood centres). The assignment is based on a functional–spatial relationship instead of administrative partitioning. Thus, various stores within one municipality may have a different centrality level due to their location within the city. For peripheral stores, the context is characterised according to its predominant functional–spatial quality. It is distinguished between *residential areas*, *industrial-commercial areas*, and *greenfield areas*. We deliberately use the term “area” instead of the term “zone” (stemming from planning law) as only their spatial character, not their exact legal status, is described.

**Table 1.** Operationalisation of the centrality of food discount store location. Source: Authors' own.

Centrality	Description	Typical Retail and Service Facilities	Code
Higher-ordered centre	High street location in city or town centre. Serves the supply of episodic necessities.	Specialist shops (e.g., toyshops), theatre, plus those of medium-ordered centres.	1
Medium-ordered centre	Secondary centre of towns or centre of medium-sized towns. Serves the supply of periodic necessities.	Warehouses, cinema, fashion shops, small niche specialist shops (e.g., leatherware, watch shop), plus those of basic centres.	2
Basic centre	Centres of the neighbourhood or small villages. Serves the supply of daily necessities.	Hairdresser, pharmacy, bank, post office, small grocery shop, butcher shop, kiosk.	3
Residential periphery	Non-central area with predominant residential land use. Scattered shops and services.	Bakery, medical practice, tax consultancy, architectural office.	4
Commercial–/Industrial-periphery	Non-central area with predominant commercial and/or industrial land use.	B2B-business, DIY store, factory outlet, furniture store, big-box retailer.	5
Outside built area-periphery (“greenfield”)	Non-central area outside the general built-up area, e.g., close to highways, greenfield, or similar.	Agricultural facilities incl. farm shops, raw materials trading.	6

The attributes on the micro level refer to the characteristics of the building itself (Table 2). The retrieved attribute is based on analysing design aspects [41] and the operation mode [24,57,68]. The attribute comprises two levels that characterise the property based on the (a) type of construction and (b) the mode of operation. Swiss planning law distinguishes between buildings built as *open construction* and those made as *closed construction*, describing

whether the distance is kept between neighbouring buildings (e.g., art. 13 BauG/BE). The mode of operation refers to site management. It is differentiated into three types. First, stores that directly share at least one crucial element (such as property, the car park, or the advertisement system) with another retailer on a shared plot. Their mode of operation is called *joint*. Second, stores that show this close relation indirectly from a client's perspective, due to their spatial proximity, but are not on a shared plot. Their mode of operation is characterised as a *cluster*. Finally, stores that do not relate their mode of operation to other retailers. Their mode of operation is called *solitary*.

**Table 2.** Operationalisation of the morphology of food discount store itself. Source: Authors' own.

Type of Construction	Operation Mode	Description	Code
Closed	Jointly	Enclosed construction. Several retailers within one building (e.g., shopping centers, shop-in-shop under one roof or within multifunctional buildings).	A
		Detached construction. Several retailers on a shared plot sharing elements (e.g., parking, advertisement).	B
Open	Cluster	Detached construction. In proximity of other retailers (from client's perspective).	C
	Solitary	Detached construction. No link to other retailers (e.g., similar to so-called big box-stores).	D

In combining the functional (macro level) and morphological attributes (micro level), we gain a classification scheme that can be applied to food discount stores' descriptions, covering the stores' heterogeneity concerning space and place rather precisely. Figure 1 gives an illustrative example of how the combination of both attributes can describe locations, from highly integrated (A1: joined and high centrality) to peripheral (D5: solitary and greenfield). The attributes are then operationalised for the visual interpretation of each food discount store's location in the period of analysis in Switzerland.



**Figure 1.** Examples of classified locations through centrality and design attributes. © swisstopo.

### 3.2. Survey and Data

The classification is based on address data and a descriptive and visual interpretation of aerial images [69]. This allows for taking a high number of stores into account and logs information on property boundaries and land use details (identifiable by objects

or by changing surface textures) regarding the macro and micro attributes, including parking places or property boundaries (see Figure 1). The present study is based on images provided by the Federal Office of Topography (swisstopo), given their free availability, nationwide coverage, and adequate resolution [70]. Those images are being updated in a three-year cycle. The images used for this paper were obtained by systematic overflying and photogrammetric surveying in 2015–2017 (*SwissImages25*). A higher resolution is available in urban areas (10 cm each pixel). For the periphery (especially in the high-Alpine region), the 25 cm resolution is calculated based on 50 cm primary images; however, those images are rarely used as it contains a small number of discount stores.

The present study incorporates a large sample. According to the companies' websites, *Aldi* and *Lidl* run 275 stores in Switzerland as of 31 December 2016. We used their database to obtain the addresses and locate the stores in the swisstopo images. In 256 cases (93%), the images from swisstopo were of sufficient quality and sufficiently up to date to collect the data needed and conduct the analysis. Due to these framework conditions, the remaining 7% of stores are probably located in more rural areas (such as the Alpine region) and relatively younger (time difference between images' shooting date and reporting date). The analysed sample is thus highly representative of Switzerland's food discount stores. As the images used are geo-referenced and true scaled, interpretation of moderate precision is possible. This opportunity is used to collect more technical information on the food discount stores beyond the mentioned macro and micro-attributes. To the extent possible, (1) the size of the property, (2) the ground size of the building, and (3) the number of storeys (if identifiable by shadowing or additional vertical image) were collected too. Some indirect attributes could be calculated based on this information, especially the floor area ratio (FAR).

## 4. Results

### 4.1. The Case: The Absence of Specific Retail Regulations in Switzerland until 2016

By definition, food discount stores take a market position via low prices [32,36,54,56]. Jürgens [57] states that low prices characterise discount stores, along with segments of different sizes dominated by their own labels, standardised store structure and interior design, a limited number of product lines, "simple" product presentation and minimalist service, dense promotion, high visibility, and high recognition. This traditional unique selling point characterises discount stores today, even though the concept's details have developed over time [32,36].

Discount companies (in Europe) seek to develop plots of a minimum of 4500 m<sup>2</sup> to build standard stores of 650 m<sup>2</sup> at least, but typically of between 800 m<sup>2</sup> and 1400 m<sup>2</sup> of retail floor space and around 130 parking slots close to a major road. The location should cover a catchment area of 20,000 potential clients [71]. The construction itself should be as standardised as possible to reduce engineering and architecture costs.

From a planning policy's perspective, these location requirements are highly problematic, as the Swiss legal planning objectives show. They implicitly contain some spatial impacts that are difficult to reconcile with planning purposes, such as the economic use of land (art. 75 SC), creation of compact settlements served by public transport (art.1 para. 2 lit. b and art. 3 para. 3 lit. a SPA) [72], and decentralised food supply (art. 1 para. 2 lit. c and d SPA). The discount stores' business concept includes a clear focus on weekly bulk shopping and are thus typically oriented towards car-based customers. The ground-level design also leads to low density, large distances between buildings, and high urban sprawl. Accessibility by public transport or non-motorised traffic (cyclists, pedestrians) is difficult, inefficient, and uncomfortable. Subsequently, the business concept does not allow high land prices to be paid. All in all, due to their business concept, discount stores prefer locations in the city's outskirts (very often in industrial areas) and are rarely in neighbourhood centres.

Food discount stores are a comparatively young phenomenon in Switzerland. Whereas other Western European countries such as West-Germany (1962), Austria (1968), the Netherlands (1973), Denmark (1977), and France (1988) have had food discount stores for a couple of decades already, *Aldi* started operating its business in Switzerland in 2005 and *Lidl* as

recently as 2009 [22,32,36,73,74]. Traditionally, the Swiss food market has only been divided between a small number of actors, such as the public welfare-oriented cooperatives *Coop* and *Migros* (incl. its low-price sub-brand *Denner*). *Aldi* and *Lidl* started their activities in this market environment and have been challenging existing competitors ever since.

The classic discount strategy was not successful from the beginning. The Swiss food market has been characterised by focusing on high-quality products, strong bonds to domestic products, and high price levels—even if adjusted for purchasing power. From an internationally successful food discount company’s perspective, this was a perfect opportunity for expansion. They tried to challenge existing competitors by establishing a low-price segment [75]. In the beginning, their strategy did not work out; Swiss consumers are not as price-sensitive as costumers in other countries [53,76,77], and the two newcomers could not gain significant market share. In 2012, both companies changed their business strategy. Since then, they have been using idyllic advertisement motifs praising the products’ high quality and sustainability. As a result, the two companies would gain about 9% market share in 2016 [78] and have the highest growth rates in the market until today. Instead of an “Aldification of Switzerland” [79], a “Switzerlandisation of the discounters” [80] took place.

In contrast, the Swiss planning system was not adjusted to the new phenomenon until recently. Before some significant planning law changes around 2016 to overcome the passivity of planning law [81], only very few general regulations were applied to discount stores.

Even though food supply is a constitutional goal of public policy (art. 104 SC and art. 1 par. 2 lit. d and art. 3 par. 3 lit. d SPA), grocery shops were not subject to specific planning regulations. National planning law does not contain general retail planning or particular instruments similar to those known in other countries [20,34,35], such as retail concepts and retail impact assessments [12,21,82], the category of centre-relevant assortment and the regulation of large-scale retail stemming from German planning law (§ 11 para. 3 BauNVO) [83], or the far-reaching ban of retail development outside traditional settlement areas in the Netherlands [18,40] or Denmark [27]. On a cantonal level, most cantons started taking action regarding shopping centres in the 1990s; however, those approaches did not cover discount stores as they did not satisfy certain threshold criteria (sales floor, several retail entities). Thus, it has been left up to the municipalities to regulate food discount stores. As they were used to working with grocery shops run by public welfare-oriented cooperatives (*Coop*, *Migros*, *Volg*), most municipalities missed the need to adapt their building regulations to these new purely profit-oriented players preventively.

In light of the comprehensive planning system (cause of action), municipalities had to permit food discount stores based on the principles of art. 22 SPA, stating that permission is to be granted if (a) an appropriate connection to infrastructure is ensured and (b) its zoning conformity is given. Both criteria are satisfied most often for discount stores, as they usually do not count as “traffic-intense” (art. 8 para. 2 SPA) (thus they do not need to present traffic plans or similar) and are to be admitted in every type of building zone (as selling food is considered a general commercial activity and most municipalities do not have specific regulations in their building code) as long as project’s technical dimensions comply with the degree admissible (cubic capacity etc.). As the floor area ratio (FAR) definition is designed as an upper limit, it fails to prevent the typical underutilisation of land usually conducted by discount stores. Conversely, the car park regulations are constructed as a lower limit and fail to reduce over-dimensioned facilities. In all, the principles of art. 22 SPA do not include relevant opportunities to influence plans for discount stores by the local planning authorities. Instead, nearly every project was to be admitted (even if local politics would refuse the project) until cantonal legislators amended planning laws around 2016.

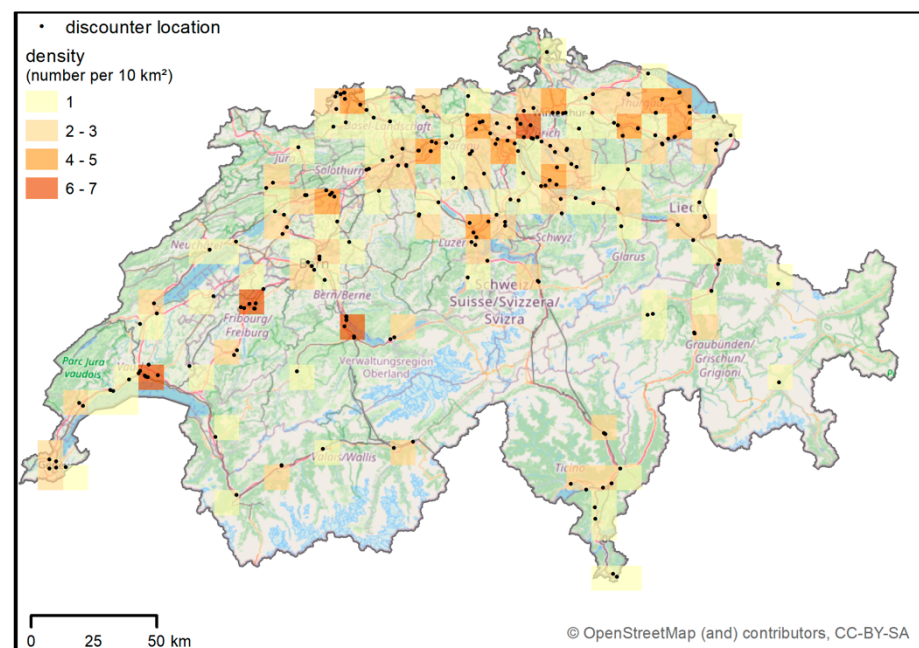
Since then, cantonal legislators have been developing condition- and performance-based specific retail regulations, addressing this recent phenomenon of purely profit-oriented grocery shops [84]. Most often, cantons focus on regulating the sales floor outside traditional commercial centres. The canton of Bern extended its definition of “special facilities” (art. 20 para. 3 BauG/BE) [85] to now include retail facilities if they are outside traditional commercial areas and have more than 1000 m<sup>2</sup> sales floor. Consequently, new



retail developments of this kind require the usage of a legally binding special land-use plan, which, in turn, needs an additional referendum (politicisation) and explicit approval by cantonal planning authorities (art. 19 para. 1 and art. 88 BauG/BE) based on their newly developed pattern of earmarked locations in its Structure Plan. This regulation includes the possibility of discount companies developing outside-centre stores; however, additional administrative and political procedures are a deterrent. Other cantons are stricter and directly limit sale floors outside traditional commercial centres. The canton of Aargau sets a maximum of 500 m<sup>2</sup> (S 3.1: 3 RP/AG) [86], which de facto takes the opportunity to develop outside-centre food discount stores, as their business model requires a more extensive sales floor. Some cantons, such as the canton of Ticino, focus on the consequences of discount stores on the modal split and require specific traffic reports (art. 72–75 LST/TI) [87], including measures to promote public transport and reduce private car usage [88]. As the general political awareness of greenfield discount stores' potential impacts increases, retail development is now explicitly assimilated by cantonal planning regulations in Switzerland.

#### 4.2. Analysis of Location Patterns

Food discount stores were developed in all parts of Switzerland (Figure 2), roughly concentrated on the primary settlement area following the Swiss Plateau, leaving Alpine areas sparsely developed. However, store densities vary over the country. Having 3.78 stores per 100,000 inhabitants, the store density is slightly higher in the German-speaking part of Switzerland than in the French- (2.60) and Italian-speaking parts (2.12). The canton of Thurgau (6.30) has the highest density. The lowest density appears in the canton of Neuchâtel (0.56), apart from Appenzell Inner-Rhodes, which does not have a single discount store.



**Figure 2.** Locations and density of discount store development in Switzerland from 2006–2016, authors' own work.

#### 4.3. Classification of Food Discount Stores

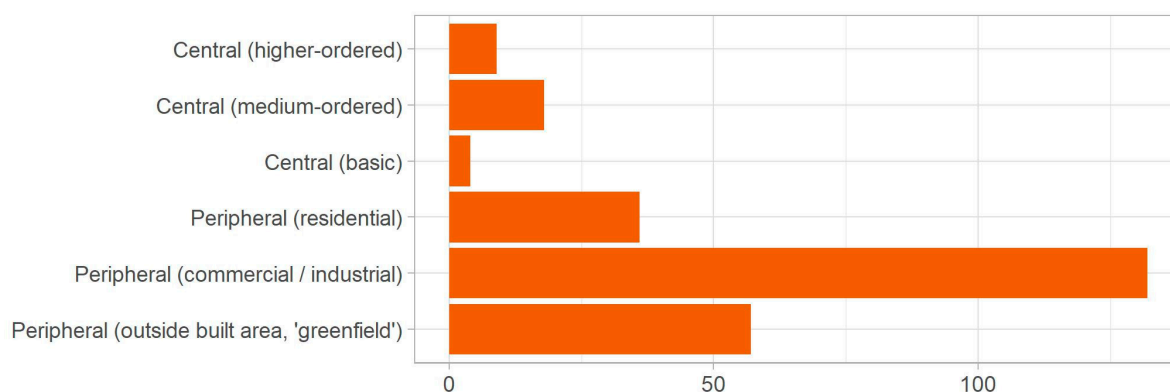
All 256 discount stores analysed are classified according to the scheme. Table 3 gives the results. The macro-attribute is listed on the left (coded 1–6). The micro-attribute is shown on the top (coded A–D) (indicated bold and dark background colours in Table 3).

**Table 3.** Food discount stores are classified according to their centrality, construction type, and operation mode. Colours highlight the frequency. Source: Authors' own.

Type of Construction			Closed		Open		
Mode of Operation			Jointly		Cluster	Solitary	Sum
Code			A	B	C	D	
	<b>Central</b> (higher-ordered)	1	8	-	1	-	9
	<b>Central</b> (medium-ordered)	2	16	-	-	1	18 *
	<b>Central</b> (basic)	3	2	-	2	-	4
	<b>Peripheral</b> (Residential)	4	16	2	1	17	36
	<b>Peripheral</b> (Commercial/Industrial)	5	31	9	34	56	132 *
	<b>Peripheral</b> (outside built area, "greenfield")	6	5	3	8	41	57
	Sum		78	14	46	115	256 *

\* Note: In three cases, the images do not allow us to classify the mode of operation clearly, as important objects for identifying the property boundary are not visible. Therefore, the sums (indicated with \*) in the table include a deviation.

As a first step towards the classification developed, the stores' centrality is analysed. Out of those 256 stores examined, the location of 31 stores (12%) can only be considered as central (classes 1–3). Within this share, the distribution is as follows: As expected, more food discount stores can be found in medium-ordered centres (18 stores) (class 2) than in higher-ordered centres (9 stores) (class 1). Surprisingly, while a classic understanding of discount stores as low-tier food supply would argue that most stores should be in basic centres, the number is even lower here (4 stores only) (class 3). The vast majority of the stores analysed are outside the traditional centres; 225 out of 256 (88%) are considered peripheral (classes 4–6). Of these, 132 stores (52%) are in industrial and commercial areas (class 5). A small share of 36 stores (14%) are located in residential use areas (class 4). The remaining share of 57 stores (22%) lie outside of any built-up area (greenfield locations) (class 6) and are mainly enclosed to cantonal roads or motorway exits. The numbers show that nearly 9 out of 10 food discount stores are not located in any class of the central area. Most stores are found in peripheral locations. Figure 3 gives an overview on the overall distribution.



**Figure 3.** Distribution of discount stores in Switzerland by centrality. Source: Authors' own.

Along with their centrality, the type of construction and mode of operation is surveyed. Out of the 256 stores analysed, 176 (69%) (the majority) are built as open construction (classes B–D). Hence, 78 (31%) are made as closed construction (class A). The mode of operation varies; 88 stores (36%) are operated jointly (classes A–B), meaning that several retailers are located on one property and share at least one crucial element (most often the building itself and/or the car park); the 162 remaining stores (64%) are typical stores with

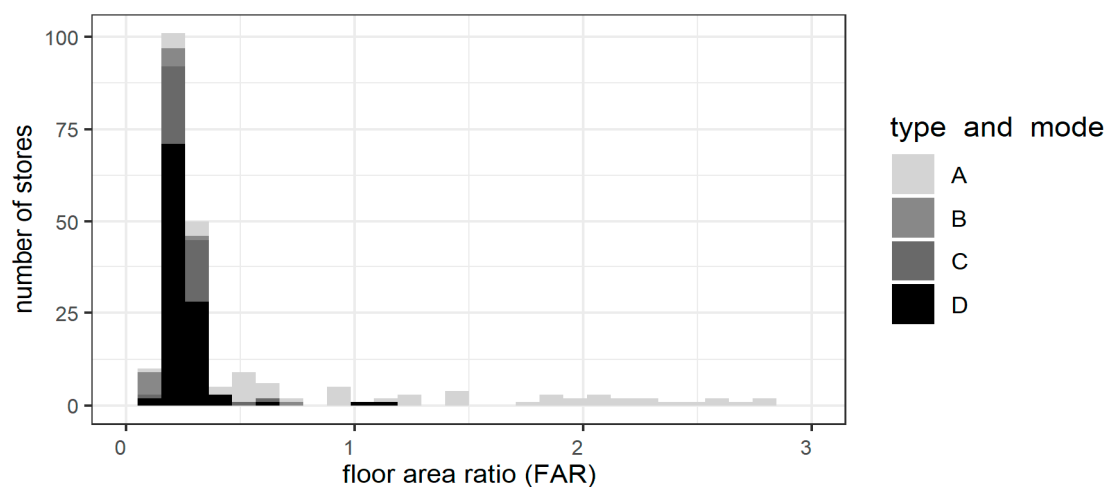
an independent mode of operation, wherein 46 stores (18%) form a cluster (class C) due to their proximity to other retailers (often other food retailers, but also clothing, houseware, pet supplies, and DIY stores); 116 stores (45%) are run solitarily (class D). The numbers show a wide variety of construction types and operation modes. Nearly half of the stores are built openly and run a solitary mode of operation. However, almost one-third are integrated into a structure (closed construction) and run a joint operation mode.

#### 4.4. Construction Characteristics

The analysis captures quantitative data on construction with relevance for planning beyond the developed structured classification scheme: (1) the size of the property, (2) the ground size of the building, and (3) the number of storeys (if identifiable by shadowing or vertical image). Additionally, the floor area ratio (FAR) can be calculated based on these numbers.

In 235 cases, the plot size could be measured. Out of those, the average size was 7680 m<sup>2</sup>. The plots at central locations (avg. 6020 m<sup>2</sup>) are smaller than those in peripheral locations (avg. 7910 m<sup>2</sup>). Properties with stores in open construction (avg. 7120 m<sup>2</sup>) are smaller than those in closed construction (avg. 8930 m<sup>2</sup>) as the measurement comprised the entire plot, including the other uses. Similar trends are observed regarding the ground size of the buildings. An average food discount store in open construction has about 1630 m<sup>2</sup>. Stores in closed constructions have approximately 3600 m<sup>2</sup>, again including the other uses. In 236 cases, the ground size of the building could be detected. The average size across all classes is 2200 m<sup>2</sup>. Considering only buildings in open construction, the value lies at 1630 m<sup>2</sup>. The detection of the number of storeys was possible in 246 cases. On average, discount stores are in buildings of 1.6 storeys. Nevertheless, 186 stores analysed are situated in buildings of one storey only. If only multi-storey buildings are considered, the average is 3.6 storeys.

From a sustainable planning policy perspective, the floor area ratio (FAR) is interesting (Figure 4). The value is calculated using the building's ground size multiplied by the number of storeys divided by the plot size ( $\frac{\text{ground size} \times \text{no. of storeys}}{\text{plot size}}$ ). It serves as an indication of the density of land use. In 231 cases, the FAR could be determined. The overall average is 0.68. If only stores with open construction and different operation methods are considered (classes C and D), the FAR varies from 0.12 to 0.50 and is on average only 0.26. Stores in closed construction have 2.68 on average and are not under 0.5 in any case. The average Swiss food discount store can be surveyed technically using these values. Based on the data collected, the average store is situated in a building of 2230 m<sup>2</sup> ground size built on a plot of 7610 m<sup>2</sup>. The building has 1.6 storeys, tantamount FAR of 0.46.



**Figure 4.** Distribution of floor area ratio of food discount stores in Switzerland by type and mode. Source: Authors' own.

## 5. Discussion

The empirical results broadly support the planner's pessimistic assumption. In cases where planning authorities barely interfered in the location of food discount stores—as happened in Switzerland before major legal reforms came into force in 2016—private actors decide in just about every tenth case to build in compliance with planning policy goals, such as being an integrated store at a central location (classes A1 to A3). Those locations seem to be unattractive for discount companies, most probably due to land prices exceeding the business model's opportunities. However, although nine out of ten stores are built at peripheral locations (classes A4 to D6), the planner's unhampered urban-sprawl-scenario is not entirely true either: Stores built outside built-up area ("greenfield sites") (classes A6 to D6) only represent every fifth food discount store in Switzerland. Therefore, the demonisation of discount stores has to be relativised. The most common combination is a different one: Switzerland's most typical food discount store (built in this period) is characterised by openly constructed stores in commercial/industrial areas (classes C5 and D5). They stand for more than one-third of all stores. Although they cannot be labelled as large land consumption directly, our analysis shows that they are characterised by low density and highly car-oriented infrastructure. Some other classes that are derived in our classification scheme are relatively uncommon in practice. About every seventh store is built in peripheral residential areas—about half in closed and half in open construction (classes A4 to D4). Finally, very few stores in central locations were built in open construction (classes B1 to D3). Only a few cases can be assigned these combinations, probably due to land prices incompatible with the discount store's business model. Considering Swiss planning policy objectives and assuming adverse external effects, these empirical findings support the need for planning's influence in retail development if sustainable urbanisation goals should be met.

This paper adds reliable data illustrating private actors' preference. Nevertheless, one limitation of our study was the clear focus on overall spatial outcome. Clearly, the precise contexts of each and every store would be of interest, such as the legal context (zoning category, planning instrument) and the small-scale local circumstances. However, this information could not be retrieved with our selected method and will require case study research in future. Furthermore, other recent tendencies and competition changes in retail have not been covered in our study. Although we are convinced that this has effects on the companies' strategies and thus on the location patterns, we could not include changes of customers' behaviour (e.g., persistent tendency toward online shopping), recent tendencies on the market (e.g., new overseas competitors due to direct delivery), and political circumstances (e.g., abortive negotiations on the EU-Switzerland framework agreement) in this research. Including these factors in further research would be essential in enhancing our empirical analysis's explanatory strength and reducing uncertainty in portraying the cause-effect relationship due to causal complexity and heterogeneity [50]. We therefore suggest contrasting our results with similar research in a country with a long tradition of specific planning regulations for food discount stores. Combining those results would allow us to derive the outcome of spatial planning in actual spatial patterns, as our study can serve as a null hypothesis. In this regard and based on this analysis across the large sample of discount stores, a closer look at the causal mechanisms in place within cases of individual food discount store construction would be highly beneficial [50].

Furthermore, the methodical approach developed in this study does not include a temporal component. It would be interesting to review whether there is a change over time. This paper's data do not allow concluding, e.g., whether the more integrated stores are younger, which might be interpreted as a learning effect. Moreover, the impact of the specific retail regulations introduced around 2016 cannot be assessed yet. We therefore suggest repeating this study in the future, focusing on those newly built stores. Here, again, comparing the results gives empirical data on the actual private actors' preferences.

## 6. Conclusions

The study's overall objective is to contribute evidence-based knowledge on private actors' preferences and planning's fundamental legitimising assumption [44,45]. If planning did not interfere, private actors would allocate themselves due to their individual preferences only and—in sum—would cause sprawled settlement patterns. Due to planning's omnipresence, it is challenging to examine private actors' preferences, particularly in highly regulated political contexts such as the Swiss land regime. Selecting food discount stores built between 2005 and 2016 allowed us to exploit a rather extraordinary legal situation, addressing this research gap scientifically. The situation was unprecedented as (1) private actors' interests are distinguishable from planning policy objectives, (2) due to the highly standardised business model, these interests do not change significantly across time and place, with conclusions relying on a high number of cases, and (3) as Swiss planning policy was not prepared for these new spatial actors, only general planning regulations apply, and this situation can be seen as offering minimal planning influence. Our methodological approach, using aerial images and assigning stores to a two-dimensional classification scheme, allows for a bold, empirical-based statement (93%).

Based on our empirical findings, we can second the general assumption that private actors prefer locations that, in turn, cause urban sprawl. The case of Switzerland's food discount stores shows that a situation with minimal planning interferences does lead to development outside existing urban centres. In general terms, private actors' preferences jeopardise sustainable urban development objectives. By this approach, we contribute to research on the effectiveness of planning on the prevention of urban sprawl. To complement our approach, we suggest two other follow-up studies: first, by conducting the same survey again at a later point in time, studying the spatial pattern of those stores that are built under the new, significantly stronger Swiss regulations coming into force around 2016, comparisons over time and with more specific retail regulations would be possible (Longitudinal study); second, by conducting a similar study in another country where specific planning regulations had already been implemented, cross-country comparisons would be possible, considering different legislation and effects. Nevertheless, we have delivered an evidence-based analysis of spatial patterns that stand for private actors' preferences. The pattern clearly shows that the public interest of as preventing urban sprawl is not achieved by private actors' decisions only. Planning interferences are needed.

**Author Contributions:** Conceptualization, A.H.H. and M.J.; methodology, A.H.H. and M.J.; software, A.H.H. and M.J.; validation, A.H.H. and M.J.; formal analysis, A.H.H. and M.J.; investigation, A.H.H. and M.J.; resources, A.H.H. and M.J.; data curation, A.H.H. and M.J.; writing—original draft preparation, A.H.H. and M.J.; writing—review and editing, A.H.H. and M.J.; visualization, A.H.H. and M.J.; supervision, A.H.H. and M.J.; project administration, A.H.H. and M.J.; funding acquisition, not applicable. All authors have read and agreed to the published version of the manuscript.

**Funding:** A.H.H. is being supported under the PostDoc.Mobility scheme by the Swiss National Science Foundation (SNSF) (grant number: P500PS\_202951).

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

**Conflicts of Interest:** The authors declare no conflict of interest.

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