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## Retail spatial organisation and the physical city: bridging retail geography and urban morphology

*Organisation spatiale du commerce et de la ville matérielle : convergences entre la géographie commerciale et la morphologie urbaine*

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### Résumés

English Français

The spatial organization of stores plays a crucial role in the production and development of the urban form while, at the same time, being strongly influenced from the physical constraints of the latter. Yet the connection between retail distribution and the physical form of cities remains underexplored. This paper aims to unify the perspectives of two distinct disciplines—retail geography and urban morphology—rooted in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. Retail geography, tracing its origins to classical works in American and German regional economics, and urban morphology, emerging from the convergence of architectural and geographical schools in England, Italy and France, have evolved independently since the late '60s. This paper reviews their development, highlighting theoretical and empirical studies elucidating the interrelationship between retail distribution and urban form. While both disciplines acknowledge the mutual influence of retail and cities, they have progressed independently, with retail geography focusing on the evolution of the retail sector and urban morphology emphasizing the impact of physical form on socioeconomic functions. Identifying common ground, this paper underscores spatial affinities and organizational aspects often overlooked. The paper concludes by encouraging a unified understanding, recognizing the potential for a more nuanced comprehension of the intricate dynamics between retail distribution and the physical features of cities. This approach paves the way for future interdisciplinary research, fostering collaboration in unravelling the complexities that shape urban environments.

L'organisation spatiale du commerce joue un rôle crucial dans la production et le développement de la forme urbaine, tout en étant fortement influencée par les contraintes physiques de cette dernière. Pourtant, la connexion entre le commerce urbain et la forme physique des villes reste largement inexploitée. Cet article vise à unifier les perspectives de deux disciplines distinctes - la géographie du commerce et la morphologie urbaine - enracinées dans la seconde moitié du XIX<sup>e</sup> et le début du XX<sup>e</sup> siècle. La géographie du commerce, trouvant son origine dans les œuvres classiques des économistes régionaux américains et allemands, et la morphologie urbaine, émergeant de la convergence des écoles architecturales et géographiques en Angleterre, en Italie et en France, ont évolué indépendamment depuis la fin des années 60. Cet article examine leur développement, mettant en lumière ensuite des études théoriques et empiriques sur l'interrelation entre le commerce et la forme urbaine. Bien que les deux disciplines reconnaissent l'influence mutuelle entre ville et commerce, elles ont progressé de manière indépendante, la géographie du commerce se concentrant sur l'évolution de l'organisation spatiale du commerce et la morphologie urbaine mettant l'accent sur l'impact de la forme physique sur les fonctions socio-économiques. Les points communs identifiés permettent de montrer l'existence d'affinités spatiales et d'aspects organisationnels souvent négligés. L'article conclut sur la nécessité d'une approche unifiée, reconnaissant le potentiel d'une compréhension plus nuancée des dynamiques



complexes entre le commerce et les caractéristiques physiques des villes. Cette approche ouvre la voie à des recherches interdisciplinaires futures visant à démêler les complexités qui façonnent les environnements urbains.

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## Entrées d'index

**Mots-clés :** géographie du commerce, forme urbaine, morphologie urbaine

**Keywords:** retail geography, urban form, urban morphology

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## Texte intégral

# Introduction

- 1 The spatial organisation of stores plays a significant role in the production, functioning and development of cities. While this association has been widely investigated considering spatial economic and socio-cultural perspectives, less attention has been given to the city considered for its physical features and generative process. Within this context, two disciplines have been independently developing significant paradigms and theories contributing to a better understanding of the relationship between the spatial organisation of retail and the physical form of cities. On the one side, retail geography and, on the other side, urban morphology.
- 2 These two research domains are rooted in the second half of the 19<sup>th</sup> and the early 20<sup>th</sup> century scientific literature. Retail geography finds its origin in the classical works of American and German regional economists and economic geographers<sup>1</sup> and investigates the role of space on the retail spatial distribution (Brown, 1991; Madry, 2016). Similarly, the works of German urban geographers<sup>2</sup> laid the foundations of urban morphology with the geographical analysis of urban forms of the European cities (Hofmeister, 2004).
- 3 At the end of the 1960s retail geography acquired its own intellectual independence at first in the US (Berry, 1967) and, subsequently, in other western countries (i.e., the *géographie du commerce* community in French-speaking countries). The geography of commerce becomes a component of applied geography in this period of intense urbanisation and planning, which contributes to the diffusion of its questions and methods outside the academic sphere (Phlipponneau, 1960). Within this renewed context, *retail was perceived as a contributor to urbanisation in the spatial sense of the term, transformer of urban morphology, creator of new fabrics and new landscapes* (Soumagne, 2013). Nonetheless, previous theories and notions developed in the spatial neoclassical economics still profoundly influenced the new geography (Mérenne-Schoumaker, 1996) focusing on questions of land use and location of urban functions rather than the analysis of their relationship with the physical features of the urban form. On the contrary, newer concepts and methods for the study of the physical properties of cities and their underlying generative process (i.e., fringe belt, burgage cycle, urban fabrics, etc.) were proposed by the urban morphology schools<sup>3</sup> established in Britain and Italy, since the late '50s and in France since the '70s (Oliveira, 2016).
- 4 From the late '70s and '80s, both retail geographers and urban morphologists acknowledged how retail represents an element *structuring or structured for or by the city* (Metton, 1984). Yet, the two disciplines continue to develop independently. While the former mainly focuses on the evolution of the retail sector and its impact on the urban form, the latter provided evidence on how the physical form of the city might influence the distribution of socioeconomic functions in the city. New theories in urban form studies emerge, exploring the relationship between retail spatial distribution and the physical properties of cities (Hillier, 1996; Webster and Lai, 2003) contributing to the development of the notion of *morphological sense of commerce* (Saraiva, 2013). Nonetheless, key aspects developed in retail geography (i.e., spatial affinities between retail functions, retailscape, spatial and functional organisation of stores, etc.) seem to be overlooked as a common working ground (Araldi, 2019).

5 It becomes evident how a better understanding of the relationship between retail distribution and the physical city might only be reached through a full convergence of retail geography paradigms and urban morphology tools and theories, overcoming traditional “disciplinary” separation. This paper represents the first step in this direction: at first, we provide a general overview of the main approaches developed in retail geography and urban morphology, in sections 1 and 2 respectively, bringing our attention to those theoretical and empirical studies discussing the relationship between retail distribution and the physical form of cities. This combined literature represents the starting point for a discussion in Section 3 about (dis) similarities and limitations associated with the two approaches. Section 4 describes the main theoretical and methodological challenges that arise when studying the spatial co-evolutionary process of retail and urban form and, Section 5, discusses how the convergence of these two disciplines within quantitative modelling approaches opens new research perspectives. The conclusion section will emphasize the critical aspects facilitating the convergence of the two disciplines.

## Retail geography approaches and the physical city

6 An extraordinarily large and diverse theoretical literature of retailing has been developed in the last century. Retail studies are varied depending on the approach, disseminating a diverse mix of scientific domains such as geography, economy, psychology, sociology, urban planning, architecture and regional sciences, among others. Wholly comprehensive literature reviews have been regularly proposed throughout the last decades; however, the growing number of approaches developed from the contribution and combination of different scientific domains, as well as the complications brought about by recent methodological procedures made this task highly challenging. In the last decades, this work has been successfully undertaken by a few academics (Brown, 1991; 1992a; 1992b; Wrigley and Lowe, 2002). Within the francophone community, interesting insights and extensive reviews have been more recently proposed, among others, by Mérenne-Schoumaker (2003), Wayens (2006), Lemarchand (2008) and Madry (2016).

7 A threefold classification considering the main approaches developed along the last century has been firstly proposed and described by Brown (1991) and successively acknowledged in the same form by several authors (Wayens, 2006; Lemarchand 2008). *Neoclassical approach* is mainly constituted by scientific works and theories developed in the fields of economic geography, land use and land planning studies. This approach reached its apex in the second post-war, in particular in the decades between the '50s and late '60s when Central Place Theory, Spatial Interaction Theory, Bid Rent Theory, and the Principle of Minimum Differentiation dominated the academic debate in the field of economic geography. Beneath these standing and well-defined pillars, are two hundred years of extensive antecedents and contributions from geographers and economists studying the relationship between city and commerce (Brown, 1989; 1993; Dawson, 1969; Madry, 2018). The main interest of these studies is to investigate the economic forces defining the spatial location and organisation of shops (Berry, 1971; Beaujeu-Garnier et Delobez, 1977; Metton *et al.*, 1984; Soumagne, 1996). Starting from the '70s, *behavioral approaches* have been proposed as a response to the several criticisms related to neoclassical theories mainly concerning the simplistic definition of the (rational) “*homo economicus*” and the homogenous assumption of space (Hubbard, 1978). Wider attention has been given by sociologists and psychologists to the study of agents with the final goal of providing a more realistic representation of human behaviour. The behavioural approach encompasses empirical and cognitive studies investigating the decisional process behind both demand and supply-side agents, and the factors influencing the frequentation of retail locations. It shares a strong methodological and theoretical framework with the discipline of environmental psychology. Since the '90s, the complete maturity of the new retail format (large surfaces and store chains) and their expansion on the global market stimulated a large number of works investigating the spatial organisation and strategies of store chains/retail networks at multiple scales. Thus, a *structural approach* emerged, investigating both the spatial organisation of these new different forms of consumption in space and their impact

on more traditional independent store distribution (Wrigley and Lowe, 1996; Metton and Lemarchand, 1997; Lestrade, 2001; Lemarchand, 2011), their managerial strategies and the control of exogenous locational factors. Several studies investigated the legislative and administrative framework and their intervention on the retail industry and the impact on their spatial organisation factors (Jones and Simmons, 1990; Wrigley and Lowe, 2002; Desse et Lestrade, 2016).

8 These approaches should not be considered as a chronological succession; they rather represent the prevalent approach in a given historical moment as a response to specific research questions raised from the challenges imposed by societal and technological evolution. Several societal and technological challenges of the current period are stimulating further research in retail studies. In the last decades, a series of demographic, social and economic mutations are profoundly revolutionizing the retail sector, stimulated/accelerated by new technologies such as the Internet, mobile phones, etc. New challenges are being investigated by academics about the impact of new retail formats (i.e., e/m-commerce, drives, etc.), the hyper-fragmentation of consumer behaviour and the dematerialization and deterritorialization of the retail/economic sector (Dart, 2018; Desse *et al.*, 2016; Madry, 2016). Within retail geography, we observe a growing number of works investigating the different environmental, social and cultural conditions underlying the ongoing transformation of the retail sector.

9 Thus, a fourth *contextual approach* is emerging from these recent works (and more generally in geographic studies, Miller, 2017). Within this direction, two main topics are investigated: on the one side, some retail geographers focus on how commerce is integrated into lifestyles or travel practices and how the cultural context is influencing consumer spaces and practices (*consumm'acteurs*, Lemarchand, 2011; 2008; the *Consumerscape Culture Theory*, Cachinho, 2014; Fleury *et al.*, 2020). This translates into a semantic evolution from a retail geography to geography of consumption (Mansvelt, 2005). On the other side, the threat of dematerialization of the retail market has paradoxically triggered a renovated interest to the physical features and location of stores with the final goal of promoting a re-spatialization/re-territorialisation of commerce (Desse, 2016; Madry, 2016; Gasnier, 2019). A renewed interest in the analysis of the spatial distribution and organisation of stores or even more broadly of the entire supply chain and its undergoing transformations within urban spaces (Ilbery and Maye, 2006; Kalchschmidt *et al.*, 2020). This is even more stimulated by urban planning concerns about urban requalification, sustainability, the social role of public space, etc. (Cachinho, 2014; Fernandes and Chamusca, 2014; Desse, 2016; Hubbard, 2017).

10 Research on the physical properties of urban space is the origin of recent work proposing renovated approaches for investigating the relationship between city and commerce in relation with usages and practices shifts of consumers and retailers. The interest in the role of physical/morphological properties of the urban space on retail spatial organisation is not completely absent in retail geography. Indeed, some retail geographers constantly remind us that we cannot separate the study of retail agglomeration and organisation from urban and transportation geography (Berry, 1967; Lemarchand, 2008; Madry, 2016).

11 Nonetheless, these works focus more on questions of land use, location of urban functions and measures of transport-based accessibility (in order to account for the anisotropy of the urban space) rather than the analysis of their relationship with the physical properties, structure and evolution of the urban form. Some exceptions might be found scattered in the literature: with the goal of defining the retail spatial distribution in Nashville, US, Parkins (1930) develops a specific set of variables describing the intensity of land utilization, building height and build-up coverage ratio, the acclivity of the site and the presence of natural barriers. Several considerations on the relation between urban morphology and retail distribution are also found in the French-speaking literature: in Beaujeu-Garnier (1977) the retail distribution related to the urban form through the qualitative analysis of built-up spaces ("*mass distribution*"; *ibid.*, pp. 207–208). The same author describes how the system of streets and squares and the process of anastomosis of squares in European city centres represents the backbone of today's urban fabrics and retail distribution. Carré and Rouleau (1974) go further into the details of urban form, describing quantitative and qualitative aspects of the interface between the street and building facades to describe the commercial dynamism within the city. Lebrun (2002) highlighted how retail continuity might be interrupted by the presence of *urban fractures* originated by both natural or

artificial linear elements as transport infrastructure, rivers, parks but also by a more or less gradual transformation of the morphological organisation of the urban fabric (defined as *differentiation barriers*, *ibid.*). The importance of the built-up form is also acknowledged at a more intrinsic level: the same author discusses how the monumental approach used in the requalification of streets (i.e., Haussmann period) or the presence of large historic administrative/religious buildings along squares have a direct influence on the economic accessibility to certain urban spaces which *earn in emphasis, but they lose in polysemy* (Lebrun, 2002, p. 363). Other authors focus on the different evolution period of cities in relation to retail distribution: for example, Grimmeau and Wayens (2003) discuss the historical extensions of the urban settlement and its link with commercial density and retail typology, distinguishing the specificity of the medieval town but also of the village nuclei progressively integrated into the urban continuum. Finally, a few rare studies have focused on the shape of commercial aggregates by using shape descriptors, an approach that is also present in the analysis of land use from a landscape ecology perspective (Vazquez-Parras, 2011; Araldi and Fusco, 2018).

## The study of the physical city and the retail distribution

- 12 While the physical properties of urban forms are still far from the mainstream literature of retail geography, their link to retail activity has been recently gaining interest in the domain of the urban form. The importance of the morphological space on retail named the *morphological sense of commerce* in Saraiva (2013), has gained a growing attention in urban morphology in the last two decades. The hypothesis underlying these works is that socioeconomic functions such as the spatial location of retailers might be influenced by the physical properties of the surrounding urban space: the spatial organisation of plots, buildings, and their composition along streets as well as the morphological context and the street-network layout and accessibility might represent important factors influencing the attractiveness and representing the necessary (but not sufficient) condition for retail activities to prosper in a given urban space. The study of the physical form of the city can identify the most important morphological elements contributing to the retailing potential at the fine-grained scale of streets and neighbourhoods.
- 13 Before proceeding with the exploration and discussion of these works, we must clarify our definition of urban form. This definition is not unique, and several interpretations might be found in the scientific literature, depending on the specific domain of research. The growing attention of urban morphologists (from different European schools) and urban geographers during the second half of the twentieth century is at the origin of a discrepancy in the notion of urban form, associating it with different meanings. This variability derives both from the polysemy of urban form itself and from the epistemological backgrounds of different academic groups. The absence of a strict definition of the expression “urban form” is also recognised in Raynaud (1999) and further developed by Levy (2005; 2016): the latter identifies and describes five different meaningful registers of urban form. The register of *bioclimatic form* describes the physicality of urban space in *its environmental dimension, as a micro-climate, considering both its geographical variations in each neighbourhood and the diversity related to the types of urban fabrics (open/closed/semi-open), the orientation (solar-thermal), the site (water, relief and vegetation) [...], the unequal repartition of the pollutants* (Levy, 2005, p. 31).
- 14 Since the first works in the '80s and '90s (Escourrou, 1980; Newman and Kenworthy, 1998) this register has gained increasing interest due to the environmental sustainability concerns of the last decades. The urban form as *urban landscape* (cityscape) deals with “*the urban space as visually perceived in its three-dimensionality and its plastic materiality*” (*ibid.*), with a specific focus on the aesthetical, stylistic, cultural and perceptual aspect of the physical city. This register finds its origin in the urban design schools initiated by the American and north-European architects and designers such as, among others, Bacon (1965), Cullen (1961), Lynch (1960) grounded on the seminal work of Sitte (1889). The urban form as *urban fabric* deals with the interrelations between its elementary components: plots/streets/empty spaces/built-up spaces mainly represented on cadastral



maps but also related to the building types and their internal distribution. Two main goals are associated with the works interested in the urban fabric: the first aims to understand the dialectical relationships between building typologies within urban fabrics as well as the historical morphogenetic process generating the different forms observable in a given cultural context. The second is related to the acquisition of that knowledge which might be implemented in urban and architectural projects for the production and renovation of urban forms. This specific notion of urban form has been independently developed by the English school, from a geographic background, as well as from the Italian and French<sup>4</sup> schools, from architectural studies (Moudon, 1997; Oliveira, 2016). A further register focuses on the form of the *street layout* considering, “the geometrical form of the city plan (organic/geometrical plan; orthogonal/radio centric plan)” (Pinon, 1994; Marshall, 2005). The distinction between the form of the street layout (often limited to the main streets) and the one of the urban fabrics is also a question of scale and corresponds to Lynch’s distinction between urban general patterns and urban texture (Lynch, 1981). Finally, the register of *the socio-functional form* is concerned with *the occupation of the urban space by different social, demographic ethnic groups, household composition and the distribution of activities and functions within the city*. For this definition, the references might be found in the works of Jacobs (1961), Ledrut (1968), the Chicago School and the French school of social morphological studies (Halbwachs, 1928; Roncayolo, 1996; 2002). Going from spatial patterns of social occupation of urban space to spatial patterns of functional occupation, this register of urban form is relatively overarching: the patterns of retail locations in urban space have a specific form and contribute in this respect to the socio-functional form of the city. This broad definition of socio-functional form is rarely considered by researchers in urban morphology (mainly dealing with the form of the urban fabric and of the street layout) and this despite Conzen’s position that building utilization is a component of urban form. This, as we will see, has important implications for the research on the link between urban form and retail carried out by urban morphologists.

15 To this fivefold distinction of the urban form, Fusco (2018) highlights the need to distinguish and recognize a sixth independent register: *the configurational approach* which finds its origins in the analysis of the complex networks firstly applied to the social science (Freeman, 1977)<sup>5</sup>. First applications to analyse buildings and urban fragments are implemented in Kruger (1977) and Steadman (1983). Hillier’s seminal works on Space Syntax (SSx) (Hillier and Hanson, 1984; Hillier, 1996), and more recently in the Multiple Centrality Assessment (Porta *et al.*, 2012) open the way to large-scale applications for whole urban areas. Configurational analysis quantifies the capacity of the network configuration (street segments, visual axes, etc.) to structure movement and encounter patterns within urban space. This approach describes the properties of form elements and considers their spatial relations established with all other form elements within the urban space (or within a shorter radius of analysis). As for the different approaches within retail geography, the polysemy of urban form derives from the diversity of theoretical backgrounds and scientific questions formulated by scholars dealing with the physical city and its transformative processes (Levy, 2015). Polysemy goes together with methodological divergence. Within the current urban morphology community, Oliveira (2019) differentiates between four main analytical approaches: the historic geographical (from the English/Conzenian schools), the process-typological (from the Italian/Muratorian School), the configurational (from Hillier Space Syntax theories) and the spatial analytical approach (gathering the large variety of approaches from quantitative and theoretical geography and computer-aided geoprocessing protocols). It seems to us that differentiating the registers of urban form being investigated brings more clarity than differentiating the chosen analytical approach, even if a relation exists between the former and the latter.

16 Among the different registers describing the physical properties of the urban form, the street-network configurational approach attracted the most attention of urban form researchers when studying the relationship between urban form and retail spatial organisation. Indeed, based on the Space Syntax configurational analysis, Hillier (1996) proposed the Movement Economy Theory (MET). This theory might be summarized by the following statement: “*space organization in settlements first generates movement patterns, which then influence land-use choices and these, in turn, generate multiplier effects on movement with further feedback on land use choices*” (*ibid.*, p. 117). Despite few limitations and inconsistencies (Ratti, 2004; Netto, 2016), an increasing number of configurational

measures and empirical studies have demonstrated in the last twenty years how the space configurational properties of the street network represent a significant location factor for store spatial distribution. More recently, some researchers also showed how the relationship between retail presence and configurational properties might vary depending on the different morphological context (urban fabrics/morphological regions) (Omer and Zafrir-Reuven, 2015; Araldi, 2019) and the presence of specific functional *locomotives* (such as retail anchor stores or any other attractor) which might determine the modification of the natural movement generated by the simple network configuration and, therefore, its multiplicative effect (Bielik *et al.*, 2019; Araldi, 2019). While the MET focuses on the relationship between the street-network system and the concentration/distribution of socioeconomic functions, a different theory based on plot system properties (an aspect of the urban fabric) is studied in Webster and Lai (2003). The Theory of Natural Occupation describes the economic intensity/specialisation in a given urban space as the result of people proximity and division of labour stimulated by the underlying land property fragmentation. More recently, Bobkova *et al.* (2019) tested this theory on three large European cities.

17 Beyond the study of the street network and plot systems, an increasing attention is also given to the urban form at finer scales proposing theories describing the relationship between urban design properties and attractiveness, which in its turn is strictly related to retail presence. More specifically, some authors studied the role of morphological and urban design properties of urban *interfaces* defined as those edges between public and private space where social and economic urban functions take place (Dovey and Wood, 2015; Kickert, 2016). Beyond the interface, architects have also been focusing on a micro-level description of ground-floor spaces and their uses, with concepts such as *urban parterre* (Psenner and Kodydek, 2017) and *rez-des-ville* (Mangin et Ferrand, 2019). The fine-grained analysis proposed by these works, the spatial analysis of the forms and their contextual and multiscale properties are often overlooked or reduced to a cartographic tool (urban mapping). All these aspects are rooted in the register of the perceived urban landscape, with a few incursions in the form of the urban fabric. As often in the approaches of urban landscape studies, the analysis of the spatial organisation of retail in conjunction with urban forms is left to a visual evaluation by the analyst.

18 Similarly to what previously observed in retail geography, also in urban form studies a smaller number of original works should also be mentioned where notions and analytical approaches proper to the typo-morphology schools are transposed/applied to the field of retail geography. Büyükcivelek (2009) proposes a qualitative morpho-typological classification of stores and their surrounding architectural properties while Hausleitner and Berghauser Pont (2017) identify typologies of micro-business agglomerations based on geometric and SSx configurational theory. More recently, Rao (2020) implements a typo-morphological approach to the study of integrated retail centres and their transformations.

## Urban form studies and retail geography: divergences and convergences

19 The research focusing on the relationship between retail and urban form represents a very specific subgroup of studies within the larger production of the urban studies. Rather than being considered as a filiation of a specific scientific domain, this research subfield is made up of a large variety of contributions from different methodological approaches and theoretical backgrounds. Those proposed in retail geography are rather scattered in time along the last century; on the other hand, the last two decades have seen increasing attention within the urban form research domain to the role of the physical form of cities as structuring factors of human and socioeconomic functions, further supported by studies from environmental psychology (Erin *et al.*, 2017). The theoretical and analytical variety of approaches results from the multiple and sometimes ambiguous definitions associated with the term urban form (as presented in Section 3) resulting in lack of clarity in which aspects of urban form are being investigated as location factors for retail. Often, form and functional properties of the urban space are not clearly distinguished, eventually preventing the investigation of their individual properties and interactions.



20 Within the two disciplines here reviewed, we can detect an uneven – almost asymmetrical appreciation – of the relationship between the retail and urban form structures. On the one side, retail geographers study the retail organisation focusing on the socioeconomic, political and demographic forces underlying its spatial patterns. Space and urban form are considered either as an impedance/constraining factor or as a socioeconomic construction/heritage. The reference with urban form is often done at a meso-scale, following the traditional opposition of centre/peripheries, urban/rural, compact/diffuse, etc. and often referring to territorial subsystems rather than considering the (typo) morphological characteristics of the urban space. On the other side, urban morphologists investigate the spatial organisation of urban form elements (such as streets, plots and buildings), their spatial organisation (geometrical, compositional, relational, structural etc.) and their influence on socioeconomic phenomena and functions (among which, the retailing activity). While retail geography oversimplifies the role of the built-up form, urban form studies often reduce the complex structure and functioning of the retail system, to simple measures of density and/or diversity. The comparison of traditional interaction theories with the MET is paradigmatic of this symmetrical theoretical position: the former *considers the location of economic activities as an input variable with their importance and their relative co-localisation in the geographical space; from this information, they derive, as output, variables measuring interaction flows between the same urban functions. In a specular way, the latter studies the urban grid as an input variable and assesses the distribution of movements and the location of the economic activities. In other words, what is considered an input data for the former (the location of the economic activities), it becomes a result of the latter* (Cutini, 2001, p. 144). More generally, while the geographical approach typically investigates *how things are distributed in space*, urban morphological/form studies explore *how things distribute space* (Marcus, 2017).

21 A second aspect which should be highlighted is the coexistence of studies developing either qualitative-descriptive or quantitative-modelling approaches within both retail geography and urban form research domains. The first approach is made of observative and descriptive studies, often based on the study of the historical evolution of a specific region or of a specific phenomenon across time and/or space, has characterised the works of retail geography and urban form studies in the second half of the 20th century. These works require a deep understanding of the complex relationship of the different factors intervening on the transformation of the urban retail/landscape and their evolution in time. The richness of data required for qualitative-descriptive studies is highly time-consuming (custom-made data, specific surveys, historical map reconstruction, etc.) and require a profound knowledge of the socioeconomic and historical context within which the study case is located as well as the role and the interactions between different actors of the urban production. The downturn is related to the idiosyncratic nature of these studies, often limited in their geographical extent, arising issues of representativeness (linked to survivorship bias) of the outcomes. Moreover, the ad hoc analytical protocols implemented in these works limits their reproducibility for comparative studies in time and space.

22 Quantitative approaches allow researchers to overcome these limitations through analytical and modelling protocols which are easily replicable. These allow us to test and explore both theories and empirical observations debated in more qualitative studies. More importantly, data-driven studies can also be able to highlight spatial and/or temporal patterns or peculiar behaviours of a given study area. Despite the fact that the quantitative revolution of geographical studies finds its origins in the late '50s, it's only in the last three decades that an impressive number of quantitative fine-grained urban studies are being developed thanks to the increasing availability of location-based data, together with higher computing capacities and innovative computer-aided analytical approaches. Works from computer science and spatial analysis are contributing to the enrichment and development of quantitative geographical studies: powerful new fine-grained and multiscale studies of the urban and retail spatial structure and their relationship are now made possible paving the way to new research perspectives (Miller, 2017). The dissemination and popularisation of data processing tools and geographic information systems has encouraged the reuse of data (better standardised and described) but also of methods in different fields. Communities of researchers are not only being formed around succeeding studies, but also around shared research tools.

23 Nonetheless, differently from what observed in the international urban research literature, the French-speaking retail geography is still characterised by a strong prevalence of qualitative and low mathematically formalised descriptive studies, often developed through the lens of sociological approaches (Lemarchand, 2008; Madry, 2018) even if there are exceptions in the (Belgian) retail geography (Grimmeau, 2011; Wayens, 2006; Vazquez, 2011; Fleury *et al.*, 2012). Independent researchers have also been developing and implementing quantitative analytical and modeling approaches for the study of the retail system with a quantitative geography approach (Tannier, 2003) or from other interdisciplinary fields (Jensen, 2006). The situation is a bit different in urban form studies. The origins of this domain of research are in the qualitative approach mainly concerned with the form of the urban fabric (Castex *et al.*, 1980; Borie and Denieul, 1984; Panerai *et al.*, 1997). Roncayolo (1996) makes the qualitative analysis of the urban fabric converge with a more quantitative approach to the socio-functional form of the city. Quantitative approaches were first developed by Frankhauser for the fractal analysis of built-up space (1994), opening an important research line in French-speaking studies of urban form (Thomas *et al.*, 2008; Tannier and Thomas, 2013). They were subsequently developed in the bioclimatic register of urban form (Long and Kergomard, 2005; Hamaina *et al.*, 2013) or in the analysis of urban landscapes (Leduc and Chauvat, 2015; Nguyen and Teller, 2017). The analysis of the form of the urban fabric and of the multiple relations between street networks, buildings and plots, is also receiving increasing attention (Badariotti *et al.*, 2009; Caruso *et al.*, 2017). Araldi and Fusco (2019) propose a quantitative analytical approach at the convergence between the form of the urban fabric and the one of visible urban streetscapes. In this respect, the aforementioned developments of quantitative approaches in retail geography offer the potential of a fruitful convergence between the two realms of analysis.

## Bridging built-up form studies and retail geography: space, time and scale issues

24 Studying the relationship between retail and urban form raises those same issues traditionally related to the study of complex systems as defined by a large number of variables that vary simultaneously through a multitude of interconnections in space and in time (Jacobs, 1961). The overall complexity of the urban system can be represented and studied focusing on a number of smaller and interconnected subsystems (Harvey, 1969). When focusing on the urban form and retailing, two specific subsystems are considered with a different nature (Rabino, 2005): on the one side a *structural complexity* describing the physical city and resulting from the spatial organisation of its fundamental constituents (such as buildings, streets, plots) at different scales. On the other side, the *functional complexity* of the retail subsystem, made by different retail formats (different goods and services, traditional small independent stores, franchised stores, anchor stores, etc.) and their material and immaterial interactions. Each discipline focuses on a reduced number of controlled variables (and interactions) operating a simplification of the overall urban complexity and of the interactions with the other subsystems. Although interactions within subsystems are generally stronger (Simon, 1962), the decomposition in structural and functional components allows us to study the interactions among subsystems. The structural complexity of the physical city tends to show stronger forces and interactions than functional subsystems (Marcus, 2017).

25 Bridging the studies of two specific subsystems such as the physical structure of the city and the retail spatial organisation requires to overcome two main challenges: firstly, a clear and precise definition of the constituents of each subsystem as well as the identification of their spatial relations. Secondly, the simplifications assumed by the two disciplines (reducing either the built form or the retail system to a few descriptors) should be redefined within a common theoretical framework focusing on the analysis of the interactions among (rather than within) the two subsystems.

26 Space becomes the key element able to bridge these two complexities of different nature: the spatial analysis of socioeconomic and urban form co-occurrences and interactions allows us to understand how the two phenomena are (co) structured in the urban space and evolve together. Despite the large amount and variety of studies, this goal has not been properly

addressed in the literature: indeed, urban form and retail geography studies often consider the *traces* left over the urban space by socioeconomic phenomena, transformations and urban policies. In other terms, the spatialization is often used (and reduced) as a cartographic tool with the final goal of showing the impact of a given phenomenon in different urban neighbourhoods (i.e., urban mapping). This approach does not allow outlining the underlying spatial organization of a phenomenon, and its role of structuring factor of (and structured by) the urban form. To overcome this limitation, specific quantitative geographical approaches able to integrate both spatiality and temporality in the analysis of the phenomena should be developed and implemented.

27 Studying and modeling the relationship between these two (sub) systems arise several theoretical and methodological challenges. The first issue is related to the spatiotemporal discrepancy deriving from different definitions and measures of the retail and urban form spatial structures. As discussed by Anderson (1972), each discipline identifies a specific multilevel organisation of the phenomena under investigation; similarly, when investigating urban and retail forms, levels of spatial aggregations can be differently defined in space and time. Thus, the cross-analysis of these two systems arises the problem of the choice of the specific agents under study, the definition and granularity of the spatial unit of the analysis and the spatial levels/scale more adapted for both systems. As further discussed by Lane (2006), the study of phenomena of the social sciences, differently from natural/physical ones, requires the investigation of systems at each different scale, from the individual to higher aggregative levels as well as their interaction between different scales. The main pitfall potentially undermining the outcomes of these studies is related to the choice of the spatial unit of the analysis. The study of a given phenomenon with an ill-suited scale (or exogenous spatial partitions) definition might mask how different trends and patterns occur at different levels of organization, defined at different scales (Pumain and Saint-Julien, 2004). Similarly, ignoring the multilevel/multiscale interactions of and between systems does not allow to appreciate and measure the role played by a specific structural level. The identification of the appropriate unit and scales of analysis becomes even more challenging when exploring the interactions among two different subsystems. At the same time, spatiality is not just a matter of scale, but a question of appropriate definitions of space at the different scales (continuous vs. discrete, areal vs. network-like, etc.).

28 As for the spatial mismatch, structural and functional subsystems also differ in their temporal scales. The dynamics underlying urban and retail processes are defined at different scales. The physical features and properties of cities evolve over decades, centuries and millenniums; on the contrary, retail structures show faster dynamics at shorter time scales. Again, the main challenge when bridging retail and urban form studies consists in the definition of the temporal scale of the analysis: large temporal windows might prevent the detection of faster evolution of the retail system while, on the contrary, using yearly/decade time series to explore the evolution of retail might result in nonsignificant patterns of change for the physical city. As for the spatial unit definition, also the definition of the temporal scale becomes a key aspect allowing for the identification and description of the interactions between urban and retail spatial structures. As already observed in the literature of complex systems, slower variables tend to rule over fast variables forcing them to adjust to their rhythm (Weidlich, 1991). Consequently, spatiotemporal interactions between the two subsystems might also occur asymmetrically: while retail activities (and especially micro-retail format) are more reactive to transformations of the urban form, on the contrary, the physical form seems more resistant to transformations in the retail system. Evolutions of the retail landscape are less likely to impact the physical landscape in the long run, yet it cannot be excluded that specific retail usage of key elements of urban form could not influence their morphological evolution. Thus, spatial and temporal scales should be elastically defined in order to size specific characteristics and to detect evolutions/interactions between the two subsystems.

29 The study of the interconnections between retail and urban form should not be reduced to the projections of one system onto the other at a given spatial scale or at a given time. Similarly, their interrelation should not fall into a simplistic causality dilemma<sup>6</sup>. Different relationships and interactions between the two systems can be identified within different spatial contexts: for example, the self-organization of the retail system in a given urban space might result from its configurational/accessibility properties, together with its local plot/building fragmentation characteristics. On the contrary, the transformation of the retail

fabric (enrichment/pauperization) might stimulate the regeneration of the urban physical form from the smaller scale of the retail window to intermediary scales of the streetscape (pedestrianization) and beyond. In other words, both retail and urban fabrics participate in different ways to the definition of those conditions stimulating the production of urban form and its ever-changing process. In order to understand the relationship between the urban physical form and retail structural organisation, all the different interactions intervening in different forms, space and time should be evaluated and combined in a more systematic approach (Tannier, 2003).

## Contemporary challenges for bridging retail and urban quantitative studies

30 The challenges that analysts face when studying the relationship between the structural and functional complexity previously outlined represent wide open research questions. Two main aspects require further examination when exploring the retail/urban form relationship with quantitative and modelling approaches. The first concerns the recent availability of fine-grained data at large scales, requiring specific protocols able to outline new insights about small-scale interactions of human-related phenomena. The second is how to develop human-based modelling approaches able to describe how urban phenomena unfold and how they are perceived from the perspective of the city user.

31 The main aspect which researchers face when analysing urban and retail data is the definition of the proper spatial unit and scales of the analysis. Since the turn of the century, without being a completely new problem, different subdomains of geography have been discussing the problem of the “right scale(s)”, the correspondent spatial units’ problem (Openshaw, 1984; Pumain and Saint-Julien, 2004) and the identification and description of the role of geographical contexts (the *mesogeography*, Miller, 2017). In urban form studies, to the traditional neighbourhood scale associated with the urban fabric, other spatial units have been proposed and discussed such as sanctuary areas (Porta *et al.*, 2014), morphological regions (Portzamparc, 1995; Oliveira, 2016) and natural cities (Jiang, 2011). Other works have been investigating the form of the physical city with systematic protocols able to identify and describe morphological regions at different (meso) scales based on fine-grained datasets (Araldi and Fusco, 2019b). In retail geography, on the contrary, the notion of micro-retail agglomerations and hierarchy investigated since the works of Brian Berry (1959), has little evolved, probably because of the inaccessibility of large disaggregated micro-retail datasets. Studies on micro-retail and independent stores have been overlooked, as already observed almost thirty years ago by Brown (1991) and regularly reminded in more recent years (Sadahiro, 2000; Fleury *et al.*, 2020). Nonetheless, starting from the 2000s exhaustive quantitative store data have been made available, at first, for large cities<sup>7</sup> (Thurstain-Goodwin and Gong, 2005; Wayens, 2006) and more recently, also at the national scales for some countries; in France, from 2017 micro-retail data is publicly available at the national scale (INSEE). This increased availability of data has stimulated a renewed interest in micro-retail studies. Systematic and data-driven protocols have been specifically developed for the investigation of retail agglomerations and their spatial organisation and evolution (Sadahiro, 2000; Wayens, 2006; Hildago and Castaner, 2015; Araldi and Fusco, 2019c; Dolega *et al.*, 2019; Carpio-Pinedo *et al.*, 2020). These works might allow in the next few years to fill the gap on micro-retail studies. Moreover, these protocols pave the way for comparative studies on large spatial extents, providing new insights about the spatial structures and scales of the retail system, its current transformations and its interactions with the urban form of metropolitan areas. Similarly, diachronic comparative studies could also be implemented (Grimmeau *et al.*, 2007; Kickert *et al.*, 2020).

32 The second aspect concerns the transformation of the urban paradigm underlying the study and the production of cities. Indeed, since the 2000s a new modelling approach has been increasingly integrated in different fields of urban studies: the studying and making of the spatial structure of cities has passed from a plot-based functionalist paradigm to the study of the urban public space, human-centred model/design and multifunctionality (also called the *revenge of urban space*, Cutini, 2001). The richness of the newly available data

also goes in the same direction, allowing the integration of human-centred perspective in the study of urban form. In the specific case of urban morphological studies, as discussed in Section 3, several works proposed human-based analyses of the urban form: from the configurational analysis (Hillier, 1999) to streetscape measure of urban design (Dovey and Wood 2015; Harvey *et al.*, 2017) and street-edges urban morphological approaches (Vialard, 2013; Araldi, 2019). All these works use the street as the possible spatial unit able to bridge different urban approaches of urban morphology studies (Kropf, 2009; 2017). In fact, the street is the main spatial unit of exploration and experience of urban space by ordinary people (city dwellers and city users). The street is here not just a scale/grain of analysis but a specific form of spatiality, involving network connections, a certain unity of perception and specific interfaces between buildings and public space. The importance of the public and street space has been also highlighted in retail geography (Lowe and Wrigley, 2000; Fleury, 2004; Hubbard, 2017). Beyond the research domain, this renewed interest to the interactions between street morphology and retail forms can also be observed in current plans (i.e., Lyon urban plan *SCOT*, described in Garnier, 2019, p. 91). A further challenge in this direction would be to have a dynamic approach to streets, retail streetscapes and physical streetscapes: these entities evolve over time, with different rhythms and path dependencies. Even configurational properties and morphological contexts of streets could evolve over time, and piecemeal transformations/adaptations happen together with more sudden structural change. Clearly, bottlenecks in terms of available data have recently been broken and (geo) processing tools are now able to manage this quantity of data in all its diversity (quantitative and qualitative attributes, spatial and temporal scales). Above all, paradigmatic convergences are emerging, particularly around the notion of the city and retailscape, but also for a better integration of the point of view of actors and users.

33 Overcoming the methodological challenges on space and time becomes paramount for the development of appropriate modelling approaches able to unlock new insights about the role of structural and functional factors in the definition and evolution of urban complexity. Models also allow us to explore and analyse the different ongoing processes transforming contemporary cities but also to outline the spatial, cultural and contextual validity of trends and theories when tested on specific case studies. Several societal and technological transformations are profoundly modifying the urban and retail systems worldwide.

34 The most studied phenomenon in the recent retail geography literature is related to the emergence of new retail formats such as e-/m-commerce and, more broadly, the effect of the electronization of the commercial activity (Rallet, 2001). The increase of on-line shopping is one of the factors behind the reduction of traditional outlets of brick-and-mortar formats and the consequent growth in retail vacancy rates. This phenomenon is not completely new: the acceleration observed in the last years is superposed to the general reduction trend observed all along the 20th century, originated by the diffusion of larger retail formats (Grimmeau *et al.*, 2007; Grimmeau and Wayens, 2016). On the contrary, large retail surfaces and chains which have flourished in the second half of the 20th century have reached a saturation level in several countries followed by a more recent shrinkage in countries such as the USA and the UK. The reduction (in number) of small and medium-sized stores observed in different European countries (Delage *et al.*, 2020) can vary in magnitude depending on the size and structure of the urban system (Wayens *et al.*, 2020). The most evident trace left by this phenomenon is the increase of commercial vacancy over the past 15 years especially in mid-sized cities (Madry, 2018; Wayens *et al.*, 2020; Saraiva *et al.*, 2019; Delage *et al.*, 2020) while a more complex transformation of shrinkage and concentration is observed in larger cities (both structural, Baudet-Michel *et al.*, 2019; and spatially, Kickert *et al.*, 2020).

35 Despite the apparent dematerialization of the retail sector, the physical properties of the urban form are more important than ever. Pick-up points, drives, and hybrid delivery systems are strongly influenced by the morphology and street-network properties of cities. The transformation of the retail sector is also strongly impacting the physical form: beyond the retail vacancy in city centres, specific functional buildings such as warehouses are transforming suburban landscapes. These transformations are opening new research questions on the interactions between urban form properties and changing retailscapes. These questions become even more important to understand how to assess local business resilience capacity or to plan and (re) develop the physical city.



# Conclusions

- 36 All along the 20th century, retail geography and urban morphology independently developed specific theoretical and methodological approaches focusing on the functional and structural complexities of cities, respectively. The two disciplines evolved separately and the study of the interactions between these two components of the city, retail and the form of the physical city, remained overlooked. In the last twenty years, the relationship between urban form and function has gained renewed attention: several theoretical and empirical works explored the relationship of urban design, morphological and configurational properties with several urban functions, including the retail activity. Nonetheless, the complexity of the overall retail spatial structure is often overlooked and oversimplified with measures of density and/or diversity.
- 37 Retail geography, for a long time centred on the description of commercial patterns, has greatly diversified its points of view and its scales of analysis, opening up widely to economics, planning, sociological and even psychological approaches and more recently to architectural and morphological approaches. Both the availability of richer and more precise data and the acceleration of changes in the functioning of commerce, with in particular a spectacular increase in the disparities of dynamism at all levels from the street to the national scale, have favoured a renewed interest in the analysis of the commercial environment, from a geographical, cultural but also morphological point of view. This renewed interest has also been fuelled by a strong societal demand for knowledge to accompany the digital and logistical transitions of retail in cities and to manage retail shrinking, including the identification of the morphological features or forms less favourable to the current and future functioning of commerce, where abandonment and reconversion are probably the most relevant “exnovation” strategies.
- 38 To reach true convergence, future studies investigating the relationship between retail and urban form should focus on the following five points: i) A common theoretical framework must be developed, able to consider and describe the relationship and interactions between retail and urban form systems and their spatial structures focusing on their interrelations and, at the same time, without oversimplify the specificities of the two domains (i.e., urban form cannot be reduced to density and accessibility, just like retail patterns have functional characteristics and a spatial form). ii) A specific attention should be given to the spatiotemporal dimensions of the phenomenon, in order to allow the understanding of the underlying process, multiple scales and meaningful spatial units have to be considered (the street being one of the most relevant at a fine scale). iii) The study of the temporal aspects and the co-evolution of urban forms and retail spatial patterns is important for the resilience of urban systems as a whole. iv) From the methodological point of view, traditional analytical approaches specific to the two disciplines should converge as well as integrate innovative protocols of spatial data analysis, artificial intelligence and machine learning. Finally, v) the development of modelling and analytical approaches should allow generalizing and understand the underlying mechanisms that generate these different outcomes without falling in idiosyncratic studies; at the same time, these analytical approaches should be more flexible and open-ended in scope and allow to investigate the sociocultural, policy factors influencing and influenced by the urban and retail spatial structure in specific geographic contexts (European and North American cities differ in many respects and differences are even more pronounced within the composite realm of the emerging countries). The development of data-driven methodological protocols should allow the implementation of comparative analysis capable of discerning between local and global trends as well as the effect of different sociocultural context on current transformations.

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## Notes

1 Von Thünen, Weber, Hotelling, Reilly, Christaller, etc., see Madry, 2016 for further discussion.

2 Fritz, Schlüter, Ratzel and later Hassinger, Geisler, etc., see Hofmeister, 2004 for further discussion.

3 Muratori, Caniggia, Maffei, Conzen, Anonymio, etc., see Oliveira, 2016 for further discussion.

4 Distinct from the Italian and English schools, it focused on the form and structure of settlements and their historical process, the French school assumed a much broader perspective, aiming to analyse and understand the urban form in a multidisciplinary context (Moudon, 1997). More in particular, the French school has been more interested in the dialectic between urban form and social action, strongly influenced by the philosopher and sociologist Henri Lefebvre (1968; 1974).

5 The same separation between configurational form and urban fabric approaches is also recognised in the urban morphology community known as respectively as the Conzenian and the SSx approaches, the two most prominent (but not exclusive) approaches within the two registers.

6 Also referred to (in urban form studies) as the architectural/urban determinism (Seamon, 1994).

7 In Paris, for instance, the APUR: [https://www.apur.org/dataviz/fiches\\_commerciales](https://www.apur.org/dataviz/fiches_commerciales)

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