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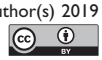

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Beyond retail: New ways of classifying UK shopping and consumption spaces

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Abstract

Early attempts to classify shopping activity often took a relatively simple approach, largely driven by the lack of reliable data beyond fascia name and retail outlet counts by centre. There seems to be a consensus amongst contemporary scholars, commercial research consultancies and retailers that more comprehensive classifications would generate better-informed debate on changes in the urban economic landscape, as well as providing the basis for a more effective comparison of retail centres across time and space, particularly given the availability of new data sources and techniques and in the context of the transformational changes presently affecting the retail sector. This paper seeks to demonstrate the interrelationship between supply and demand for retailing services by integrating newly available data sources within a rigorously specified classification methodology. This in turn provides new insight into the multidimensional and dynamic taxonomy of consumption spaces within Great Britain. First, such a contribution is significant in that it moves debate within the literature past simple linear scaling of retail centre function to a more nuanced understanding of multiple functional forms; and second, in that it provides a nationally comparative and dynamic framework through which the evolution of retail structures can be evaluated. Using non-hierarchical clustering techniques, the results are presented in the form of a two-tier classification with 5 distinctive 'coarse' clusters and 15 more detailed and nested sub-clusters. The paper concludes that more nuanced and dynamic classifications of this kind can help deliver more effective insights into changing role of retailing and consumer services in urban areas across space and through time and will have implications for a variety of stakeholders.

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Introduction

The idea of classifying and ranking urban centres based upon their retail role and function, often using a selection of supply side attributes, is not new. Such retail taxonomies and rankings have been developed in many countries to differentiate one centre from another for a variety of purposes: in order to inform investment or development decisions; to assist in the formulation of retail planning and urban economic policy; and, as retailing itself has evolved, to assist in monitoring the changing locational characteristics of retail real estate (Reynolds and Schiller, 1992). Early attempts to classify centres often took a relatively simple approach, however, largely driven by the lack of reliable data beyond fascia name and establishment counts by centre. These exercises were also generally oriented around an assumption that such a ranking of centres would be hierarchically organised. This assumption was driven by assumption that retail centres were 'naturally' nested for functional reasons within a hierarchical network of local retail centres (NPPF, 2012). There is still a view that different orders of shopping and non-shopping activities exist and that these can be associated with a particular centre's anticipated level of vitality and viability, its resilience to economic and competitive shocks or retailer's locational preferences (Jansen et al., 2014; Reynolds and Schiller, 1992; Wrigley and Dolega, 2011).

More nuanced and comprehensive classifications would materially assist in generating more systematic and better-informed insights into changing urban economic landscapes (Guy, 1998). Such classifications are now both more possible and more necessary. More possible because new, more sophisticated sources of data are available and there is a growing capability to analyse this wider range of data in a more effective way. More necessary, because in many retail markets worldwide, dynamic changes are underway, driven by new technologies and subsequent shifts in consumer behaviour that are transforming the physical provision of retail services (Grewal et al., 2018; Treadgold and Reynolds, 2016; Wrigley and Lambiri, 2015). This radical transformation of traditional retail functions is of considerable concern to both retail practitioners and public policymakers (Hughes and Jackson, 2015; Jones and Livingstone, 2018). At the end of 2016, retail real estate in the UK comprised 38% of commercial property by value – equivalent to some £337bn (Property Industry Alliance, 2017). Retailing is also a major employer, of over 2.9mn people in the UK. Eighty per cent of product purchases are still made in stores.

This research comprises a contemporary exploration of the nature of retail agglomerations in Great Britain (data were not available for centres in Northern Ireland). We develop a non-hierarchical classification derived from four sets of characteristics: the composition, diversity, function and economic health of the centres under study. Such multidimensionality will, we believe, more accurately depict complex structural and functional interdependencies within and between centres. We evaluate the results of the emergent taxonomy and provide descriptions of the identified clusters. We discuss the significance and limitations of the findings in relation both to the four identified domains of the suggested multidimensional retail centre classification as well as to the degree of insight which the chosen methodology permits, given some of the inherent limitations of heuristic analyses. We are under no illusions that this is a complex problem to model. The transformation of the retail function in contemporary urban centres has been described as a 'Rubik's Cube of an

issue' given its complexity, fast-moving nature and the involvement of a number of stakeholders with conflicting agendas (Treadgold and Reynolds, 2016). Nevertheless, we argue that this modest, data-driven, contribution will allow the debate over the future economic role of urban centres to be conducted more rigorously and transparently.

Approaches to retail classification

Classification of the spatial incidence and relative importance of economic activity has always been seen as a necessary process in understanding the development of urbanised economies. Early work by academic geographers focused upon differentiating between urban centres (Smailes, 1944). In his proposal of an urban hierarchy for England and Wales, Smailes observed that

> vertical classifications of towns, based upon differences in function or site, have often been put forward, and terms descriptive of their categories are very familiar. Much less attention, however, has been given to their horizontal classification, which involves assessment of comparative status and graded order.

In part, the reason for such lack of attention was the result of a shortage of useful data. In the 1960s, the government recognised a shift in focus of centre activity towards retailing by commissioning a Census of Distribution, providing for the first time a more detailed description of the nature of the primary shopping areas of Great Britain (Board of Trade, 1964). This allowed academics to undertake more sophisticated analyses and classifications of centre activity. Thorpe (1968) commented that 'without studies which penetrate further than the available data are able to do, it is impossible to begin to answer, with any certainty, many important questions about the functioning of these centres'.

The need for more nuanced insight was becoming critical in the 1970s and 1980s as the UK retail sector became more organised and professional, with multiple chains and networks of stores seeking out locations both inside and on the edge of town and city centres. Reynolds and Schiller (1992) argued that the purposes of classification exercises within this rapidly changing context were four-fold:

a. To enable the monitoring of change in patterns of retailing;
b. To allow the evaluation of individual investment decisions by retailers, property developers and others;
c. To assist in the formulation of policy guidelines for retail land uses; and
d. To provide more rigorous academic insights into the changing role of retailing within town and city centres.

Guy (1998) had taken the view that 'classification is essential as a means of understanding and analysing relationships in the world of retailing' (255).

Hierarchical models

The conceptual approaches to classification of retail spaces have also often assumed that hierarchies naturally exist within a network of retail centres (e.g. Hall et al., 2001). Yet there are no uniform methods to establish what such a retail hierarchy should look like, nor is there wholly convincing empirical proof that retail activities are 'naturally' hierarchically ordered outside the plains of Germany, the US mid-west or in centrally managed economies

(Brown, 1991; Christaller, 1966; Parr, 2017). Typically, metrics related to town centre size and attractiveness are used to define the position of a retail centre in a hierarchy of an existing network. There seems to be an agreement that centres towards the upper end of a hierarchy offer a 'multi-purpose' shopping experience and act as regional hubs for employment, and therefore tend to draw consumers from a wider area (Dennis et al., 2002; Dolega et al., 2016) as opposed to smaller town or district centres serving more local functions (Coca-Stefaniak et al., 2010; Guy, 1998). Town planner Thomas Sharp (1948) observed that 'central-city shops are nearly always of a special kind and size, or sell goods of a different quality and in a wider range than suburban shops'.

The hierarchical approaches to retail centre classification ranged from basic rankings based on the presence of multiple comparison retailers (Hall et al., 2001; Reynolds and Schiller, 1992; Schiller and Jarrett, 1985) to more complex analyses implementing classic central place or growth pole theory (Christaller, 1966; Dennis et al., 2002; Parr, 2017). Such early analyses were inevitably reliant on relatively simple datasets, comprised snapshots in time and, as a result, made the changing character of centres, and the context for them, hard either to fully grasp or to monitor. This is no small drawback, as Smailes (1944) commented: 'towns are constantly rising or slipping back in the urban scale, and this fact of vertical mobility is very real'.

Commercial rankings

Business service firms also started to take a particular interest in analysing retail centre characteristics and performance, made necessary in the UK by the Government's abandonment of the Census of Distribution (Sparks, 1996). Property agencies and commercial consultancies sought to provide up-to-date rankings for their clients based on 'high-low' index scores of retail places, using various composite measures or focusing on particular attributes such as vitality (Harper Dennis Hobbs, 2017) resilience or economic outlook (Experian, 2013). Supplementary analyses of consumer data and demographic composition of catchment areas were often undertaken, in order that an optimal retail mix could be suggested and a position of a particular centre within the hierarchy could be compared over a period of years (Harper Dennis Hobbs, 2017). Typically, such rankings tend to include only the top 100–200 retail destinations in terms of overall size, which limits more comprehensive assessment of systems of retail, but also the scope for comparison and benchmarking.

Methodologies employed here are often opaque, which is problematic in the context of reproducible research (Singleton et al., 2016); or are constructed in a way that make their replicability at a national extent difficult and costly to update.

Contemporary drivers of evolution in shopping and consumption spaces

In common with many countries, the UK retail landscape has undergone significant change in the past decade, following the major economic crisis of 2008–9, as well as a result of the rapid growth of online and multichannel shopping. The spatial behaviour of consumers continues, to radically evolve, with increasingly knowledgeable customers finding different ways to fulfil their consumption needs (Grewal et al., 2018; Treadgold and Reynolds, 2016; Wrigley and Lambiri, 2015). This has begun to alter both the form and function of many traditional shopping spaces, reducing demand for physical space and in some cases changing its use (Dixon and Marston, 2002; Jones and Livingstone, 2018). We have witnessed increasing polarisation between prime and secondary locations as the impact of online retailing is felt. Conversely, however, the emergence of a culture of convenience and value has paved

the way for the opening of new convenience and discount stores (Hood et al., 2016; Wood and Browne, 2007). Similarly, the composition of many town centres has evolved to accommodate increasing demand for leisure units and hospitality services (Wrigley and Dolega, 2011; Wrigley and Lambiri, 2015). Considering retail uses alone may not be sufficient to define the emerging roles of town and city centres.

The need for a more holistic approach to classification

We argue that a more comprehensive approach to a classification of shopping and consumption spaces is needed, involving a more systematic analysis of the contemporary retail and consumer service landscape at both national and local levels. A small number of classifications of retail areas can already be found, in which the conventional role of shopping is not only linked to the real estate, but also focuses on other demand and supply related factors such as the type of goods sold, trip purpose or footfall. For example, Brown (1991) developed an explicitly 'post-hierarchical' approach to classifying retail centres using a conceptual framework that combined two centre dimensions: form and function. Coca-Stefaniak (2013) developed a town centre classification matrix based on a comprehensive set of socio-economic indicators at multiple spatial scales. Mumford et al. (2017) experimented with a classification based on new sources of data such as footfall patterns and attempted to capture the inherently dynamic nature of retail centres.

Although all these studies attempted to break away from a preoccupation with hierarchy, they had their own limitations – such as their static nature. In addition, some were not developed using a data-driven approach. And even when, as in the case of the work of Mumford et al. (2017), the dynamic classification employed real world data – with only four distinctive types of retail centres based on footfall signature in 112 retail centres – it might perhaps be viewed as of limited value to decision-makers and indeed has not been fully tested in practice.

Coca-Stefaniak (2013) and Batty (2008) highlight the importance of including a number of dimensions and scales that are essential to capture the complexity of retail centre ecologies. One way of addressing this gap in research would be enhancing the two dimensions employed by Brown (1991), of form and function. In addition, perhaps also exploring a centre's diversity and its catchment's socio-economic characteristics – supplemented with evidence on its economic performance – would be novel and of value to stakeholders.

Methodology

Data

In this project, a number of datasets were employed to create a multidimensional typology of shopping and consumption spaces in Great Britain. The study utilised both non-commercial socio-economic data and commercial surveys of retail centre occupancy, linked to the Consumer Data Research Centre (CDRC), a data initiative developed by the UK Economic and Social Research Council.

We used the boundaries of the 3110 retail centres located in Great Britain (Pavlis et al., 2018). These boundaries were a preferred option to the official DCLG town centre boundaries developed in 2004, for two reasons. First, the geographical coverage of the dataset: the 2004 DCLG dataset comprises only 1300 town centres and excludes Scotland. Second, as retail centres constantly evolve and their spatial extent changes, the CDRC boundary dataset offered more up-to-date retail areas based on data from 2016. The latest ONS estimates

of unemployment rates and income variable at LSOA level, supplemented by crime data at a postcode level, available from www.data.police.uk, were employed to obtain socio-economic profiles of each retail catchment.

Most centre characteristics, however, were derived from data on town centre occupancy, which were made available from the Local Data Company (LDC: http://www.localdatacompany.com/). These data provide a series of attributes for each retail centre, collected every 6–12 months through LDC's own site survey team (Dolega et al., 2016). The data contain detailed information about the current occupier and location of retail or service premises at the building level of accuracy. Other collected information for each location included the occupier and type of retail or service business (i.e. leisure, comparison, service and convenience) including vacant outlets, whether the retail units were located in shopping centres or retail and leisure parks, and the respective name of the shopping centre or retail park.

Analytical framework and approach

It was important to ensure that the classification we generated was conceptually coherent in comprising a number of domains that could both be measured over time as well as representative in accounting for the evolving functions of retail centres – such as their configuration or economic health. The typology also needed to be capable of comparison across various spatial scales. The exploratory approach adopted in this study focuses upon four distinctive domains: the composition, diversity, size and function and economic health of each town and city centre.

- *Composition* classifies shopping spaces by the type of store and shopping trip purpose, measured by the proportional presence of retail and service categories;
- *Diversity* focuses on the variety of goods sold and services offered and included store ownership (i.e. multiple, small multiple, independent);
- *Size and function* identifies the various roles shopping spaces have and the ways in which they interact with catchment demographics;
- *Economic health* explores both the cause and effect of a retail centre's economic performance by measuring the most popular drivers of its vitality and viability and links these to the information on each centre's hinterland.

Each of these domains comprised a number of more detailed and nested sub-domains. Table 1 provides additional details and Supplementary Table S1 shows all the input variables that were used to define each sub-domain.

Sensitivity analysis was used to examine which variables were responsible for the greatest differentiation between areas as well as to limit the impact of those attributes that were either highly correlated or which offered the least discrimination potential. Initially there were 52 variables generated. However, due to issues of multicollinearity, six variables were removed, with the remaining 46 variables being used in the modelling process (see Supplementary Figure S1). The multicollinearity issue was especially pronounced in the case of local and national diversity metrics, as the measured attributes were identical and only the spatial scale was different. It was decided that the highly correlated measures of national diversity should be removed and the local dimension retained.

The analytical approach adopted for this research involved exploration of various clustering techniques, especially non-hierarchical methods. Cluster analysis is a multivariate technique (in which multiple attributes of the phenomenon under investigation can be included) that is employed to group a set of objects based on a similarity

Table 1. Domains and sub-domains used for the cluster analysis.

Domain	Sub-domain
Composition	Comparison hub
	Convenience hub
	Hospitality services
	Other consumer services
Diversity	National diversity
	Local diversity
Size and function	Upmarket destinations
	Mass/general shopping
	Value destinations
	Specialist destinations
	Ancillary and emerging
Economic health	Robust performers
	Stable performers
	Weak performers
	Fluctuating performers

(or dissimilarity) measure. There are many clustering algorithms. Amongst the most commonly used are centre-based clustering algorithms such as k-means, as their computational complexity is often linearly proportional to the size of the dataset. Thus, they are relatively more efficient and suitable for clustering large datasets (Gan et al., 2014). For this reason, k-means was initially used to explore the classification of retail centres. K-means algorithms represent each cluster by its centre (i.e. the mean) with the objective to allocate the objects to the nearest centre (i.e. the cluster). Although different distance-based measures can be used to evaluate proximity and membership to a cluster, we decided to apply the most typical choice – the Euclidean distance. The optimum solution to the objective function was provided in four steps as suggested by Everitt et al. (2011):

a. Initial partition of the objects in the clusters (on either a random basis or on the basis of prior knowledge).
b. Calculation of the clustering criterion by moving each object to another cluster.
c. Accepting the change that provided greatest improvement of the clustering criterion.
d. Repeating the previous two steps until no improvement of the clustering criterion could be made.

One of the disadvantages of employing the k-means clustering method is that it uses the mean as a measure of centrality and the results can be adversely affected by the presence of extreme values in the data. The use of the median value as measure of centrality provides a clustering solution that is more robust in the presence of outliers. Algorithms that minimise dissimilarities to the median values are referred to as 'partitioning around the medoids' (PAM) (Kaufman and Rousseeuw, 1990). In this study, the PAM method was used to develop the final classification of retail centres due to the presence of outliers in the data. In addition, given that the Euclidean distance is affected by the scale of the variables, these were range-standardised to the scale 0–1.

Another hindrance created by centre-based algorithms (including k-means and PAM) is that the user is required to provide a prior estimation of the number of clusters in the data. Various methods have been used to estimate the number of clusters. Most commonly

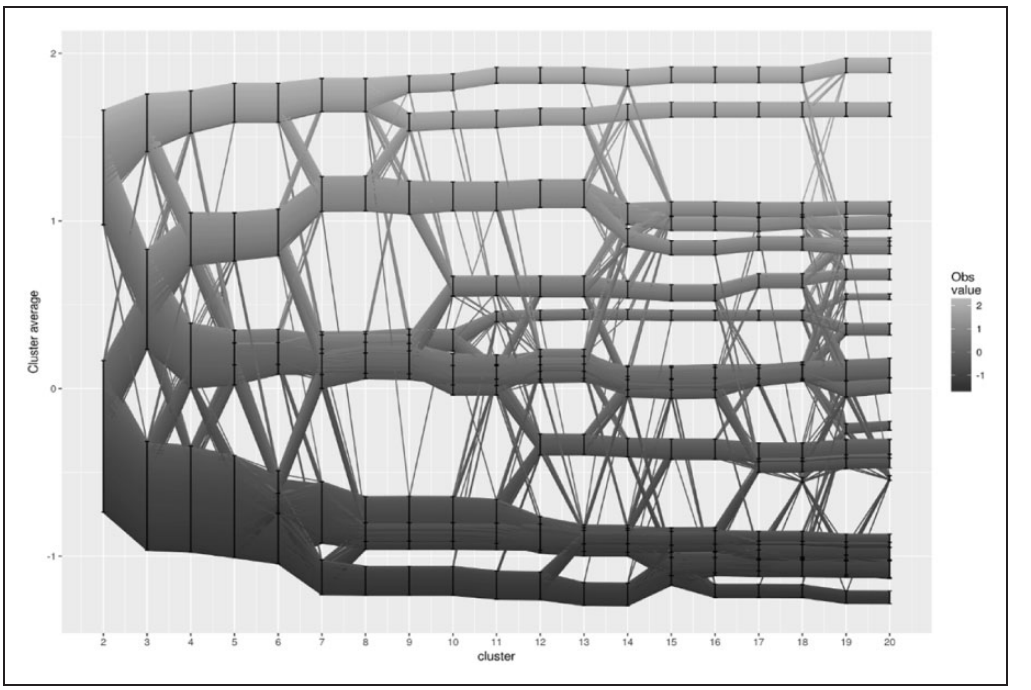

Figure 1. Clustergram of the cluster medians versus no of clusters.

internal criteria, or other criteria of the goodness of the clustering solution, are plotted against the number of clusters (Dimitriadou et al., 2002). In this study, a tree graph known as a clustergram (Schonlau, 2002) is used to determine the optimal number of clusters for the data at hand. For each cluster iteration, the cluster centres are multiplied by the first loading of the principal components of the original data, thus offering a weighted mean of each cluster centre dimensions as a representation of the cluster. Subsequently, the data points are ordered according to their respective cluster first component and plotted against the number of clusters, thus creating the clustergram (Figure 1).

Typology

The clustering process first created an initial 'coarse' tier referred to as 'Supergroups'. Based on the clustergram, numerous tests of different cluster frequencies and the assessment of classification performance, five main clusters were eventually selected at this level. A different number of observations were assigned to each 'Supergroup' varying from 261 to 1192 centres. The evaluation included mapping of the results, examining cluster plots and empirical testing of cluster fit through within sum of squares statistics. The final stage in building the classification was to assign labels and descriptions to each of the clusters of this typology. Although there are multiple approaches to this task (Singleton and Longley, 2015), our preferred method was to calculate for each cluster and input variable median values and index scores, computed as a sum of the values per cluster divided by the total sum of the values. By considering variability in these scores, the characteristics of each cluster were compared and descriptions, the so-called pen portraits, of each 'Supergroup' created.

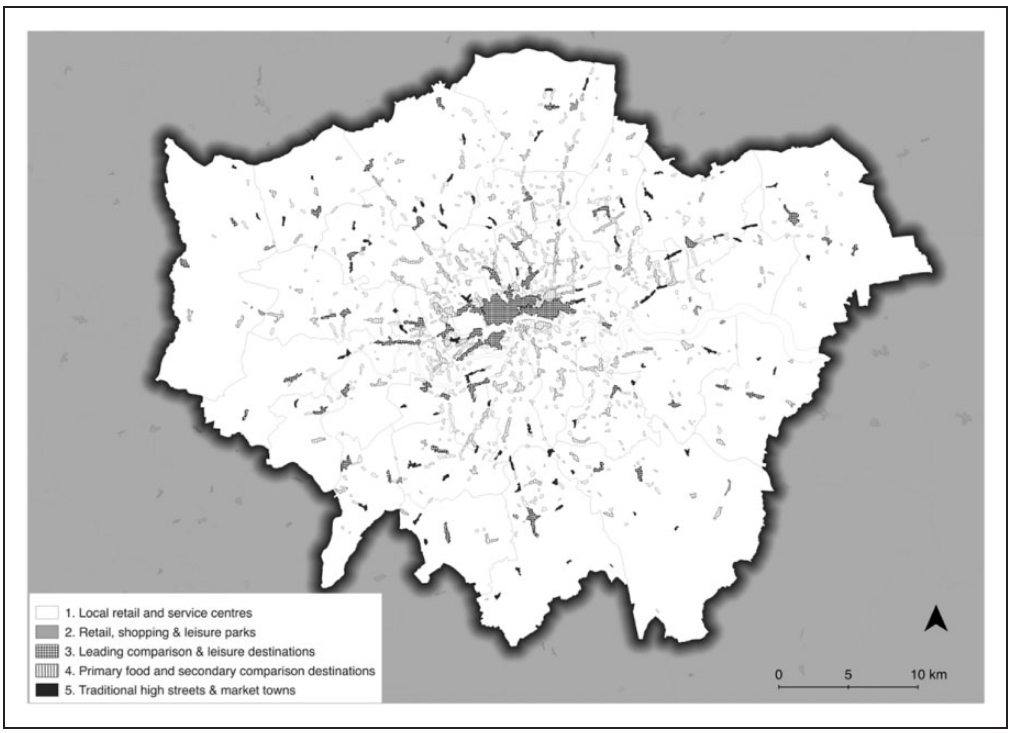

Figure 2. Spatial distribution of the 'Supergroups' in Greater London.

These descriptions provide an overview of the salient characteristics of each cluster and are summarised below:

1. *'Local retail and service centres'*

The largest cluster of 1200 predominantly local retail and service centres with clear spatial concentration around the major urban areas, half of which are located in Greater London (Figure 2). They provide a generally highly independent offer, focusing on consumer services and local leisure, with limited retail provision.

2. *'Retail, shopping and leisure parks'*

A very distinctive cluster of typically out-of-town locations occupied by 'big box' retailers and large multiple chains. Such centres specialise in mass and value comparison retail goods, offer limited services and generally have a low vacancy rate.

3. *'Leading comparison and leisure destinations'*

These are the main regional and sub-regional retail destinations and also generally include larger market towns serving large catchments. These centres have diverse and comprehensive retail, leisure and hospitality offers, typically anchored by department stores, and are presently home to large national chains of premium, mass and value retailers.

4. *'Primary food and secondary comparison destinations'*

A cluster comprising larger district centres, suburban and coastal towns with medium-size catchments. These centres are relatively diverse and vibrant; they specialise in food retail and are secondary comparison goods destinations. They comprise a good mix of independent and multiple retailers and offer a good choice of consumer and leisure services.

5. *'Traditional high streets and market towns'*

These are highly diverse but traditional British high streets and smaller market towns which focus more on convenience and local household services. Such centres are often located in more rural areas, face less competition and their catchments are characterised by low unemployment and crime rates.

In the second stage of the analysis, the data were re-clustered within the 'coarse' assignments to form a second, nested, 'Group' level, so the final classification formed a nested hierarchy of 5 Supergroups and 15 Groups. The detailed 'pen-portraits' of all the identified clusters are available from the CDRC website https://data.cdrc.ac.uk/dataset/retailtypology, but Table 2 provides some key characteristics for each 'Group' level cluster.

Discussion and implications

Through our creation of a multidimensional typology of the spatial provision of retailing and service activity, we seek to better understand the transformed functions of consumption spaces. In this section, we draw out in our discussion some of the implications for scholarship, including research methodology, as well as the considerations for those stakeholders in policy and practice with interests in, or responsibility for, the economic vitality and viability of urban areas. This final perspective is important, in that our analysis has potentially far-reaching consequences – ranging from assisting in the development of more realistic retail planning policy guidelines to the provision of substantial analytical leverage for the investment decisions of commercial stakeholders.

Scholarly significance

By investigating spatial interdependencies between different types of consumption spaces in the UK, this paper provides new rigour for the academic discourse on the nature of spatial change in the retail landscape. It does this in three respects: in relation to challenging the contemporary relevance of a hierarchical ordering principle for centres, in providing a better understanding of the role of service and leisure uses in a hybrid typology of centres and finally in demonstrating the polarization that is now becoming apparent between 'winning' and 'losing' locations in respect of retailing activity.

Our analysis first contributes to the debate on the extent to which Christaller's (1933) 'central place theory' can be applied to the contemporary structure of urban retail (e.g. Dennis et al., 2002; Forbes, 1972; Jones, 2017). Our results serve to corroborate the academic argument that the traditional urban hierarchy of retail systems, driven by 'central place theory', is of limited contemporary utility. This is consistent with Jones (2017) and Jansen et al. (2014), who argue that regional dominance of the major UK comparison retail hubs is now constrained by the existence of large out of town retail developments. In our typology the split within the broader cluster 3 (Leading comparison and leisure destinations) was mainly driven by the attributes related to affluence of an area rather than the distance between centres, or the spatial dispersion of demand (Parr, 2017). Indeed, cluster 3.1 ('Premium shopping and leisure destinations') is dominated by the presence of anchor

Table 2. Key characteristics of the two-tier classification of consumption spaces.

Supergroup	Group	Key characteristics
1. Local retail and service centres	1.1 Diverse urban service centres	Upmarket, minor urban centres, densely populated catchments, London-dominated, higher diversity, hospitality service
	1.2 Local urban convenience centres	Urban centre, independent retail and food service, convenience goods and some comparison
	1.3 Inner urban service centres	Inner urban small shopping parades, low diversity, highly independent, focussed on consumer service and non-retail
2. Retail, shopping and leisure parks	2.1 Primary retail, shopping and leisure parks	Large retail parks, extensive catchment, broad offer including mass brand fashion and department stores, very low vacancy
	2.2 Less diverse retail, shopping and leisure parks	Smaller and less diverse retail parks, non-leisure, predominantly comparison goods
3. Leading comparison and leisure destinations	3.1 Premium shopping and leisure destinations	Top regional and sub-regional destinations, affluent market towns, diverse and comprehensive offer, retail, services, leisure, home to top national chains
	3.2 Mass market and value retail large centres	Semi-regional, less affluent destinations, smaller catchments, broad mass and value retail/service, fewer anchors
	3.3 Affluent and premium retail destinations	Small number of centres, affluent catchments, upmarket fashion and multiple retailers, premium brands, non-value, low vacancy
4. Primary food and secondary comparison destinations	4.1 Vibrant secondary urban destinations	Smaller urban district centres, densely populated and less affluent catchments, vibrant, service hubs
	4.2 More affluent district destinations	Town/major district centres, more affluent, high diversity, mass and value retail, local leisure hubs
	4.3 Urban value destinations	Less affluent, higher crime and unemployment, less diverse, value oriented, non-premium, fast food hubs
5. Traditional high streets and market towns	5.1 Traditional high streets of rural Britain	Small market towns, rural Britain, independent, diverse, convenience and comparison retail and leisure offer
	5.2 Suburban and market town high streets	Small suburban centres, commuter belt, less diverse, convenience retail and consumer and business services
	5.3 Diverse and affluent urban leisure destinations	Inner-urban traditional high streets, affluent, independent and speciality, e.g. boutiques, tea-rooms
	5.4 Indie and value oriented high streets	Small high streets, less affluent, deprived, value oriented independent retail and consumer services

stores, premium brands and more upmarket and chain restaurants, compared to cluster 3.2 ('Mass market and value retail large centres'), which can be characterised by mass and value retailers and higher vacancy rates.

Furthermore, it is clear that consumption centre networks are not hierarchically organised even at the regional level. For instance, all major urban areas contain more than one centre assigned to the ostensibly higher order cluster 3.1. As Supplementary Figure S2 shows, in Greater Manchester alone there are in total four 'Premium shopping and leisure

destinations' (Central Manchester, Bury, Stockport and Wigan). Besides this, the premium comparison offer is supplemented by further two 'Affluent and premium retail destinations' (Trafford Shopping Centre and Lowry Outlet Centre). We conclude that higher order comparison retail destinations in the larger urban areas now typically include a complex mix of city centres, regional shopping centres and designer outlets, and are also supplemented by a number of primary and secondary retail parks. This suggests a more fragmented and complex set of relationships between centres than would be allowed by central place theory or notions of simple hierarchy. This trend, however, is less pronounced in smaller urban areas such as Oxford, Norwich or Southampton where the presence of outlying regional shopping centres and designer outlet centres is less extensive (largely thanks to policy interventions).

Similarly, in terms of convenience retailing, our classification shows that the patterns of spatial interdependencies are different, with a number of types of retail centre offering comprehensive food shopping experience. Of course, the provision of convenience retailing is supplemented by the free-standing large supermarkets and increasingly important and rapidly growing sector of convenience stores found in all types of retail areas, but which are not caught by our focus on agglomerations (Wood and Browne, 2007; Wrigley and Lambiri, 2015). Despite this, the trend is more polycentric, with many distribution points that have relatively small market areas (Parr, 2017).

A new feature of this classification is the addition of leisure and consumer service activities. Our typology demonstrates that these non-retail functions display a more dispersed rather than hierarchical tendency, with a number of suburban nodes operating in a manner that is increasingly independent of the central node (Jones, 2017). Notably, our analysis also confirms that the leisure offer has become a fundamental element of almost all types of centre, with its role seen as a complementary one, increasingly important to the vitality and viability of consumption spaces (Wrigley and Lambiri, 2015). Indeed, it could be argued that in smaller local urban centres, services are tending to substitute for the role which higher order goods shopping are playing in large centres. Finally, there are a number of clusters such as cluster 5 ('Traditional high streets and market towns') that have more 'specialized' functions with their activities being exceptionally diverse and, as Parr (2017) has already proposed, appearing to have a more random spatial distribution within both urban centres and rural areas.

Finally, our results provide evidence for assertions made in the literature that in the new retail landscape there are 'winning' and 'losing' places for retail functions, especially in respect of the presence of leading multiple brands (Treadgold and Reynolds, 2016). For example, centres defined as 'out-of-town centre retail and leisure parks' followed by those centres in the 'Affluent and premium destinations' cluster are the strongest performers as measured by vacancy rate, and a contrast between these types of centre and more poorly performing locations such as all the value-oriented types (groups 3.2, 4.3 and 5.4), where vacancy rates are higher, can be discerned. Both of the strong performing clusters are highly specialised and perhaps are relatively less exposed to the more acute problems facing more traditional high streets such as the impact of online sales, multiple branch closures or changing consumer culture. They therefore perhaps offer lower risk locations to investors and developers. By contrast, many secondary and value-oriented retail areas have suffered from higher vacancy rates. This has recently been exacerbated by declining consumer confidence, falling retail sales (BRC, 2018) and a number of retail chains going out of business. Consumer culture and the socio-economic characteristics of catchment areas continue to evolve and it will be important to understand how retail offerings will remain aligned with trends in demand particularly including technological advances, polarisation of income or an ageing population (RBS, 2013).

Methodological significance

This study makes three important methodological contributions: in developing a new classification that is more comprehensive in terms of its scope than prior analyses; one which also offers a new level of granularity by functioning at both national and local scales; and one which restores a broader understanding of the economic role of urban centres, beyond merely retail. First, this multidimensional classification adopted a non-hierarchical cluster analysis approach and analysed data for over 3000 centres. This alternative and more sophisticated analysis was also able to employ an extended set of variables that were deemed fundamental to understanding the contemporary retail landscape, as opposed to those employed by many past exercises. We found that it was essential to move away from more simplistic notions about customer shopping behaviour (Guy, 1998) in order to better account for those dimensions that are shaping both consumer perceptions as well as precipitating the configurational adjustment of retail spaces and their relationship one to another. Our approach focuses on the non-hierarchical interactions occurring between British retail centres and depicts their 'horizontal' relationships, as referred to by Smailes (1944), by classifying these spaces by their similarity rather than a position within the hierarchy. This important and deliberate methodological consideration contrasts sharply with the more conventional two-dimensional rankings of retail centres, but is in line with some of the other non-hierarchical approaches to town centres classification proposed by Brown (1991) or Coca-Stefaniak (2013). However, our typology has some methodological advantages over these, being both entirely data driven and organised around several domains, in a way that more systematically captures the dynamic nature of centres.

Second, the research embraces a number of spatial scales (Batty, 2008) during the modelling process. An effort was made to incorporate both national and local scales when constructing the metrics depicting various characteristics of consumption spaces, their catchments and competition. It has been argued that the vitality and viability of retail areas depends on factors attributable to different spatial scales, but the extent to which they overlap and interact is also important (Parker et al., 2016). Typically, the scale and scope of the impacting force will vary spatially depending on the local context (Batty, 2008; Hughes and Jackson, 2015), such as catchment characteristics, levels of local competition or diversity of retail offering and services provision. For instance, understanding how various nationally observable trends or events (e.g. changes in levels of unemployment or crime, the collapse of a national retail chain or the implementation of a new planning policy) may filter down to a local area level could offer useful analytical leverage.

Finally, by broadening the scope of this study beyond retail, we found greater resonance with some of the research carried out in the 1940s and 1950s on 'service centres' and what Smailes (1944) refers to as 'the hallmarks of a true town'. Arguably, urban centres in Great Britain have become too dependent upon retail functions in recent years. It is clear from previous research (e.g. Coca-Stefaniak, 2013; Wrigley and Lambiri, 2015), but also from our classification, that achieving the right balance between retail and services provision is crucial to all types of consumption spaces with their vitality increasingly reliant on both leisure activities and services provision.

Commercial significance

This leads us to consideration of the commercial significance of our findings. We are under no illusions that the transformation of the consumption function of urban areas is a complex and multifaceted process. Simply put, until recently, the past 60 years were

characterized by the continued expansion in demand for physical 'brick and mortar' retail (Hughes and Jackson, 2015), which translated into a continuous increase in sale floorspace and of retailing's contribution to the economic value of towns through its physical presence. However, this has changed. On the one hand, retail presence within town and city centres has become increasingly combined with other uses such as services and leisure activities (Wrigley and Lambiri, 2015), and on the other, the expansion of online retailing is causing a net loss of demand for some forms of retail floorspace and a change in function for others, thus requiring traditional retailers to rethink their business models and the role of physical space within those models. Unquestionably, these effects vary geographically with different location and type of retail areas exhibiting diverse demand patterns (Birkin et al., 2017; Jansen et al., 2014; Singleton et al., 2016). The results of this research can be applied to identify and monitor the appropriateness of particular urban environments for new investments or, given the competition from online shopping, to bring intelligent, analytical rigour to the decisions that might need to be made to rationalise existing store portfolios and distribution networks for branch-based businesses. Profiles of particular retail areas, their evolutionary trajectory, their diversity or the presence of competitor brands can be used as an evidence base for monitoring market share performance, estimating revenue potential through the use of more sophisticated analogues (Drummy, 1984) and implementing appropriate locational strategies (Duley, 2013). The capability for replication of this analysis is therefore a particularly important feature of commercial relevance.

Methodological limitations

Cluster analysis is a well-established exploratory technique used in urban and retail planning to understand the context of place (Singleton and Spielman, 2014). Outputs from a cluster analysis are nevertheless representations, and in some sense, 'there is no right or wrong answer' (Singleton and Longley, 2015; Vickers and Rees, 2007: 381). However, we argue that an effective segmentation must employ a robust and transparent methodology that enables challenge and critique, and is guided in its specification, estimation and testing by a community of end users.

Our classification heavily relies on indicators that are calculated as a proportion of various types of retailers or service providers and, as a result, the analysis is sensitive to the overall size of a centre as measured by total number of units. This issue is particularly noticeable in the case of smaller retail centres, where the small base from which proportions are calculated can generate sizeable values which can serve to bias the results. For instance, some larger market towns with a good representation of multiple retailers and presence of premium brands have a similar proportion of these store types as larger regional centres and may be allocated to the same cluster. It could be argued that those market towns have attracted several national retail and leisure chains, anchor stores and premium brand retailers, and due to their isolated location, they do not face strong competition and play a disproportionately important role within local markets. However, introducing a scale dimension for cluster 3.1 with a cut-off point differentiating market towns from larger regional towns and cities could be beneficial. A similar issue was also reported by Hall et al. (2001) who observed that the differentiation achieved between centres in the upper part of the hierarchy was less satisfactory than elsewhere.

Although we endeavoured to capture the complex nature of consumption space, inclusion of additional measures from alternative data could improve the quality of our understanding. For example, some data sources – such as the Internet User Classification, developed by Singleton et al. (2016) – were not available for the entire extent of Great Britain.

Also, employing some other new forms of data such as footfall dynamics on a micro-level may be of further benefit. Footfall is often cited as the 'lifeblood' of a retail centre vitality and viability (Birkin et al., 2017; Mumford et al., 2017) and its relationship with type of retail centre are still underexplored; however, we had no access to such data at an appropriate level of either granularity or coverage.

Finally, the dimensions accounted for in the classification are not ordinal and are multidimensional. For instance, the right mix of tenants is an important factor affecting the perceived attractiveness of a particular shopping space and this relationship has been found to have a pivotal role in terms, for example of patronage (Blut et al., 2018; Teller and Schnedlitz, 2012; Teller et al., 2016) or vacancy levels (Wrigley and Dolega, 2011; Wrigley and Lambiri, 2015).

Concluding remarks

The retail landscape of the 21st century is becoming increasingly complex, with competition from online retailers and the growing presence of services and leisure activities transforming the role that traditional 'brick and mortar' retail has had in our towns and cities. Many of the challenges faced by existing retail businesses have resulted from the increasing complexity and unpredictability of consumers' behaviour. Contemporary exercises in spatial analysis of demand and supply need to match this growing complexity. We believe our approach, which involves accounting for the dynamic and multidimensional nature of consumption spaces, compares favourably to more widely adopted 'high-low' measures of an urban centre's characteristics. Further, our analysis takes into consideration potential spatial interaction across a number of scales (Batty, 2008) and examines the growing role of non-retail functions in our town centres and high streets, some of which will increasingly move 'beyond retail'.

Although not free from the limitations inherent to heuristic methods, this classification offers novel and valuable insights that can be used to generate more systematic and better-informed debates on the changing British retail landscape, contributing to an evidence base which is otherwise notable for its sparseness. It contributes to the debate on the extent to which central place principles can be applied to British retail centres. Our classification offers a useful tool for commercial decision making, especially to determine what retail and services provision are viable across different locations and how this relates to existing levels of provision and competition. The study also provides a basis for comparison of retail centres across time and space, with the analysis capable of being replicated relatively easily by using public domain software tools. This may be particularly useful when new data become available. Finally, our research speaks to the concerns of planners and public policymakers. The UK retail sector came to play an increasingly important urban economic role as multiple branch retail firms expanded their presence, and local economies have become dependent on the economic value that such activities create. A largely defensive planning policy put town centres first and placed retailing at the heart of urban planning policy. The viability of this policy is now unclear. For example, although the eventual impact of Internet shopping on retail real estate is still emerging, it has been suggested by the Distressed Town Centre Property Taskforce (2013) and Weltevreden et al. (2008) that it may vary substantially by type of retailer, with large multiples likely to benefit more from a multichannel offer than small independents.

Arguably, whilst much of the added value of this research and its implications are still to be determined it provides a benchmark for future studies, enabling easy replication and creation of alternative representations of the commercial landscapes of urban areas and the dynamic changes to which they are presently exposed.

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