**QUANTITATIVE METHODS STATEMENT**

The quantitative data contained within the archive is based on individual property data within the policy-defined principal retailing /principal shopping areas within Edinburgh, Glasgow, Hull, Liverpool and Nottingham. The individual property records were compiled by linking administrative and commercial datasets in the way detailed below.

**Data Linking Process**

The Non-Domestic Rating Valuation List (Valuation Roll in Scotland) contains a snapshot of all non-domestic properties eligible for local taxation purposes within the primary shopping area (PSA) or principal retailing area (PRA) designated by local authority planning policy[[1]](#footnote-1),[[2]](#footnote-2). These lists contain details of their use and net annual value[[3]](#footnote-3).

The records in the valuation roll for 1st April 2000, 1st April 2005, 1st April 2010 and 1st April 2017 in Edinburgh and Glasgow were linked by address, allowing for subdivisions and mergers as identified in the record codes, and in Hull, Liverpool and Nottingham the Valuation Office Agency (VOA) records for 1st April 2010 and 1st April 2017 were linked by Unique Assessors Reference Number (UARN) or address where an administrative update had resulted in the property’s UARN changing. This created a database for each centre of the officially recognised stock of retail and commercial properties at each observation point after car parking spaces, and telecommunication and advertisement facilities were removed. For the Scottish databases, size data and the details of occupiers and proprietors were copied from the online Scottish Assessors Association (SAA) database, as at December 2018 while the English property records were also linked to the history and summary records by UARN to get size data[[4]](#footnote-4), changes in rateable value and the reason for the change to allow appeals to be differentiated from changes due to change in use. The entries for 2000 and 2005 could not be linked into the stock databases for Liverpool, Hull and Nottingham as the legal obligation for the VOA to make information about the Non-Domestic Rating Lists for 2005 (and earlier) available came to an end on 31st March 2017 which meant they no longer published these lists or made them available outside the VOA.

The properties in these stock databases are then further linked by address to data held from a range of sources, including sales and long leasehold records in Edinburgh and Glasgow from the Land Registers and HM Land Registry Company and Overseas transaction datasets; property sales transaction data and 2000 and 2005 business rates exported from CoStar and PropertyData; occupier data from Experian and Local Property Data; and vacancy status recorded in Local Authority Business Rate Accounts and Non-Domestic Empty/Exempt Lists. The records were then cleaned to create variables with the name and details of occupiers and owners as at 1st April 2000, 1st April 2005, 1st April 2010 and 1st April 2017. As part of this process, the occupier and owner variables in the stock databases created for Glasgow and Edinburgh were cross referenced against the occupier and proprietor data recorded in the valuation rolls held on public display, and the ownership records held for the English cities were cross-checked with the listing in Nimbus Maps to ensure the HM Land Registry records had been correctly matched with the right buildings. Where an information gap occurred, ‘unknown’ was recorded.

As a final stage in the creation of the stock database for each city, the data were linked to the easting and northing co-ordinates in the AddressBase Premium dataset as this provided a consistent mapping methodology, whereas the co-ordinates that exist across the Experian, Local Property Data and Land Registry datasets were not always based on the midpoint of properties. For the English properties, the linking was automated by Unique Property Reference Number (UPRN) as this variable was provided in the valuation lists. Address was used to manually match the Scottish properties to the entries in AddressBase Premium. The properties were then mapped and their location cross-checked against their address.

**Data Sources and Licenses**

City of Edinburgh Non-Domestic Valuation Roll electronic copies- Lothian Valuation Joint Board. Economic and Social Research Council. Lothian Valuation Roll, 2018 [1995, 2000, 2005, 2010, 2017]. University of Glasgow - Urban Big Data Centre.

City of Edinburgh Non-Domestic Valuation Roll hardcopies- Lothian Valuation Joint Board (2000) Lothian Valuation Roll as at 1st April 2000, Lothian Valuation Joint Board and Lothian Valuation Joint Board (2005) Lothian Valuation Roll as at 1st April 2005, Lothian Valuation Joint Board Assessor available in the National Library, and Lothian Valuation Joint Board (2010) Complete Valuation Roll for Edinburgh City Centre as at 1st April 2010 provided electronically by Lothian Valuation Joint Board.

City of Glasgow Non-Domestic Valuation Roll electronic copies- The Assessor For The City Of Glasgow appointed in accordance with The Local Government etc. (Scotland) Act 1994. ESRC. Glasgow Valuation Roll Dataset 1990–2018, 2019 [1995, 2000, 2005, 2010, 2017]. University of Glasgow - Urban Big Data Centre.

City of Glasgow Non-Domestic Valuation Roll hardcopies- The Assessor For The City Of Glasgow (2000) City of Glasgow Valuation Roll as at 1st April 2000, Assessor For The City Of Glasgow; The Assessor For The City Of Glasgow (2005) City of Glasgow Valuation Roll as at 1st April 2005, Assessor For The City Of Glasgow; The Assessor For The City Of Glasgow (2010) City of Glasgow Valuation Roll as at 1st April 2010, Assessor For The City Of Glasgow available in the Mitchell Library, Glasgow.

CoStar Suite Transaction Records for Edinburgh, Glasgow, Hull, Liverpool and Nottingham [1998-2017].- Information provided by CoStar contains information produced by HM Land Registry. © Crown copyright [2017, 2018 and 2019] and information produced by Registers of Scotland © Crown copyright. Material is reproduced with the permission of the Keeper of the Registers of Scotland.

Experian Goad Plan Data - Goad Plan Experian Data. Economic and Social Research Council. *Goad Plan Data Experian, 2019* [1998, 2000, 2005, 2007, 2010, 2012, 2017]. University of Glasgow - Urban Big Data Centre.

HM Land Registry Company and Overseas transaction datasets- Information produced by HM Land Registry. © Crown copyright [2017, 2018 and 2019].

Land Registers for Non-domestic properties in Edinburgh and Glasgow - Registers of Scotland. Economic and Social Research Council. Registers of Scotland All Sales Data [2003 to 2018]. University of Glasgow - Urban Big Data Centre. © Crown copyright. Material is reproduced with the permission of the Keeper of the Registers of Scotland.

Local Authority Business Rate Accounts and Non-Domestic Empty/Exempt Lists - Information provided by Hull City Council, Liverpool City Council and Nottingham City between 2009 and 2017 and published as Business Rate Account and Non-Domestic Empty Properties Lists on their data portal and as Freedom of Information Requests at https://www.whatdotheyknow.com, contains information produced by VOA. © Crown copyright [2005, 2010 and 2017]. For Hull these lists were published for July 2014, September 2015 and January 2018. For Liverpool these lists were published for May 2011, September 2012, August 2013, January 2015, April 2016, February 2017, and April 2018. For Nottingham these lists were published for June 2009, April 2011, December 2016 and March 2017.

Local Property Data Records for Edinburgh, Glasgow, Hull, Liverpool and Nottingham [2010-2017], Licensed for REPAIR Project at University of Glasgow and University of Sheffield.

Nimbus Maps – Information provided by Nimbus Maps, contains information produced by HM Land Registry. © Crown copyright [2017, 2018 and 2019].

OS AddressBase Premium - For data relating to Hull, Liverpool and Nottingham © Local Government Information House Limited copyright and database rights [2019] [0004120784]; For data relating to Glasgow and Edinburgh, this product contains data created and maintained by Scottish Local Government; Please note AddressBase Premium contains public sector information licensed under the Open Government Licence v3.0.

PropertyData.Com Transaction Records for Edinburgh, Glasgow, Hull, Liverpool and Nottingham [1998-2017].

Valuation Office Agency (VOA) records for Hull, Liverpool and Nottingham- Contains public sector information licensed under the Open Government Licence v3.0. Information produced by VOA. © Crown copyright [2017 and 2018].

**Data Aggregation and Methods**

The micro-level records could not be archived due to the license restrictions attached to the administrative and commercially sensitive data used to create the stock databases. Instead, aggregated measures of the variables created from the mixed datasets were generated at different levels of aggregation, and in different formats. The quantitative data provided in the files is explained below:

* ***Non-Domestic 100mx100m Grid Data***

Counts of properties within non-domestic property use and ownership categories within 100mx100m grids was provided for the PRA/PSA in Edinburgh, Glasgow, Hull, Liverpool and Nottingham at April 2000; April 2005; April 2010 and April 2017. Different levels of property use categorises are available and defined in the accompanying metadata file.

* ***Non-Domestic Postcode Sector Data***

Counts of properties within non-domestic property use and ownership categories within the Postcode Sectors in the PRA/PSA in Edinburgh, Glasgow, Hull, Liverpool and Nottingham was provided for April 2000; April 2005; April 2010 and April 2017. Different levels of property use categorises are available and defined in the accompanying metadata file.

* ***Non-Domestic Postcode Data***

Percentages of all properties in different non-domestic property use categories and percentage of all non-domestic properties in different ownership categories at the Postcode level was provided for the PRA/PSA in Edinburgh, Glasgow, Hull, Liverpool and Nottingham at April 2000; April 2005; April 2010 and April 2017. Different levels of property use and ownership categorises are available and defined in the accompanying metadata file.

* **Non-Domestic 200mx200m Grid Data**

Percentages of all properties within the PRA/PSA used as residential, office/storage/business and accommodation services within 200mx200m grids was provided for the PRA/PSA in Edinburgh, Glasgow, Hull, Liverpool and Nottingham at April 2000; April 2005; April 2010 and April 2017.

* **Diversity Metrics**

Property use and ownership Richness, Gini-Simpson diversity index, Simpson diversity index, Simpson Equitability index measures are provided for 100mx100m grids spanning the PRA/PSA in Edinburgh, Glasgow, Hull, Liverpool and Nottingham at April 2000; April 2005; April 2010 and April 2017. These metrics are provided for property use and ownership.

Richness is measured as the total number of different types of property use/ownership in the PRA/PSA (R).

Equation 1 details the equation used to measure the Gini-Simpson Diversity Index (D):

Equation 1

$$1-D=1-\left[\sum\_{i=1}^{R}\left(\frac{n\_{i}}{N}\right)^{2}\right]$$

where $n\_{i}$ is the number of retailers or operators within use classification *i* in a retailing market and N is the total number of retailers or operators and R, richness, represents the total number of different types of use categories. The greater the value of the 1-D metric, the greater the sample diversity.

The Shannon diversity index (H) captures the proportion of individual retailers/operators belonging to the *i*th use classification (𝑛𝑖𝑁). It is calculated as:

Equation 2

$$H=-\sum\_{i=1}^{R}\left(\frac{n\_{i}}{N}\right)∙ln\left(\frac{n\_{i}}{N}\right)$$

The higher the Shannon index the higher both richness and the evenness of heterogeneity in the market.

While the Shannon’s diversity index (H) accounts for both abundance and evenness of the species present, it can be modified to allow evenness to be singled out. This is calculated as:

Equation 3

$$E\_{H}=\frac{H}{lnR}=\frac{-\sum\_{i=1}^{R}\left(\frac{n\_{i}}{N}\right)∙ln\left(\frac{n\_{i}}{N}\right)}{lnR}$$

Equitability assumes a value between 0 and 1, with 1 being complete balance in the uses present, although perfect use balance is not necessarily desirable.

These index measures are provided for all properties (including and excluding residential properties) within the PRA/PSA. Table 1 defines the categories used to estimate these measures.

**Table 1. Classifying Property Use**



These index measures are provided with categorical ownership data for non-domestic properties. Table 2 defines the categories used.

**Table 2. Classifying Property Ownership**

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The diversity metrics data files also contain percentages of all properties within PRA/PSA in different broad non-domestic property use categories within 100mx100m grid at April 2000; April 2005; April 2010 and April 2017.

1. The National Planning Policy Framework (Ministry of Housing, Communities and Local Government, 2019) defines urban core retail area in England as the primary shopping area (PSA); while in Scotland the principal retail area (PRA) is identified by the controlling Local Authority as the preferred location for retail development (Scottish Government, 2014). [↑](#footnote-ref-1)
2. This excluded the North Bridge extension to Edinburgh’s PRA, removed in 2016 City Plan but present in 2010 , and the London Road strategic area in Liverpool as deemed to be disconnected for the main retail cores. [↑](#footnote-ref-2)
3. Rateable values determine the local property tax liability of the occupier and set at effective dates based on market rents at earlier tone dates. [↑](#footnote-ref-3)
4. Zoning is a measurement methodology used in the UK to compare shops of different sizes and layouts, and used in the valuation of retail units. Zone depths depend on local custom – typically 6.1m in English cities and 9.14m in Scottish cities. Each zone is weighted to convert the shop area into the equivalent Zone A which is the most valuable zone at the front of the shop. The area data was used to work out the size of these zones and convert the rateable values into the Zone A rate per square metre. [↑](#footnote-ref-4)