



How website users segment a city: The geography of housing search in London



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ABSTRACT

This paper explores spatial patterns of housing search in London, using data generated by users of the UK's most popular real estate portal. By focusing on the variable geographies of 'search extent', it attempts to make a contribution to a long line of studies focused on understanding the fragmented geography of metropolitan housing markets. It also builds upon more recent work in economics on the utility of user-generated search data. After introducing our approach, we discuss the background to housing search and the wider emergence of 'search' as an object of study. We then provide further details on the data and methodology before exploring the spatial and sectoral characteristics of search in London. The results suggest that there is much to be gained by incorporating search studies into housing market analysis and that there is significant potential for future work in this area.

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1. Introduction

Housing markets are inherently spatial entities, so it is not surprising that their spatial structure has been a key concern for analysts over the years (e.g. Palm, 1978; Goodman & Thibodeau, 2007). Underlying the spatial composition of housing markets – and submarkets in particular – is the concept of 'search extent'. This relates to the mental and physical geographies associated with housing search at the very early stages of market interaction. It is a feature of the housing search process in which households search for substitutable properties within specific areas, based on preferences such as price and property characteristics. Some analysts have favoured a spatial approach to understanding housing search processes and others have explored the topic from a sectoral perspective but there remains no clear consensus on which approach is optimal (Watkins, 2001; GLA, 2004; 2013).

Rather than seek to provide a definitive approach to housing submarket definition, this paper combines sectoral and spatial approaches to develop an overview of the geography of search extent in London using a very large housing search dataset. It does so in the context of a London housing market in the midst of historic price inflation and lack of affordability (Reed, 2015) and at a time when online real estate portals are the first point of engagement for the vast majority of individuals

entering the market (Dunning & Grayson, 2014). In addition to literature on housing submarkets, our approach also draws upon recent work on the subject of search extent (e.g. de Groot, Mulder, & Manting, 2011; Chen & Lin, 2012) and earlier studies focusing on search behaviour in a metropolitan context (Brown & Holmes, 1971; Huff, 1986).

The research is based on a user-generated dataset of more than 100,000 unique searches, sourced from rightmove.co.uk, the UK's leading housing market portal. It builds on previous work in the United Kingdom by Rae (2014), and emerging work in the United States by Beracha and Wintoki (2013) and Kroft and Pope (2014). A novel element of this research is that all search areas have been drawn by website users and the geographical structures we analyse are therefore not confined to existing administrative boundaries of the kind so commonly encountered in previous studies (e.g. Hincks & Baker, 2012). The focus in the paper is on residential properties for sale, and we use data from March 2013.

The next section of the paper performs two functions. First, following previous work, it makes the case for incorporating user-generated search data into housing market research (e.g. Wheaton, 1990; MacLennan, 1992). Second, it reflects upon emerging interest in the use of online search data and its potential to add value to existing knowledge (e.g. Choi & Varian, 2012; Wu & Brynjolfsson, 2009). After this initial positioning, the methods and data are explained in more detail. This is followed by an overview of housing search activity within London as a means to foreground the main exploratory spatial data analysis, which in turn looks at spatial and sectoral search, and the differences between where

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people search and where properties are available. We conclude by discussing the implications and limitations of our findings and by suggesting opportunities for further research in this area.

2. Making the case for user-generated search data in housing market studies

This study builds upon a significant volume of previous research on the topic since, as Chen and Lin note, ‘the extent of a search is one of the most studied aspects’ of the housing search process (2012, p. 901). They identify several measures previously used to investigate spatial search extent, including the number of properties visited, the number of neighbourhoods searched, the mean distance among vacancies searched, and the total area searched (e.g. Brown & Holmes, 1971). What is most significant in the context of this study is that Chen and Lin proposed to understand the extent of search through the concept of mental maps and awareness of space, following Lynch’s famous ‘mental maps’ approach in *The Image of the City* (1960).

The Chen and Lin method helps overcome some of the traditional limitations encountered in previous survey-based research (e.g. MacLennan, 1992) and situates conceptions of space at the first stage of the search process, as we do in this study and as Rae (2014) does in his model of housing search. Despite their innovative approach, however, the authors still had to solicit their 82 participants through newspaper advertisements, brokers, public relations offices and personal connections so unlike what we propose in this paper, it would be difficult to replicate and update at a national scale over time.

There are several other examples of seminal work on the importance of housing market search, including papers by Huff (1986) and Wheaton (1990). Making the case for incorporating search models, Huff states that ‘search-based models of residential mobility are conceptually appealing, but they have proven to be difficult to operationalize’ (1986, p. 224), partly as a result of data constraints. Wheaton in particular provides a useful departure point for the present study since his conception of ‘search costs’ was constructed in an era when information asymmetries were more strongly weighted against buyers in that 25 years ago it was much more difficult to identify suitable properties and obtain detailed information on them. This was also highlighted by Brown and Holmes (1971, p. 308) when they commented on the limited ‘awareness space’ of households in the search process.

With the advent of mass market real estate portals in many countries, it gives rise to the possibility that we might be able to develop a more accurate understanding, and build upon existing research, if we draw upon the vast data resources being generated by website users. Such ‘big data’ approaches to understanding housing market search extent could significantly enhance existing ‘small data’ approaches and simultaneously overcome the restrictions reported in other studies in relation to the use of administrative boundary data (e.g. Hincks & Baker, 2012). This is the first city-focused study of its kind in the British context, but previous studies in economics have taken a similar approach, as we describe below.

There is a long tradition of studying search frictions in the labour market and it is in this field that most progress has been made (KVA, 2010). Although labour and housing markets exhibit many fundamental differences, several transferable concepts suggest that studying search behaviour in the housing market could yield potentially useful results, particularly in relation to search extent. For example, the changing dynamics of information asymmetry between buyers and sellers, mediated by online housing portals, is one example (Pope, 2008). Another is the way in which potential buyers can now search very easily an almost complete set of products across an entire country, in contrast to previous decades when search was restricted to local newspapers, real estate offices, or driving around individual neighbourhoods and looking for properties (Palm, 1976). This has undoubtedly lowered search frictions but, of course, has not necessarily led to better outcomes for buyers.

In 2001, when Palm and Danis looked at the impact of web-based information on housing market search, they found that little had changed from previous decades, but more recent research suggests that the situation is now fundamentally different (Rae, 2014; Dunning & Grayson, 2014). This mirrors existing work in economics pioneered by Choi and Varian in a series of contributions since 2009, where they have explored the potential of ‘predicting the present’ with Google search data (e.g. Choi & Varian, 2009, 2012). Other researchers, notably Wu and Brynjolfsson (2009), have attempted to apply search data analysis methods to the housing market to predict how Google searches might foreshadow housing prices and sales. More recently, Beracha and Wintoki (2013) used Google search data to claim that abnormal search intensity in a particular city could help predict future price volatility.

A more recent advance in the use of online search data in understanding segmentation of the housing market has come from Piazzesi, Schneider, and Stroebel (2015). Instead of using coarser, indexed Google Trends data, they source search information from Trulia, a major US real estate portal. They focused their study on 183 San Francisco Bay Area zip codes to explore factors such as turnover, time on the market, inventory and search queries. This research represents the cutting edge of search studies in the housing market, but to date nothing similar has been conducted in the UK. This is not surprising, given the difficulty in obtaining search data, but it is somewhat disappointing given the importance of the housing market to national economic performance, and the current crisis of affordability in London. In 2011 The Bank of England highlighted this issue in a study on using online search data as economic indicators (McLaren & Shanbhogue, 2011) but only now is work beginning to emerge which explores this potential in any depth (Rae, 2014). The next section therefore explains the data and methods used herein, before we proceed to an analysis of housing search extent from a user perspective.

3. Data and methods

This paper represents a tentative first step towards a greater understanding of housing market search extent for London, focused on residential properties for sale in March 2013. There is a strong exploratory spatial data emphasis in the study since this is an effective way of unleashing the explanatory power of the underlying data, which are very large and inherently spatial. It is also somewhat experimental since such a large user-generated search dataset has never before been used in the UK housing market context. The data are sourced from Rightmove plc, the nation’s leading online housing market portal. Rightmove is similar to Trulia or Zillow in the United States or Funda in The Netherlands and within England includes more than 90% of all properties for sale. Users can search for any kind of geographical entity, such as a town, a postcode or a train station, using the search form on the website (Fig. 1). A list of available properties is returned so that users can then refine results based on property characteristics such as price and number of bedrooms. Users can also choose a map-based search where they draw an area on a Google map and then view properties for that area only, which they can then refine further, as above. This is Rightmove’s ‘Draw-a-Search’ tool and has been active on their website since it was first developed in 2010.

Two types of data are used here. First, we have a set of almost 100,000 user-drawn search polygons from March 2013, covering the entirety of Greater London. For each user-defined search area, we have details on the price and property attributes they entered on the website (if any). We also have a time-stamped search session variable associated with each polygon so we are able to ascertain whether an individual website user performed multiple searches during a session. This could be used in future to understand the kinds of ‘search journeys’ users go through during online sessions. In order to preserve the confidentiality of website users, we were not provided with any personal identifying information such as name, street address or IP addresses. The second kind of data is for individual properties for sale. We have

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