



**A Systems Approach to Housing Market Analysis:
The Role of Search and Migration in Market
Dynamics in Greater Manchester**

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To my mother and father who always wish me to success

To my wife who always supports me in my life

To my little boy who is always my treasure

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Abstract

Housing markets are complex and dynamic entities. They are fragmented across space and their structure and functionality alters over time. This complexity makes monitoring and steering markets difficult and is one of the reasons that planning for housing is analytically and technically challenging. To analyse housing effectively, it is widely held that we should conceptualise the market as a part of a system of linked but spatially coherent Housing Markets Areas, comprising internally of inter-linked submarkets that are over time subject to changes in configuration and function. In response, this thesis adopts a systems approach to frame the analysis of housing market dynamics (O’Sullivan et al, 2004). Within this framework, the study aims to understand the spatial and temporal dynamics of the Greater Manchester housing system in recent years. The analysis seeks to demonstrate the usefulness of a market systems approach that employs visual data analytical methods to provide insights into market processes. Specifically the thesis analyses housing search, migration and house price and offers a case study that explores the interactions between HMAs, and submarket connections within an HMA. The major contribution is to highlight the importance of considering a housing market as a system of linked HMAs and submarkets, to illustrate the useful insights that might be generated using visual data methods and to provide a novel analysis that combines role of housing search, migration and house price data in gaining a better understanding of how a local housing market works. In doing so, the study is at the forefront of the emerging literature that uses new micro-datasets to analyse search information.

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Abbreviations

HMA: Housing market area

SPSS: a statistical analysis software produced by SPSS Inc.

QGIS or Quantum GIS: a geographic information system application developed by

QGIS Development Team and licensed by GNU GPL

ArcGIS: a geographic information system application produced by Esri

GMCA: Greater Manchester Combine Authority

GMC: Greater Manchester Council

Chapter One: An introduction to the role of migration and search in the housing market system

1.1 Introduction

In the UK, housing affordability problems have been caused by a combination of rising demand and sluggish supply side adjustment to market signals. As a result, much of the policy debate has centred on exploring measures to enhance supply, for example through planning reforms. There has been comparatively little attention paid to better understand changes in demand, and their spatial characteristics, in order to ensure that what new supply there is comprises of dwellings of the correct size, type and in the right locations (Jones and Watkins, 2009).

The failure to adequately predict demand levels in local markets is one of the main reasons for the enduring mismatch between supply and demand.

An inadequate supply in areas of localised demand tends to cause significant increases in house prices, and then leads to a reduction in the homeownership rate. These patterns play out very unevenly across space.

A report from Greater Manchester mentioned that the metropolitan would require 217,000 dwelling units to keep up with the growing need by 2035, more precisely, 6000 new homes every year (BBC News, 2016). Therefore, it is crucial for every local authority to allocate land resource to develop sufficient housing. In the absence of the correct volume of homes to meet all demand, it becomes even more important that any homes build are of the right type and are in the correct micro locations. To achieve this, it is necessary to assess housing needs and demands based on Strategic Housing Market Assessments which play an important role in the planning system in the UK. However, the accurate estimation of housing needs and demands relies importantly on the models used being able to reflect accurately how the housing

market is structured and how it operates. This causes a challenge to planners and policy makers as the housing market comprises a system of linked submarkets within an array of HMAs (Jones et al., 2005). Not only that, the structure and operation of the housing market is also shaped by housing choices that are underpinned by poorly understood but highly complex housing search processes (Rae, 2015a). These all create challenging tasks for researchers and market analysts who need to develop a better understanding of the structure of the housing system and how the system works (Watkins, 2008). In particular, there is a need to understand the dynamics of submarkets and market areas (often referred to as Housing Market Areas, hereafter HMAs) and the behavioural aspects of the housing search process in a market system.

A housing market area is defined as a self-contained housing market with a high level of household mobility within the area (Jones, 2002, p. 557) and interacts with the labour market which imposes spatial rigidities on housing search and mobility (Hincks and Wong, 2010; Hincks, 2012). Theoretically, HMAs may be identified based on house price, search patterns, household migration and commuting decisions (Jones, 2002; Hincks and Baker, 2012). These present households' choices and aspirations regarding the locations of dwelling units, with the consideration of their home and workplace. In practice, the most comprehensive and robust way to identify HMAs is certainly based on census migration data which is released every 10 years (Brown and Hincks, 2008). Although we can employ several datasets, the accuracy of identifying HMAs may rely on the appropriateness of the dataset and its relationship to other datasets. In terms of un-affordability or low demand, it is important to identify HMAs based on examining house price levels. For areas with high rates of changes in migration, it is important to use migration data. Because of its significant impacts, the practice of identifying HMAs has been a long-standing concern in the housing market (Brown and Hincks, 2008; Hincks and Baker, 2012; Baker et al.,

2010; Jones, 2002; Coombes et al., 2006; Coombes, 2009). In addition to the identification of HMAs, and more significantly in the context of this study, there is also a need to investigate the interactions between and within them.

The notion of submarket becomes central when it comes to investigating the internal structure and dynamics of the local housing market (Watkins, 2001). Submarkets can be defined based on the demand side or supply side. For the demand approach, there are distinct groups of households with similar housing preferences and aspirations in relation with the life cycle, household composition, and social and economic profile and even similar search or information restrictions. On the other hand, the housing supply can be segmented by both spatial and structural characteristics simultaneously to identify distinct groups with similar dwelling units (Watkins, 2001). Submarkets are associated with the household migration regarding family life cycle and the consideration of replacement housing units and neighbourhoods when people migrate (Maclennan et al., 1987). Jones (2002) made an effort to identify the differences between submarkets and housing market areas. He mentioned that both housing market areas and submarkets are associated with the notion of geographical arbitrage. However, submarkets are created due to the restrictions on the arbitrage process, while HMAs are defined based on the spatial difference in the characteristics of housing units within the HMAs and the lack of spatial difference over a long time (Jones, et al., 2003). Due to their importance in the housing market, housing submarkets have been a topic of interest among researchers for over six decades. Despite that, the links between them is a subject that still requires more investigation.

Housing search has long been an important topic among researchers because of its important role in driving dynamic change within local markets. The process of housing search includes a central role of time, a process of acquiring information,

evaluating available alternatives, and revising household aspirations (MacLennan, 1982, p. 60; Marsh and Gibb, 2011, p. 217). These influences make the housing market complex and difficult for policy makers and planners in decision-making. The difficulty of the problem lies in the fact that households may change their aspirations when facing market constraints and restrictions during their housing search process. This may be because households possess imperfect market information, or compete among themselves for limited housing opportunities. Recently, the study of housing search has taken a new direction due to the availability of big data (Rae, 2015a). This has shed new light on the study of households' behaviours and makes this an opportune time for research projects into the search process with households' aspirations and expectations under the context of market constraints and restrictions (Rae, 2015a).

In short, a local housing market could be considered as being part of a system of linked HMAs comprising of a network of inter-connected submarkets. The entire system and its component parts are affected by national and regional factors as well as more specific local conditions. The housing market system operates in different ways with differing pricing structures and area trends (Bramley et al., 2008).

However, its structure and operation is subject to the influence of supply and demand influences, some of which are very localised in expression, as well as subject to the imbalance between them. Adjustment to such imbalance occurs and, among different ways of market adjustment, migration and households' aspirations take on important roles. To understand the adjustment process, many researchers have examining the reasons why people move, household preferences and aspirations. A recent and growing literature has examined the relationship between mobility intentions and mobility outcomes (Coulter & Van Ham, 2013; Coulter et al., 2011; De Groot et al., 2011; Max Lu, 1999; Watkins et al., 2011). These studies investigated the influential

factors on mobility decision-making and households' behaviours, including the strength of mobility intentions, household characteristics, household expectations, life events. However, less attention has been paid to the impact of market constraints and restrictions, the influence of household expectations and aspirations, the links between submarkets and between HMAs as well as the potential to use search and migration data for developing predictive models. These play an important role in understanding the decision-making process and the behaviours of market players, and should be taken into account to gain a better understanding of how a local market system works and how households' search and mobility activities affect its outcomes.

Collectively, several issues emerged when reviewing the studies of HMAs, submarkets and housing search and mobility. Although HMAs, submarkets and search are all important in the analysis of the housing market, there is a need to have a better understanding of how a system of submarkets within HMAs works and is influenced by the impact of potential demand, expressed through search patterns and resulting ultimately in migration. These investigations should be based on both market outcome data and household preferences to truly understand the housing market. Noticeably, many researchers were interested in household mobility but not many investigated the links between HMAs and submarkets via migration flows. What is more, there are still questions on the proportions of upward, downward movements and the nature of the connections between neighbourhoods. On the other hand, with the greater availability of micro datasets (big data) generated by the internet providers, housing search is recurrently attracting interest among researchers, but to fully understand its role in the local market system, more studies are needed. Also, there have been a limited number of analytical models based on search, migration and house price to explore the interactions between them. All in all, this study will try to answer the abovementioned issues based on the availability of house

price, migration and search data as well as the potential for using GIS mapping overlays, as demonstrated by Wong et al. (2015), to explore complex problems in a market system.

The main contribution of this thesis is to demonstrate the value of adopting a systems approach that integrates the analysis of migration, search and house prices as a means of understanding housing dynamics in three ways. First, is by adopting the position that housing markets operate within a system of linked submarkets and housing market areas. Second, is by integrating the three main economic theories that are features of housing market analyses but which are often treated in isolation from one another: Neo-classical Economics, Institutional Economics and Behavioural Economics. Third, is by applying a GIS-based visual method to provide a systematic analysis of new data (search, migration and house price data) related to a large metropolitan area.

1.2 Research aims and objectives

The aim was to explore the role that migration and search can play in shaping the structures and dynamics of a local housing market system and explore the potential to construct a model based on search and migration indicators for predicting the flows and impacts of migration and search in future. It has tried to fill the gap in the literature relating to the links between submarkets, search behaviour during housing search processes, and the relationships between search, migration activity and house price.

The overall aim of the study will be delivered by addressing several objectives. The objectives are:

1. To develop a conceptual framework to explore the role of migration and search in the dynamics of a market system
2. To explore the role of migration data in understanding the structure and dynamics of a market system by examining the links between HMAs and the interconnections between submarkets.
3. To explore the role of search data in understanding the structure and dynamics of a market system by examining the submarkets based on households' preferences and the mismatch between demand and supply.
4. To examine the possibility of using search and migration data to develop an analytical model for predicting the flows and impacts of migration and search in future.

1.3 Research approach & method

The study takes a systems approach to analyse the local housing market. A housing market system is composed of a number of local HMAs and submarkets. These components are separate but interact or interconnect together and often exhibit imbalance and adjustment in response to imperfect situations. These imperfect situations, described by analysts as market failures, are used to explain an imbalance between supply and demand (O'Sullivan, et al., 2004). These housing problems have an impact on market dynamics, leading to changes in price and an unresponsive supply.

To investigate these, a system framework is adopted, while migration and search data are used to explore the changes in house price and market activity. The thesis takes Greater Manchester, a large metropolitan conurbation in the North West of England, as a case study. Based on prior research, the study area consists fourteen housing

market areas that have a number of submarkets within their boundaries. The adoption of this system approach is intended to help us gain better understanding of the dynamics of the system and therefore potentially to help us deal with housing problems more effectively.

The focus of this study is on exploring the role of migration and search in market dynamics, especially in terms of changes in house price and market activity within a housing market system. To achieve this, the study uses a visual method based on GIS application. The analysis of visual maps is mainly employed with the aid of computing and mapping soft-wares SPSS and QGIS. The study employed search data from Rightmove, migration datasets from Census 2011 and house price data on Greater Manchester from the Land Registry for the years 2005 to 2013. To simplify the analysis, the thesis investigates only the tenure of ownership and does not consider each housing type separately but instead considers the average price for all types of housing.

1.4 Thesis structure

The thesis reviews the theories in the history of household mobility studies and housing search studies to build the theoretical framework for the research. The study will take into account theoretical positions in the study of housing market, and choose the framework that best suits the purposes of the thesis, especially regarding search behaviours and household mobility. It also reviews the literature on conceptualisations of mobility and search studies to provide the context of the research and the justification for the objectives of the thesis. The conceptual framework is shaped for the study based on the important factors from the literature. Further, the study examines the housing market in Greater Manchester as a system based on house price, price change, and supply and demand. Particularly, the study

will explore the role of migration and search in the structure and dynamics of the local housing market system. Further, it will examine the relationships between migration activity and house sales and between search activity and house sales. This will help us assess the potential to develop an analytical model for predicting housing market activity in future.

The thesis includes a further eight chapters. The next chapter (**Chapter two**) first discusses the complexity of housing as a product and then focuses on the literature review of theories. These economic theories include Neoclassical, Institutional and Behavioural Economics.

Chapter three outlines the structure of the housing market system, the dynamics of the system and reviews the development of housing market models. Based on the literature review, an analytical framework of the thesis is developed. The housing market system is composed of an array of linked submarkets within an array of HMAs and includes the process of housing search. The system dynamics are associated with the process of market filtering, housing search and household migration. Reviewing the development of housing market models will help to identify the important factors for inclusion in an analytical framework. This theoretical framework is developed to explore the interactions between search, migration and housing market outcomes.

Chapter four provides the research design. It is necessary here to highlight the research aims and questions for the analysis as well as the selection of a study area. Next, the chapter introduces the GIS-based visual approach adopted as a main method for the analysis. Datasets the available through Census 2011, migration flow data, house price information from the Land Registry, and online search from Rightmove

are also discussed. Based on these datasets and the GIS approach, an outline for analysis of house price, migration and housing search is developed.

Chapter five explores the housing market system in Greater Manchester with a focus on house price, housing supply and transactions. The analysis is based on descriptive statistics and visual maps. Through this analysis, the chapter will try to identify the issues in the housing market system in Greater Manchester.

Chapter six explores the role of migration activities in understanding the structure and dynamics of the market system. This is based on the conceptual framework, datasets and methods from the previous chapters. This chapter also uses descriptive statistics and visual analysis based on a series of maps.

Chapter seven similarly explores the role of search activities in understanding the structure and dynamics of the market system based on descriptive statistics and visual analysis.

Chapter eight will assess the potential to develop a model for predicting house sales and market activities in future based on the relationships between house sales and either search or migration activities. The chapter intends to examine the interactions between migration, search activities and housing market outcomes based on descriptive statistics and correlation analysis.

Chapter nine will present the conclusions of the thesis. It will consider the theories, aims and questions in relation to the research results and present implications of migration and search data for practice. It will also identify future areas for research.

Chapter Two: Theorising The Housing Market

2.1 Introduction

One of the purposes of this thesis is to develop a systems approach based on the works of O'Sullivan et al. (2004) as a more appropriate way to investigate housing market dynamics, particularly the interactions between search, migration and market outcomes. The underpinnings of the framework will draw on ideas from different schools of economics.

Economic theories have received more attention recently in the housing literature, especially Neo-classical Economics, Institutional Economics and Behavioural Economics (see Ferrari et al., 2011). Different concepts and ideas are typically used to shape theoretical frameworks to investigate the housing market. This has created a fragmented literature, and therefore it is important to conduct a review of different schools of economics to identify their differences or similarities. The aim of this literature review is to identify the main themes and sub themes of these economic theories which will contribute to the theoretical framework for this thesis.

It is noted that the school of economics with most influence on the field of housing market is arguably Neo-classical Economics. However, its assumptions of utility maximisation and perfect information have been ill-suited to the analysis of housing market which includes a process of changing aspirations and preferences. Regarding Institutional Economics, market players are influenced by behaviours, habits and social factors. On the other hand, Behavioural Economics has challenged the notion of rationality and provided the concepts of satisficing and shortcuts. These concepts are different from the assumptions in Neo-classical Economics. Behavioural Economics appears to be the most suitable alternative as it permits focus on

households' behaviours under constraints and restrictions in the market. This school of thought has been suggested by many researchers for use in the analysis of housing market.

The chapter is structured as follows. First, the study discusses the characteristics and complexity of the housing product and market. Next, the chapter focuses on three schools of thought: Neo-classical Economics, Institutional Economics and Behavioural Economics. Finally, the conclusion will blend together these three schools of thought for use in the analysis.

2.2 The characteristics of the housing product and market

Housing units provide households with space to live, internal amenities, external spaces for recreation, the social context of the area, local amenities and services, access to workplace, schools and other activity sites. Housing products are complex, with unique characteristics such as spatial fixity, product heterogeneity, high expense, joint consumption and investment purchases, and lengthy time delays in supply. These characteristics also cause the complexity of housing markets. A housing market cannot be seen as a well-defined and self-contained market, but can be divided into a number of interlinked sub-markets (Leishman, 2003, 16). Housing markets can be segmented by housing sector (owner-occupied, rented), house type (flats, detached, semi-detached, terraced), location (neighbourhood difference, urban area, rural area), size, quality and other criteria. These segments somehow interact and are subject to the impact of supply and demand side. Demand may shift from a particular segment to another segment. For example, households may change their demands from flats to detached houses or from city location to suburban location. Such changes in a short time period make it difficult for the supply side to make a timely response, thus leading to shortages in desirable segments. Additionally, the complexity of housing

markets is caused by the process of housing search. The housing search process includes simultaneously a search for location, size, style and quality as well as the adjustment of households' aspirations and expectations. It is the influence of households' behaviours in the search process that makes housing markets more difficult to analyse and understand.

According to Quigley (1979), the attributes of housing units are rarely similar to those of common products, therefore it is not appropriate to apply mainstream economic theories to examine the housing market. In addition, Maclennan (1977, p.112) stated:

“Housing has all the characteristics of a complex commodity, the housing stock is highly varied and this variation occurs with respect to a large number of locational, neighbourhood and internal characteristics.” (Maclennan, 1977, p.112)

2.2.1 Immobility

As property has spatial fixity, there can be no physical marketplace. Due to this immobility, the housing market is adjusted by household mobility flows rather than the flows of dwelling units. This is an acknowledgement that household tastes and preferences are subject to change.

According to Meen (2001), the buyer of a dwelling unit not only owns the dwelling itself but also the specific location and space. Households consider both structural and spatial factors when buying a home, as well as facilities, amenities in the neighbourhood (Galster, 1996). According to McPeake (1998), households search for dwelling units based on their preferences for spatial locations and the structures of the properties.

2.2.2 Product heterogeneity

A housing unit is unique regarding the location, the building, and non-spatial characteristics (Meen, 2001; Tu, 2003). This heterogeneity causes issues in terms of search costs, information asymmetry, and restricts substitutability. Moreover, the housing market is segmented into groups of detached, terraced, or semi-detached, or flats. Based on the attributes of the housing units, it is difficult to identify households' demand that match the supply segments. According to Maclennan et al. (1987, p. 33), housing units tend to satisfy households' expectations and aspirations::

“Adopting Lancaster's perspective, housing should not be viewed as being desired as a good per se. Rather, housing can be viewed as a collection of attributes which, in conjunction with the household's consumption technology, are used to satisfy more basic consumption objectives such as shelter, comfort, aesthetics, accessibility, etc. That is, goods are only intermediaries in the consumption process.” (Maclennan et al., 1987, p. 33)

According to Galster (1996, p.1798), the heterogeneous ingredients of housing all play a role in satisfying households' desires:

“Indeed, housing units are enormously heterogeneous. They differ in numerous structural characteristics, lot features, neighbourhood characteristics, local public services and access to desired destinations. Occupants demonstrate the importance of these features through their behaviour. Therefore, housing is a package of many salient attributes, only some of which are under the control of the owner. And this heterogeneity ensures a wide spectrum of degrees of substitutability among dwellings. Housing is not, then, a single commodity but rather a complex of variously related commodities.” (Galster, 1996, p.1798)

2.2.3 High cost

A housing unit is a product with high cost implications. Buying a house is seen as the most single expensive purchase that people make. The transaction costs of purchasing a home are seen as much higher than for most other types of transaction. As Galster (1996, p.1798) stated:

“The considerable search warranted by the extreme heterogeneity and immobility of housing, the complex legal and other transactional services, and the household move itself require a heavy outlay of time, effort and money. Both current and capital cost aspects are mingled, and liquidity as well as income constraints are involved. An important consequence is that most households change occupancy infrequently.” (Galster, 1996, p.1798)

2.2.4 Both a consumption and investment product

According to Rothenberg et al. (1991), buying a property is seen to incorporate two objectives: consumption and investment. A dwelling unit may be purchased with the expectation of attaining a return, with the intention of using it, or both of these. When buying a house, households may expect an increase in price so that they can recoup the cost of purchase, and potentially sell it for a higher price to make a profit. Therefore, the owner-occupier housing market should be considered as serving both consumption and investment goals.

2.2.5 Long time delays

The housing market is subject to an adjustment process which causes delays in housing supply. This is because of the financing period, time taken to design and construct new houses, and also changes in household demand. As a result, there is an

imbalance between supply and demand over a short time period. The adjustment process that takes place is likely to be slow relative to those in more fluid markets.

In summary, a housing unit is a complex product and attracts buyers through its structural and spatial characteristics as well as its neighbourhood and locational accessibility. These key characteristics render the housing market complex for its actors, particularly buyers and sellers. The complexity of the housing market derives from the fact that potential buyers make choices based on their preferences and budgets, in consideration with house prices and attributes. In the market, information becomes an important factor as actors possess only partial market knowledge, with spatial limitations, and this needs to be updated over time. These factors, among other aspects, contribute to the non-equilibrium between supply and demand which causes imbalance and adjustment in the housing market. To understand and deal with these problems in an effective way, it is necessary to devise an appropriate analytical framework. To achieve this, many have relied on various economic theories to build up their own theoretical approaches for analysing the housing market. The section below will discuss the basic ideas of three paradigms, namely Neo-classical Economics, Institutional Economics, and Behavioural Economics, in order to recognise the most appropriate options for the research.

2.3 Economic Theories

In the housing market, there may be three stages in the search process: initial aspiration, search, intensive evaluation (Maclennan, 1982, p 71-74). During this process, households may face market constraints due to imperfect information and supply restrictions therefore, they may change initial aspirations. To make decision under these difficulties, households may rely on their behaviours and shortcuts which have made it difficult to the analysis of the housing market (Ferrari et al., 2013, p 4).

To cope with this, it is necessary to come up with a better synthesis of models. The prospective model should be based on mainstream economics, but more account should be taken of behavioural aspects in order to offset the limitations of the neo-classical models (Craig and McMaster, 2011). The housing market is complex and one single theoretical view cannot provide a comprehensive understanding of how the market system works. Therefore, Craig and McMaster (2011) have called for the use of inter-disciplinary frameworks in analysis of the housing market. This approach could be based on the synthesis of neo-classical, behavioural and institutional perspectives.

2.3.1 Neo-classical Economics

Regarding the neoclassical economics approach, it advocates a free market based on a number of assumptions (Lipsey and Chrystal, 2003). It is generally assumed that actors in the market seek to maximise satisfaction, economic benefits or utility in making decisions based on possession of perfect information. For example, in the housing market, developers and investors will maximise their profits, while households seek utility or satisfaction maximisation. It is also assumed that households possess perfect information about the housing market; they know what they want, and know how to purchase it within their budget constraints. To summarise the ideas of neoclassical economics, it is focused on maximisation of utility and profits in combination with the use of rational choice theory based on the assumption of perfect information (Campus, 1987).

According to neoclassical economics, government intervention should be kept to a minimum. The role of government in the economy is to protect individuals and property and to improve economic efficiency (Lipsey and Chrystal, 2003, p 360). For example, in the housing market it is important for the government to improve the

information available to the market and protect households' rights. Also the government may influence the rate of economic growth and balance the economy in terms of national income and the price level through using tools such as taxes, rules and regulations and public ownership (Lipsey and Chrystal, 2003, p 360). It can be said that the government not only plays a role in creating rules of the economic game and makes market actors follow such rules, but also prevents political influence on the economy and makes efforts to control monopolies.

In the housing market, the neo-classical approach advocates a free market based on a number of assumptions: utility or satisfaction maximisation, and perfect information (Maclennan, 1982). Households seek to maximise utility or satisfaction, know which options they want, and how to purchase within their budget constraints. Modelling the housing market based on this assumption is an approach that offers simplicity and predictive power. The literature on modelling of the housing market has mainly investigated influential factors on mobility decision-making, and housing choices and information asymmetries.

The history of neo-classical economics can be traced through the development of modern economics, originally from *The Wealth of Nations* by Adam Smith. Based on the work of Adam Smith, neoclassical economics was established and became dominant until the Great Depression. The period after that witnessed the rise in popularity of Keynesian economics based on the work of John Maynard Keynes (1936). Now, mainstream economics includes neo-classical economics and neoclassical synthesis (neoclassical methods and Keynesian macroeconomics).

2.3.1.1 Main points

Neoclassical economics adopts a number of assumptions: rationality and utility maximisation, perfect information, market equilibrium. Many researchers have paid attention to investigating the impact of these assumptions on analytical models.

2.3.1.1.1 Utility maximisation

In the housing market, the most common assumption is that households maximise utilities and benefits through rational behaviour. People attempt to maximise their own gains through their choices. However, the neo-classical approach has ignored the constraints faced by households in the process of their housing search. In the housing market, utility maximisation is used to explain households' choices regarding house type, size and location in order to maximise their predefined expectations and aspirations. Households' choices are essentially influenced by economic factors and the impacts of social and behavioural factors are seen as unimportant (Wallace, 2004). To maximise their predefined aspirations and expectations, households perceive perfect information and are able to compare or calculate to decide the best choices to maximise benefits. In some cases, if utility maximisation is not possible for all options, households will adjust their accommodation in correspondence with their desire, thereby arriving at another state of utility maximisation. This embodies an assumption that households are able to instantaneously know the desirable outcome regardless of the processes of housing search and decision-making.

2.3.1.1.2 Perfect information

Perfect information is an important assumption in relation to the neo-classical approach. It is assumed that households have perfect knowledge of the housing market regarding such as price, utility, and quality. With all information available,

when making any decision, they consider all possible options and pick the most desirable one. Utility maximisation is only possible if households are able to perceive perfect information to assess the future benefits. Without perceiving perfect market information, households cannot predict future gains and therefore they are unable to maximise benefits. With the assumption of perfect market information, there is also an assumption that perfect information is perceived among households equally across the market.

2.3.1.1.3 Market equilibrium

In the neo-classical approach, the assumption is that there is always balance between supply and demand (Wallace, 2004). Based on this assumption, within the market, as supply is equal to demand, the price will not change. Instead, price differences will exist when there are external influences on supply or demand which lead to a lack of balance between them.

If the equilibrium state is broken, the market tends to move towards equilibrium. In the housing market, if the house price is below the equilibrium level, an excess supply exists. Price tends to be reduced to absorb the surplus supply. This will slow down housing construction and, encouraged by the lower prices, more households will enter the market. As a result, demand will increase, while supply will reduce until equilibrium is reached. Similarly, if the house price is above the equilibrium level, excess demand will exist. Prices will tend to increase due to a shortage of supply. As prices are high, the market will see an increase in supply, leading to a gradual decline in price. As a result, supply will increase, while demand will reduce until equilibrium is reached. A number of studies have investigated equilibrium level in relation to the housing market, for example, where prices adjust at a very slow level (DiPasquale

and Wheaton, 1994), or where the market naturally moves towards a state of equilibrium (McMaster and Watkins, 1999).

2.3.1.2 Strengths of the neo-classical approach

The neo-classical approach deals with the trade-off between supply side and demand side based on the notions of rationality and ability to maximise utility. Its strength is its capacity to simplify aspects of human behaviour and overlook the role of market processes. With its various assumptions, the neo-classical approach has become a powerful approach to analyse the housing market. It also seeks to explain the relationship between influential factors on the outcomes of the market.

Many researchers have employed the neo-classical approach to investigate the factors that influence income, house price, and households' choices. In their analyses, researchers have taken into account household characteristics such as age, marital status and composition as well as housing characteristics such as house type, size, tenure, and location to construct models to explore influential factors on housing outcomes such as house price and housing choices.

The neo-classical perspective is dominantly used to build models to understand aspects of house price and mobility decision. In terms of house price, the approach is used to investigate the relationship between demand and supply and how they influence house price. The theory is used dominantly in the analysis of household mobility, including developing models in relation to decision to move, tenure choice, location choice, time on the market, and information. The neo-classical approach has the additional strength that it is possible to simplify the models to understand household choices regarding such as housing tenure, house type, and location. Based on this approach, housing search models were also developed to understand more about the actual decision-making process but were subject to certain weaknesses.

In general, the neo-classical approach has been employed by many studies, especially the theory of utility maximisation and optimal choice theory, to develop theoretical frameworks to investigate the process of household mobility. While these models have proved to be useful, they have failed to explain the behavioural aspects of the market process.

2.3.1.3 Limitations

Neo-classical housing market approach has ignored the role of market processes and households' behaviours by embracing its assumptions (Watkins, 2008, p 165). The neo-classical approaches have assumed that households possess perfect information with predefined expectations. This assumption does not properly reflect the reality and therefore the outcomes are likely to be unreliable. For example, Dunning & Watkins (2012) researched the process through which households buy their dwellings. Their study showed that information plays a crucial role in the housing search process and households may change their aspirations and their findings challenge the neoclassical approach based on the assumption of perfect information. Therefore, problems emerge when applying the neo-classical economic approach to the analysis of housing search, due to the central role of time in the housing search process, the importance of information acquisition and the process of evaluating available alternatives (MacLennan, 1982:60–62; Marsh and Gibb, 2011, p 217).

There are also limitations relating to the assumption of utility maximisation. It is argued that the assumption of utility maximisation is made in order to develop a technical model rather than develop a theoretical framework that reflects the real world. The neo-classical approach no doubt enhances the ability to construct a model to explain outcomes by bypassing household behaviours. This makes it easier to apply mathematical equations to model and predict future outcomes. Arguably, neo-

classical approaches are still widely used in the analysis of housing markets (Wallace, 2004; Ferrari et al., 2011).

The third limitation is the assumption of equilibrium. The housing market is a complicated system with a number of factors preventing such equilibrium (O'Sullivan et al., 2004). This may be referred to as market failure. A number of factors can contribute to market failure, including imperfect competition, information asymmetries, externalities, or public goods. In the housing market, these factors become more severe and therefore imbalance often occurs. As a result, the housing system becomes relatively unstable, with unanticipated fluctuations in price which is caused by supply being unresponsive to demand. Housing demand may change but because of restrictions in land allocation or construction problems supply does not respond in a timely way.

Taking the discussion above into account, it can be argued that there are a number of issues relating to the neo-classical approach that make this approach inappropriate for analysis of the housing market. In the housing market, housing search analysis plays an important role in supporting housing planners and market providers. During the process of housing search, households are likely to take shortcuts when faced with the problem of information restrictions (Ferrari et al., 2011, page 8). Households may use sophisticated behavioural rules to deal with information limitations and reach a decision (Marsh and Gibb, 2011, 21-22). Therefore, it is important to adopt a research agenda specially designed for understanding the perceptions, preferences and expectations of households in the housing market, particularly in terms of their housing search process. Realising the limitations of Neo-classical Economics in relation to analysis of the housing market, many researchers have called for a new direction to be taken towards comprehensive understanding of the market, especially

calling for investigation into behavioural aspects. Particularly, such research should be based on a combination of Institutional, Behavioural and Neo-classical Economics.

2.3.2 Institutional Economics

Institutional economics focuses on a wider study of institutions, and considers markets as a result of complex interactions of institutions, for example, individuals, firms, states. In the late 20th century, the integration of neo-classical economics into the analysis led to the creation of the new field of institutional economics. The focus of institutional economics is on learning, bounded rationality, and evolution, and it seems to ignore the role of stable preferences, rationality and equilibrium. The development of institutional economics relied heavily on the works of Thorstein Veblen. However, institutional economics can be traced back to 1919 and the ideas of Walton H. Hamilton.

According to Tomer (2001), there is a basic difference between Institutional Economics and Neo-classical Economics:

“Recall that EM [Economic Man] is self-interested, rational, unchanging and separate. To begin, IEM [Institutional Economic Man] does not have a given, unchanging character like EM. IEM behaves in line with habits and rules, is strongly influenced by institutions and learns from his social and technical experience” (Tomer, 2001, p.287)

In the housing market, Adams et al. (2005) stated that:

“Although regarded as a social institution, the market is not considered by institutional theory to be a single uniform entity. Indeed, a strong disaggregated view is taken of market structures, with each particular market

seen as having its own routines and procedures alongside its own distinctive relations with a particular social culture and other institutions.” (Adams et al., 2005, p.39)

2.3.2.1 Main ideas

Institutional economics takes into account the role of the evolutionary process and of institutions in explaining economic behaviour (Samuels, 1995). In the housing market, institutional economics does not focus on the outcomes that households maximise benefits, but embraces the influence of factors on their behaviours in the search process. In short, Institutional Economics expresses the importance of social and behavioural factors and institutions in defining households’ aspirations and making housing choices.

According to Masahiko Aoki (in Menard, 2000), there are three extensions in detail of this definition of Institutional Economics. Firstly, institutions are seen in a simple form of organisational establishments. Secondly, it is able to consider institutions as formal or informal regarding economic interaction. Thirdly, actors shape and are shaped by the market processes and are able to adapt, break or create rules when they need to make decisions.

Original institutional economics was found by Thorstein Veblen. Veblen (1899) used the notion of ‘conspicuous consumption’ to express the importance of interaction between actors, institutions and the roles of customs and aspirations. It has also paid more attention to the interrelationship of agents through introducing the concepts of ‘institutionalised individual’ (Hodgson, 2000) and ‘cultural animal’ (Dequech, 2003).

Original institutional economics plays an important role in explaining the impact of institutions on actors’ aspirations and expectations. In the housing market, the use of

original institutional economics may be restricted as it is not generally applied to all markets. We may employ it to understand how the market and institutions are influenced by small events or insignificant impacts. In particular, original institutional economics may be useful to housing policy makers in their decision-making, for example, the important influence of institutions on differences in market outcomes (Needham et al., 2011).

New Institutional Economics is shaped under the influences of organisational economics, information, institutions (North, 1990). Apart from these, it is also important to mention the roles of property rights or transaction costs which represent market frictions and risks (North, 1990). According to Jaffe (1996), transaction costs are the key factors in explaining housing markets through, for example, exploring the influence of listing and management contracts, mortgages, leases. According to D'Arcy and Keogh (2002), the role of institutions is strengthened and influenced by market situations and conditions as well as actors' actions. New Institutional Economics considers that actors' aspirations and expectations are shaped by social factors, thereby deviating from the Neo-classical assumptions of rationality and utility maximisation (Healey, 1999).

2.3.2.2 Strengths of the institutional approach

Institutional economics seeks to address concerns that neoclassical economics regards as unproblematic, for example, behavioural aspects of the housing market. It highlights the impacts of social and cultural factors on forming households' preferences and behaviours in the housing market.

Old Institutional Economics expresses the important role of institutions for market actors, and provides a deeper understanding of how the housing market works. The

approach is useful to understand the impacts of insignificant events on the outcomes (Needham et al., 2011). According to new institutional economics, actors act rationally and try to maximise utility. Although, institutions may restrict how actors act, actors' expectations and aspirations are still unchangeable. It can be argued that institutions are formed by individuals, and may influence individuals' aspirations and expectations.

This school of thought suggests that markets operate with friction under information inefficiency and risks (Williamson, 1975). In the market, transaction costs present an obstacle to the perfect operation of the market (Arrow, 1969, p. 68). The process of buying houses is subject to the process of obtaining information about prices, quality and neighbourhood facilities and services. Institutions can make the process of information exchange easier and therefore reduce transaction costs. According to Needham et al. (2011), the most important aspect of the theory is its incorporation of property rights. Property rights are an expression of institutions' role in applying good governance of the market.

A number of researchers have adopted a new institutional economic perspective to provide a better understanding of how the market works (Alexander, 2001; Webster and Lai (2003); Buitelaar, 2004; Jaffe, 1996). Importantly, Marsh and Gibb (2011) described Institution Economics as one of the important approaches for addressing behavioural aspects of the housing market.

2.3.2.3 Limitations

In relation to Old Institutional Economics, Needham et al. (2011) pointed out that this is seen as partial theory which cannot generally be applied to other markets with difference in time and spatial characteristics. Regarding this point, many institutions

emerge that may affect housing markets at the same time. The limitations of new institutional economics are that actors are still seen as acting rationally and seeking utility maximisation (Needham et al., 2011). Williamson (1996) also highlighted that the new institutional theory only stresses the importance of those institutions that directly influence the transactions, such as property rights and governance structures, and overlooks the role of the general institutional environment or contextual factors such as laws and customs.

Based on Institutional Economics it is difficult to explain behaviour that is not in line with the norms in society. Also, developing models to reflect the processes and outcomes is a challenging task. Therefore, behavioural economics emerges as an appropriate approach to coping with these difficulties .

2.3.3 Behavioural Economics

Behavioural economics is a relatively new discipline based on both traditional economics and psychology, and relaxes the restrictive assumptions of the neo-classical economic models (Wilkinson, 2008, p. 29). In behavioural theory, there are two important definitions: bounded rationality and prospect theory. Prospect theory was proposed in 1979, and then extended in 1992 under the name of ‘cumulative prospect theory’ (Wilkinson, 2008, p. 98). A valuable contribution to the behavioural approach was made by Kahneman and Tversky (1979) with their study on behaviour under uncertainty. According to Augier and March (2003) and Tomer (2007), Simon is the founder of bounded rationality theory. Simon stated his view on Neo-classical Economics:

“Broadly stated, the task is to replace the global rationality of economic man with a kind of rational behaviour that is compatible with the access to

information and the computational capacities that are actually possessed by organisms, including man, in the kinds of environments in which such organisms exist.” (Simon, 1955, p.99)

Further, Simon mentioned that:

“This man is assumed to have knowledge of the relevant aspects of his environment, which, if not absolutely complete, is at least impressively clear and voluminous. He is assumed to have a well-organized and stable system of preferences, and a skill in computation that enables him to calculate, for the alternative courses of action that are available to him, which of these will permit him to reach the highest attainable point on his preference scale.”
(Simon, 1955, p.99)

Simon developed bounded rationality and in 2000 defined it as follows:

“the idea that the choices people make are determined not only by some consistent overall goal and the properties of the external world, but also by the knowledge that decision makers do and don't have of the world, their ability or inability to evoke that knowledge when it is relevant, to work out the consequences of their actions, to conjure up possible courses of action, to cope with uncertainty (including uncertainty deriving from the possible responses of other actors), and to adjudicate among their many competing wants. Rationality is bounded because these abilities are severely limited.”
(Simon, 2000, p.25)

2.3.3.1 Main ideas

The notion of rationality cannot be applied in situations where the household needs to make a decision under a limited amount of time, and computational resources. In such situations, bounded theory can be used to deal with the shortcomings. According to the notion of bounded theory, households tend to make shortcuts when dealing with imperfect information and limited computational ability (Wilkinson, 2008). This helps households simplify the decision-making procedures to make decisions in the finite amount of time and the cognitive limitations of their minds (Wilkinson, 2008, p. 98). In such cases, the household tends to seek a satisfactory solution rather than the optimal one (Wilkinson, 2008).

Simon (1976; 1986) stated that limitations to humans' cognitive abilities cause the household not to follow a rational process. Households may employ behavioural rules to deal with the uncertainty. This is the notion of satisficing and is suboptimal in terms of their initial choice. According to Simon, households do not concentrate on the market outcome, but they deal with the process of thinking and reasoning. When it comes to satisficing, households may employ a decision-making strategy based on searching through the available options until they meet their acceptable level. The notion of satisficing may be employed to explore the process of decision making when the optimal option cannot be achieved. According to this notion, it may be difficult for decision makers to choose the optimal options in a complicated world and therefore they may satisfice by finding satisfactory options.

Bounded Rationality highlights the importance of households' behaviours and the difficulties that prevent the possibility of benefit maximisation. It suggests that households' behaviours in the search process, imperfect information and uncertainties make it difficult for them to employ their rationality techniques. The New Economics

Foundation (NEF) (2005) suggested six key principles of New Behavioural Economics: the importance of other people's behaviours, the importance of habits, people's motivation to 'do the right thing', the influence of self-expectations on behaviours, people's loss aversion, people are bad at computation.

On the other hand, prospect theory has become the most influential theory to explain decision-making under risk. Based on prospect theory, there are two important phases: edition and evaluation (Wilkinson, 2008). Prospect theory may be used to explain the decision-making process, especially mover and non-mover behaviour. The researchers showed that households may choose shortcuts to make their decisions and then may make mistakes, especially when they do not have enough information to make their decisions. Moreover, the researchers also mentioned the importance of household tastes and choices and starting point, which contradicts the idea of utility maximisation. To develop the framework of Kahneman and Tversky (1979), many have paid attention to exploring human behaviour. In highlighting the importance of behaviour Camerer et al. (2004), Conlisk (1996), and Rabin (1998) referred to reciprocity and self-sacrifice, limited cognitive powers, and other factors that restrict the idea of maximising utility. Camerer et al. (2004) and Starmer (2000), meanwhile, used neuroscientific techniques to identify that the decision-making process was influenced by specific stimuli. Another study indicated that if people have a high level of the neuro-hormone oxytocin in their blood, this can influence the decision-making process (Zak, 2008). These researchers have demonstrated that households' choices are influenced by their emotions and are not always based on rational consideration (Camerer et al., 2004).

2.3.3.2 Strengths of the behavioural approach

Both new and original behavioural economics regard the housing system as fragmented and including a number of components (Ferrari et al., 2011). Households tend to make decisions under restrictions and uncertainty and therefore may make sub-optimal decisions. These restrictions are seen as market inertia. During the decision-making process, emotional factors influence their choices; for example, social and cultural factors influence households' preferences for particular tenures, house types and neighbourhoods or neighbourhood attachment. Moreover, during the market process, market actors respond to their lack of information and the market constraints by looking for 'shortcuts'.

This approach considers mismatches between housing demand and supply in order to understand and resolve housing problems. This approach can help to deal with housing problems and address differential mobility constraints. According to Ferrari et al. (2011), original behavioural economics stresses the importance of household behaviours, the roles of emotion and habits in the process of buying houses, and the importance of knowledge and information. According to the theory, households will only assess their mobility decisions and choices under the influence of 'triggers', for example, job changes. The process of household mobility is complex, involving a number of inherently social activities such as discussion, family negotiation, agent interaction, and taking advice from other professionals or other sources (Levy et al., 2008), while, in addition, emotional factors, social referents, expectations and experience all play a role. Therefore, the behavioural approach seems to be one of the most suitable perspectives for analysis of this process.

With the importance of behavioural aspects in the housing market, a number of studies have been concerned with the construction of a model to understand the

demand side of the market system based on socio-economic characteristics, preferences and aspirations, as well as budget constraints. Meanwhile, many others have focused on development of models to understand the supply side of the system. These studies have concentrated on analysing the submarkets based on similar type, size and neighbourhood qualities. According to Ferrari et al. (2011), these studies incorporated ideas of consumer theory, marketing and behavioural psychology (Feitelson, 1993; Watkins, 2001) and old institutional economics (Grigsby, 1963). In short, these models suggest that it is important to increase our focus on behavioural constraints which restrict the ability of the market to effectively match household groups to appropriate submarkets (Ferrari et al., 2011).

2.3.3.3 Limitations

Lack of data is the main issue for this approach. Traditionally, housing studies have mainly been based on market outcome information such as house price and migration data, which do not reflect the market process. Based on these sources of data, researchers have developed models to understand households' choices and the factors influencing their choices. Whilst these outcome data are important for researching changes in price and influential factors, they do not provide us with information on households' preferences and aspirations, and are not applicable for studying households' behaviours, market restrictions and constraints in the market process. On the other hand, the information from household surveys plays an important role in identifying latent housing demand, providing insights into mobility intentions, household aspirations and preferences. This helps us estimate housing needs from existing households, from newly forming households, and from migration flows. However, because obtaining large data samples for analysis and model development is a time consuming and costly task, only a limited number of studies have used this

approach to research households' behaviours and develop behavioural models. The lack of behavioural data has also limited development of theoretical frameworks based on this approach.

Recently, online search data has become available to the public, for example, via Google or online search portals such as Rightmove or Zoopla. This opens new opportunities for researchers to investigate households' preferences and aspirations. For example, Rae (2015a) stressed the importance of housing search data in understanding the structure of the market system; meanwhile, Piazzesi et al. (2015) used housing search data to understand the influence of behavioural factors in the process of home search and purchase. Researchers who have employed Google search data to examine market activities include Beracha & Wintoki (2013); Choi & Varian (2012); Varian (2014), Wu & Brynjolfson (2009). These studies have provided evidence of the usefulness of big data in unpacking households' behaviours in the housing market system. However, to make the best use of these datasets, it is necessary to develop an appropriate theoretical framework.

2.4 Conclusion

Taking the three schools of economics into consideration, certain important points emerge. According to the Neo-classical approach, households act independently and in line with predefined preferences and perfect market information. Households behave consistently and rationally in order to achieve utility maximisation based on their own preferences and perfect knowledge. In the case of Institutional Economics, the actors' perceptions and aspirations are subject to change according to social factors. Their behaviours tend to rely on customs, social and cultural impacts as well as consideration of transaction costs. If the rules change, the actors' behaviour will change in accordance with their reflection and learning. On the other hand, according

to 'Old' Behavioural Economics, households' preferences are influenced by Institutions. Households seek to gain market information from their action during the search process and from other market actors in the market. Under market constraints and restrictions, they look for shortcuts to deal with imperfect information. Actors' references and aspirations may be similar based on the similar knowledge from institutions and may differ based on their own experiences in the market. The focus here is on the behaviours of individuals and institutions, processes and outcomes. In the view of New Behavioural Economics, actors have their own preferences and aspirations that are associated with cultural norms. Within the limits of their cognitive powers, actors will seek to maximise utility in their decision making process, and tend to have only partial understanding of the market. This focus on the individual marks a departure from the view of 'rationality' in processes and outcomes.

In general, neo-classical economics appears to be the most popular approach for studies of the housing market. Perceptions of precision and accuracy in relation to models based on this approach render it attractive to analysts, researchers and policy makers as an evidence base. However, the underpinning assumptions on which neoclassical paradigms are based expose these models to certain criticisms. This approach is, for example, inappropriate for application in investigations of household aspirations and preferences. Therefore, in addressing these disadvantages, it is necessary to take into account other economic theories. A blend of the three discussed paradigms, namely neo-classical, institutional and behavioural, may provide us with an appropriate method for analysis of the housing market.

The importance of heterodox approaches in relation to analysis of the housing market was highlighted by Hincks et al. (2013) in the following comment from a Special Issue of the Town Planning Review:

“There is also considerable scope to expand the depth and coverage of our behavioural and institutional analyses. The adoption of different methodological perspectives – such as institutional and behavioural approaches – will offer valuable insights in their own right but they will also enrich the behavioural underpinnings of our econometric models (see Watkins and McMaster, 2011). Again, this requires a research community that is less segmented along disciplinary or methodological lines and that is more willing to embrace intellectual diversity” (Hincks et al., 2013, p.5)

Chapter Three: Towards a System Model of the Housing Market System Approach

3.1 Introduction

According to O'Sullivan et al. (2004), housing is a system that is structured as an array of housing market areas and submarkets which connect and interact in some way. Adopting a systems approach will help us better understand how the housing system works, understand the housing problems, and deal with them effectively. Bearing this in mind, the study intends to take a market systems approach to examine the influences of migration and search on price changes and market activity in Greater Manchester. This approach will focus only on the owner-occupied sector, which is a deviation from the whole system approach proposed in the work of O'Sullivan et al. (2004).

The structure of a housing market system can be seen as an array of linked housing market areas and submarkets. A housing market area is defined in Planning Practice Guidance by DCLG (2004) as a geographical area identified by household demand and expectations and reflects the relationship between homes and workplaces. While various datasets may be employed to identify housing market areas, defining the boundaries of housing market areas based on self-containment criteria is a challenging task. Previous studies have adopted a certain self-containment threshold to identify the boundaries for local HMAs (Hincks and Baker, 2012; Jones, 2002; DTZ Pineda, 2004; Brown and Hincks, 2008). It is argued that if there are high percentages of migration in and out of a particular area, this area may not be an HMA in its own right but instead may belong to a larger HMA (Jones, 2002, 554). Despite the related difficulties, identifying housing market areas is an important aspect of estimating and predicting housing demand and needs.

Housing submarkets can be seen as a specialised subdivision of the market which includes groups of dwellings with similar characteristics regarding tenure and dwelling structural characteristics and geography factors. Submarkets are changeable over time, therefore a dwelling unit may be in one submarket today but may be in another one next year. It is suggested that in theory each submarket should operate independently based on the shifts in supply and demand side without any market interference. However, in reality submarkets are subject to restrictions from the supply side and excess demand from the demand side. This is because the tastes of demand are dependent on households' preferences and aspirations and thus are changeable but the dwelling itself is unchangeable as well as immovable. Meanwhile, the supply side is slow to respond to shifts in demand and is affected by policy. Despite these restrictions, housing submarkets are connected through the mechanism of household mobility activities. Household migration presents the dynamics of the housing market based on the central notion of market filtering. According to filtering theory, households may move from one submarket to another submarket when their social and economic characteristics change.

Within a housing market system, market dynamics may be depicted through the connections and interactions between its components and are associated with the processes of market 'filtering', housing search and migration. The concept of 'filtering' has been in use for a long time, and substantial disagreement surrounds this notion (Baer and Williamson, 1988). Market 'filtering' can refer both to processes of change in dwelling units and the processes of change in households, but in this thesis the focus is on changes in dwelling units. The filtering process necessarily involves segmentation of the housing market into a number of linked submarkets. In the filtering process, the flow of movements can be upward, or downward. It should be

noted that upward movements to higher priced submarkets provide opportunities for lower income households to move up and settle in units which have been left vacant.

Although housing search has long attracted the interest of researchers as a study topic, the number of published works is limited, mainly due to lack of data availability (Jones and Watkins, 2009). Recently, a number of studies have researched housing search and produced prospective results (Rae, 2015a; Piazzesi et al., 2015). These studies have taken housing search analysis in a new direction through focusing on online search data known as big data. Using these search data, it is possible to explore the notion of market segmentation and examine excess demand as well as restrictions of the market or the connections between submarkets.

The process of household migration may be divided into a number of stages. First, households need to decide whether to move or not. It is argued that mobility intentions are related to actual moves, and affected by residential dissatisfaction and life course (De Groot et al., 2011). Having decided to move home, households need to make their housing choices in relation to housing tenure, house type, location. Households have been found to choose housing tenure based on both economic and non-economic factors. Location choice is influenced by locational amenities, transportation, and social ties. On the other hand, households' time in the market and search intensity are affected by the strength of mobility intentions, the urgency to find new dwellings, market constraints and restrictions. In addition, the cost of information acquisition plays an important role in the mobility process, as information asymmetry significantly affects the behaviour of households and market agents.

To model the housing market, analysts and researchers have formulated a number of analytical models. These models were aimed at relaxing or addressing the

assumptions of neo-classical economics and reflecting household behaviours during the process of housing search. However, these models have paid less attention to insights of the market system, especially regarding how its structures and dynamics work. To explore these factors, the model should adopt a disciplinary framework with a systems approach. Moreover, with the availability of migration flow, housing search and house price datasets, it is possible for a synthesis study to explore how search and migration activities influence the outcomes of the market system. This may help us have a better understanding of the structures and dynamics of the housing market system.

Moving on from this introduction, the structure of this chapter is as follows. Next, there is discussion of the structure of the housing market system in relation to housing system frameworks, housing market areas and submarkets. Then, it is necessary to focus on market dynamics based on the important processes of market ‘filtering’, housing search and household migration. Market system models are discussed in the following section, followed by suggesting an analytical framework for this thesis. Finally, the conclusion is presented.

3.2 Market structure

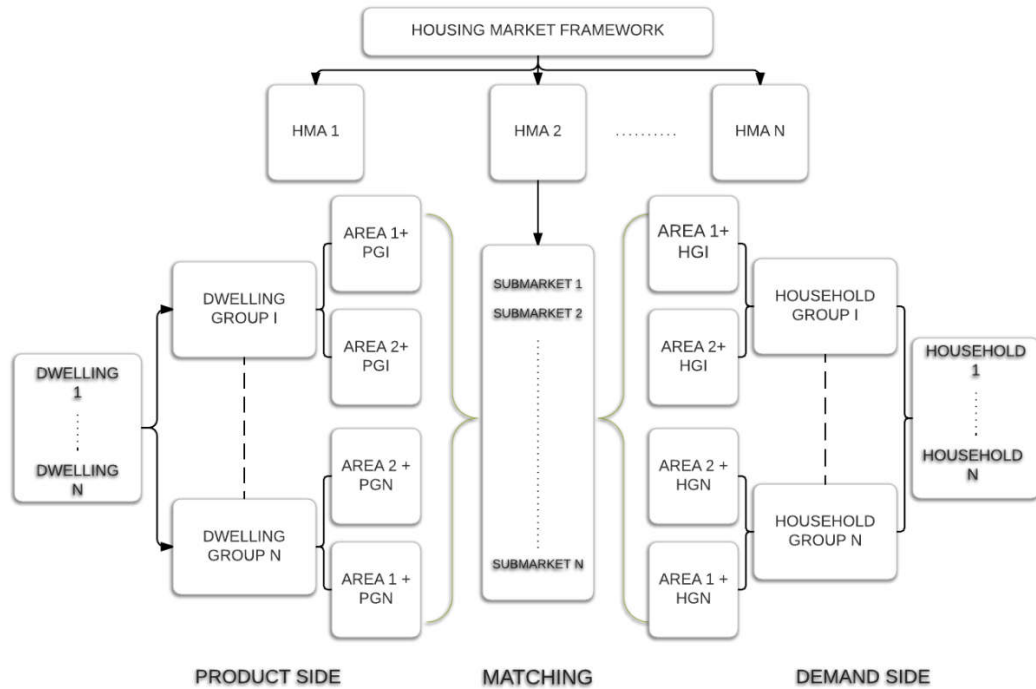
3.2.1 Housing system framework

The study embraces the theoretical perspective that a housing market is composed of a system of interconnected submarkets within an array of housing market areas. This viewpoint was built on a number of previous studies including Jones et al. (2010, 2012), Maclennan (1982) and Maclennan et al. (1987). Particularly, the housing market is structured as three layers: Framework HMAs; Local HMAs; and Submarkets. Framework HMAs are identified as encompassing long-distance commuting activities and may show us how the market works in the long run. Local

HMAAs are identified by migration flows and reflect the structure of the market for a short period of time. Finally, submarkets can be identified by supply and demand approach. It can be argued that the theoretical perspective is an important foundation to study HMAAs and submarkets in the housing market.

Figure 3.1 shows the submarket framework. First, the housing market framework can be identified based on mobility patterns and travel-to-work patterns. This method of identifying the housing market area framework can be referenced to the work of Jones et al. (2010) and (2012). Within the housing market framework, a number of housing market areas can be identified through migration self-containment. Jones et al. (2010) derived individual wards directly to identify the HMA framework based on commuting and then divided these areas based on migration self containment criteria to identify HMAAs. To do this, the HMA framework and local HMAAs were integrated in one arrangement with self-containment criteria of 75 percent and 55 percent for commuting and migration respectively (Jones et al., 2010, page 22).

Figure 3.1: An analytical framework of a housing market



Source: Maclennan (1982)’s own analysis in terms of the submarket framework and Jones et al. (2010)’s own analysis in terms of the HMA framework.

Within each housing market area, submarkets are defined based on supply or demand. On the supply side, submarkets may be identified based on both the neighbourhoods of dwellings, and by dwelling structural characteristics (Watkins, 2001). Individual housing units can be grouped into separate product groups, each with similar characteristics. This grouping can be done by factor or cluster analysis or based on house type and size. Location plays an important role in the housing market and mostly makes housing units more specific. Meanwhile, spatial attributes of housing units are important to market segmentation. In the structure of the housing market, distinct groups of dwellings units have different prices based on similar sector and spatial characteristics, such as detached houses, flats, semi-detached houses, terraced houses, and location.

On the other hand, submarkets can be identified based on the demand side. Given the supply opportunities, households search for their housing units based on their preferences and constraints in terms of income, demographic circumstances, wealth, the present population, and house price (Maclennan, 1982, 16). Therefore, each household can be placed into a household group with similar characteristics and preferences. These distinct household groups have preferences for specific housing units in a specific price band according to their desirable submarkets.

It is argued that it is necessary to define demand groups based on the economic, demographic and preference characteristics of households. Different groups of households may have different preferences or tastes regarding where to live, for example, urban areas or suburban areas. Home searchers may prefer to live near their workplace or their children's schools. Households also have their specific preferences for house types or bedrooms, such as detached houses with 3 bedrooms or terraced houses with 2 bedrooms. Some groups of households may have their preferences for both house type/size and location. Household preference data on neighbourhoods, price, bedrooms and house types can be obtained from the process of housing search. All this available information is important to identify submarkets and has been used by a number of researchers to explore submarkets at the local area level. For example, Rae (2015a) conducted an investigation of submarkets based on search information that produced prospective results. Based on the map series, he showed that submarkets can be defined based on both sector and spatial characteristics in the London housing market.

Although submarkets can be identified based on either supply or demand approach, it is necessary to pay attention to the mismatch between product characteristics and

household preferences. It is important to realise the difference between what home searchers are looking for and what their final choices are.

During the search process, people are most likely to change their preferences to the realities of the market. Households change their aspirations sometimes because their lack of market information caused them to have unrealistic preferences in terms of what they could achieve with their current income and financial ability. However, sometimes a mismatch occurs because the market lacks the available supply of suitable housing types or sizes in particular neighbourhoods which home searchers with sufficient resources are currently looking for (Maclennan, 1982, 19). Such a mismatch may highlight restrictions of the market and excess demand. From this, it is possible to identify whether the supply side reflects the actual demand or the market lacks the preferred stock, or the reason may be that searchers have unrealistic aspirations. To explore the mismatch between search preferences and actual choices, search data and outcome data such as house price and flow data become important.

3.2.2 Identifying housing market areas

A housing market area is defined as a self-contained housing market with a high level of household mobility within the area (Jones, 2002, p. 557) and may be identified based on search patterns, household migration and commuting (Hincks and Baker, 2012).

It is possible to define a HMA as a contiguous area that has a high level of migration self-containment (Jones 2002, 557). This means that a housing market area has only a small proportion of in-migrants from areas outside it. If an area has high percentages of migration activities, in-migration and out-migration, with other areas outside, it is not a HMA and may belong to a larger housing market area. Under a housing market

area, there may be different local submarkets associated with household preferences for housing tenure, location, house type/size. Different sub-market areas have different house price structures, price inflation trends, and affordability levels (Jones et al., 2012, p. 2639). This means that supplying new houses in a particular local area tends to reduce house prices in the area, but may not affect considerably the price structure in adjacent submarket areas.

Three different types of information can be used to define HMAs: price differentials, price change, mobility and/or search patterns, the patterns of travel to work and /or other criteria (Jones et al., 2012). Among these types of data, the analysis of migration data become the most comprehensive and robust way (Brown and Hincks, 2008). However, it is generally accepted that one of the main challenges when using migration data to identify local housing market areas is how to define their boundaries. Previous studies have adopted a certain self-containment threshold to identify the boundaries for local HMAs; for example, Jones (2002) applied a 50 percent self-containment threshold, DTZ Piedad (2004b) used above 70 percent self-containment, while Brown and Hincks (2008) used a minimum threshold of 70 percent. When applying different self-containment levels, a range of HMA sizes can emerge. Actually, it remains unclear how to choose the degree of self-containment based on mobility flows, and the choice of migration self-containment criteria depends on the theoretical framework and the experiment trials used by the individual researcher.

The study of HMAs has been a longstanding concern for researchers because of their significant impact on the housing market. Jones (2002) provided useful insights into the structure of spatial housing markets by using Scotland migration data to identify twenty-two HMAs based on the high level of housing market self-containment. In

addition, Coombes et al. (2006) determined HMAs in North East England through analysis of the 2001 Census migration data. They found that HMAs did not entirely overlap with local authority boundaries. Three year later, Coombes (2009) continued to investigate migration flows to analyse HMAs in the East Midlands, East, London, and South East. The author identified a big HMA containing London and many areas of the South East region. On the other hand, Brown and Hincks (2008) employed migration data from the 2001 Census to identify HMAs in the cities of Liverpool and Manchester. Their study, which was based on the criterion of 70% self-containment and estate agencies' knowledge, identified twenty-five HMAs. These studies by HMA researchers indicate a need to build a framework for identification and analysis of HMAs.

The study conducted by Jones et al. (2005) developed an analytical framework for studying HMAs. They highlighted that such a framework can now take advantage of the huge availability of data and advanced statistical analysis to provide a more effective method to understand how the local housing market works and thereby to support planning policies. Their study indicated that this framework should be based on examining commuting patterns and migration flows and that market planners and policy makers should use a framework of submarkets nested within a system of housing submarkets to explore mobility dynamics from the bottom up.

The framework used in Jones et al. (2010) and Jones et al. (2012) divides the housing market into three layers: Framework HMAs; Local HMAs; and Submarkets. They argued that there are differences in house price trends and affordability between areas in the same framework HMA due to the market constraints between local HMAs and submarkets. To deal with the shortage of housing supply in a particular housing market area, account must be taken of influential factors such as transport networks

and whether that housing market area is within a Framework HMA (Jones et al., 2012). Thus, it can be argued that the theoretical perspective can be an important foundation to explore HMAs and submarkets in the housing market through using migration, house price and housing search data that are available to the public in England.

Later on, Hincks and Baker (2012) continued their research on HMAs by studying Framework HMAs based on travel-to-work data and Local HMAs from household mobility patterns for the North West of England. The result showed up certain technical and methodological issues in practice and that these issues have an influence on how best to conceptualise the HMA framework. Nevertheless, their study highlights that HMA frameworks should consider the influences of spatial price differentials, housing search, the relationship between home and work and consider the issue of scale. Recently, Jones and Coombes (2013) examined HMAs based on tenure and explored their role in estimating housing needs in the current policy system for the North West of England. The authors identified Framework HMAs and Local HMAs by analysing travel-to-work and mobility patterns, and then made an extension by applying tenure criteria on the identification of Local HMAs. Identifying tenure-specific HMAs allowed a better understanding of the large urban housing systems in this region. Their work supported that it seems to be important for the planning process to include tenure in the analysis in order to determine market signals.

It is widely accepted that there is a need to develop the concept of housing market areas as the basis for a framework to understand the structures of the housing system. Researchers could use migration analysis to determine the geography of HMAs through mobility flows from origins to destinations (Hincks and Baker, 2012; Baker

et al., 2010; Jones et al., 2012). However, several relevant issues emerged from reviewing the literature of HMAs. Firstly, although HMAs are important in the analysis of the housing market, how to draw HMAs boundaries accurately is still a concern for researchers. Particularly, this raises a question about the wide range in HMAs' size when applying different levels of self-containment or distance. In addition, in order to gain a better understanding of the housing market, it is important to explore the relationship between local HMAs and submarkets as mentioned in the theoretical framework above. While the investigation of the two top layers: Framework HMAs and local HMAs, by Jones et al (2012) has provided new insights about the housing market's structure, we need to investigate how submarkets and local HMAs are connected together to understand housing demand within housing market areas.

3.2.3 Identifying submarkets

The housing market can be defined as a network of submarkets segmented by structural and spatial characteristics (Watkins, 2001). Submarkets can be seen as a group of housing units with similar characteristics or housing services and they exist when price variations come into play across the market as a whole (Rothenberg et al., 1991). According to Grigsby et al. (1987, 9), neighbourhoods may be defined as submarkets when they satisfy three requirements. First, there are groups of housing units in different neighbourhoods and these groups cannot be seen in other neighbourhoods without major interventions. Second, demand is inelastic in terms of location or dwelling characteristics, and there is a variation in price. Third, different neighbourhoods have different housing packages.

The identification of submarkets is important for a number of reasons: house price prediction; residential property valuation; the effect of policy interventions; and how

the market is structured. To value residential properties effectively, the housing market should be seen as a system of linked submarkets, and then investigated based on house prices associated with each submarket (Watkins, 1998). On the other hand, defining the market segmentation provides a better understanding of the housing market, and helps us to predict house price more effectively and explore variations of house price geographically (Bourassa et al., 2003; Goodman & Thibodeau, 2007). Moreover, Bates (2006) indicated that examining housing submarkets provides a picture of household behaviour and improves the quality of intervention policies. For example, identifying submarkets can provide more accurate knowledge of the effects of planning policies on the housing submarket and understanding of the spatial arbitrage process. Identifying submarkets can also help planners to make decisions on the necessary policies and how the effects of such policies come into play as these submarkets reflect household behaviours.

The study of housing submarkets has been a topic of interest among researchers for over six decades. To identify housing submarkets, a number of researchers used topographic boundaries (Goodman & Thibodeau, 1998; Gallet, 2004), while others used the criteria of house quality (O' Sullivan & Gibb, 2003; Sirmans et al., 2006). Studies that base housing submarkets on quality seek to determine the effective demand of a dwelling group. This type of submarket is composed a group of dwelling units with a similar level of quality. On the other hand, market segmentation can be based on price difference or the housing market can be grouped by housing tenure (Leishman, 2001; Tu, 1997), or by house type/size (Grigsby et al., 1986; Sirmans et al., 2006), or by spatial areas (Goodman, 1978; Goodman & Thibodeau, 1998; Palm, 1978). Another approach to the definition of submarkets was taken by Palm (1978), who showed that market segmentation can be defined by exchange of information, and this is seen as a better method than identifying submarkets by economic and

racial-ethnic characteristics. She argued that the practice of identifying submarkets had traditionally ignored the process of information acquisition, the use of vacancy information, and the process of choosing from among these vacancies.

Maclennan and Tu (1996) hypothesised that the housing market may be composed simultaneously as an array of components based on significant difference in prices spatially and structurally. They examined certain Scottish cities based on hedonic and other techniques and found that housing sub-markets exist and, more importantly, were segmented both geographically and sectorally. This was supported by the work of Leishman (2001) and Watkins (2001). Particularly, Leishman (2001) mentioned that identifying housing markets may be done on both a spatial and structural basis, with a system of linked submarkets. This result was also coincident with the work of Watkins (2001). He employed data from the Glasgow housing market to examine the notion of market segmentation and highlighted the importance of identifying submarkets, stating that this practice should be based simultaneously on geographic characteristics and the structure of the dwellings.

Regarding the method to define submarkets, a number of studies investigated housing submarkets by employing discrete choice models (De Palma et al., 2007; Eluckson, 1977; Longley & Dunn, 1988; Quigley, 1985; Yates & Mackay, 2006). Other researchers used equilibrium models (O'Sullivan & Gibb, 2003; Baier et al., 2006). On the other hand, it is possible to apply a hedonic approach (Leishman, 2001; Lipscomb & Farmer, 2005; Tu & Goldfinch, 1996). The application of hedonic approach is described through two steps (Maclennan, 1982, p. 43). The first is to calculate the price of dwelling characteristics by the use of hedonic technique. The second is to assume that household decisions are made based on price analysis and utility maximisation. It is argued that hedonic approach is mainly employed by

researchers because it is more powerful in terms of modelling and identifying submarket based on price differentials (Dale-Johnson, 1982; Tu & Goldfinch, 1996; Leishman, 2001; Kauko et al., 2002; Lipscomb & Farmer, 2005; Schnare & Struyk, 1976; Tu & Goldfinch, 1996; Leishman, 2001; Kauko et al., 2002). However, as this approach is built on the assumptions of market equilibrium and utility maximisation, it is ill-suited to analysis of the housing market (Maclennan, 1982, p. 46).

It is argued that submarkets play an important role in analysing the housing market but, as Watkins (2008) suggested, the practice of identifying submarkets has traditionally relied on the use of mainstream economics. Watkins went on to argue that this kind of research mainly focuses on improvement of the analytical models and de-emphasises exploration of how the local housing market works regarding housing market search and submarket dynamics. Enhancing such knowledge is significantly important to market planners for their decision making. The limitation of using mainstream economic models was also raised by Jones et al. (2012). They argued that the traditional models for identifying submarkets are insufficient and the identification of submarkets should reflect their creation processes. Also, they mentioned the relationship between household mobility and submarkets, particularly the association between submarkets and distinct migration patterns (Jones et al., 2012). They embraced that analysing migration flows, especially migration linkages, not only provides important information about the identification of submarkets and but also helps us understand the submarket structure and spatial dynamics (Jones et al., 2012). To achieve this, more research work should be done to improve the conceptual models and analytical framework based on a system of intra-connected submarkets. Among the efforts to develop an appropriate housing analytical framework, Jones et al. (2005) suggested a framework of submarkets nested within a

system of HMAs. This has become possible with the availability of big data and new statistical techniques.

3.3 System dynamics

Researchers have so far paid little attention to the dynamics of the housing market system as a complicated array of HMAs and submarkets. Within the system, the dynamics include the process of submarket filtering, the connections between HMAs and between submarkets, the process of housing search and migration activity. To understand the market system dynamics, a framework that is compatible with the process of housing search is needed. This framework should be based on several economic theories, especially Old Institutional Economics, Old Behavioural Economics, and Neo-classical Economics. Before discussing this framework in detail, it is necessary to review three important notions: market filtering, housing search process and household migration.

3.3.1 Market filtering

3.3.1.1 The notion of market filtering

Filtering is a term to describe the shifts in house price and housing quality relating to household migration. During the filtering process, as the cost of house repair is high, those households with higher incomes tend to move to new dwellings. This will happen when their income increases or when the quality of dwelling unit no longer satisfies the household's preference. For some researchers, filtering can be understood as the process of family life-cycle.

Originally, Grigsby (1963, ch2) conceptualised the filtering process with reference to housing stock and the level of substitutability and based on groups of housing units

by migration patterns, consequently through household migration, house price, and quality change. The theoretical framework examined the changes in related characteristics of home purchasers and characteristics of the dwellings based on an analytical matrix. This theoretical work has played an important role in exploring household movements that affect house price and market supply or demand.

Researching on housing filtering is seen to be difficult as researchers need to collect data regarding the variables over a long time period. However, it is important to study the filtering process to deal with the issue of affordable housing for low income people. The contribution of studying the filtering process is to improve the understanding of market conditions that low income households may confront. This can help us assess the supply side of the market, understand how the supply can match the needs of low income households, or explore the relationship between characteristics of housing units, neighbourhoods, and housing supply for low income households. It is argued that the process of filtering can provide affordable housing units for low-income households. This is because when housing units decline in quality over time, the current households with high income tend to move out to seek more preferable dwelling units of higher quality. Their current housing units become vacant and then provide choices for low-income households at an affordable price.

Many studies have investigated this process. Smith (1964) constructed a model to match households with housing units and analyse the response from the supply of new built houses. As a result, he indicated that the supply of new houses comes into play when the benefit of building new houses is higher than the cost of new construction at the according quality level. In this framework, the author included behavioural factors but did not pay attention to shifts in house price, or the influence of such changes on migration, housing quality and existing stock (Galster, 1996,

1801). The framework is subject to the shortcomings that the housing stock remained unchanged and there was no relationship between house price and household formation (Galster, 1996, 1800). Later on, Sweeney (1974a, 1974b) and Schall (1981) examined the influence of new construction on the price of housing units on lower-quality and demand and supply. They found that supplying low-income dwelling units relies on the supply of higher quality housing. If the quantity of high or medium quality housing is limited, the supply of affordable housing units for low-income households becomes restricted due to less of the housing stock filtering down (Baer & Williamson, 1988; Galster, 1996; Sweeney, 1974a; Sweeney, 1974b). Bogdon et al. (1994) investigated housing conditions, housing needs and how to deal with the issue of providing affordable homes. These studies explored the match between affordable housing units and low income households, and income profiles. Weicher and Thibodeau (1988) investigated the impact of supply of new built houses on the stock of affordable houses based on the analysis of census data between 1960 and 1970. They found that the demolishing of low-quality units led to the remaining low-income units reaching a higher quality; also the supply of new built housing in submarkets with higher demand led to a decline in the stock of low-quality units. Elsewhere, Somerville and Holmes (2001) pointed out that there was a weak connection between affordable housing segmentations with other submarkets. On the other hand, Rothenberg et al. (1991) generated a model to examine the framework of filtering and explored shifts in price and quality. This provides a clearer picture of how to identify the conditions that lead to price changes and shifts in housing quality. The authors indicated that equilibrium of submarkets is established through the interplay between market demand and supply and the influential factors.

Since housing quality goes down over time, the process of filtering can usually be based on the relationship between housing age and value. Skaburskis (2006)

investigated the relationship between housing age and housing value and showed that older dwellings had increased more in value than newer dwelling units from 1981 to 1996. There is often more stock of old houses in the city centre and, rather than move, households tend to repair them because of the convenient transportation links. This could have the effect of either slowing down the filtering process or preventing down filtering from happening. Rosenthal (2008) supported that the process of filtering should be investigated in the conditions of complex housing and land market dynamics and the influence of neighbourhood change.

The process of filtering is closely connected with neighbourhood conditions. When the process of filtering occurs, existing households leave the neighbourhood and new households come in, thereby leading to neighbourhood succession. Because dwelling units in the same neighbourhood have similar characteristics, the process of filtering happens across the neighbourhood (Grigsby et al., 1987). Many studies have investigated this issue. Nelson and Vandembroucke (1996) examined the influence of dwelling units, neighbourhood, and market condition on household migration among low income people. Phillips (1981) examined neighbourhood income in relation to housing stock, while Bond and Coulson (1989) focused on change in neighbourhoods and examining the relationship between house price and neighbourhood characteristics.

It is argued that the process of filtering is triggered by the movement of upper income groups of households from their current dwellings to new ones. However, if the supply of new built houses is limited, the new dwelling stock will not meet the growing demand from high income groups. This leads to the process of filtering happening more slowly than normal and causes problems such as prices of older homes becoming highly inflated, therefore squeezing out people of low and modest

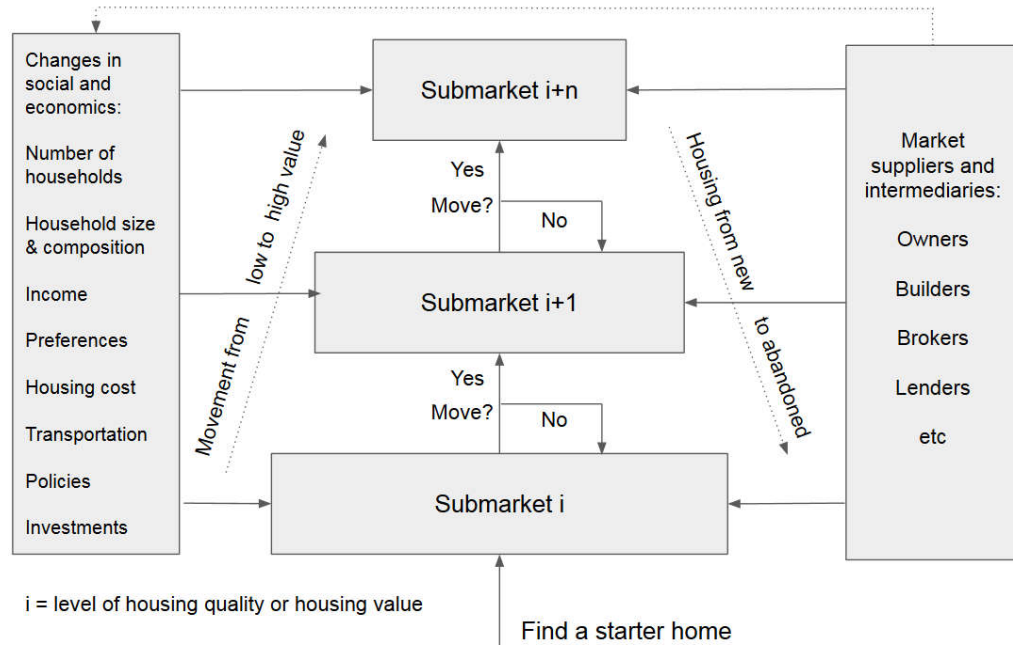
incomes. In this case, it can be seen that the process of filtering is an ineffective vehicle to deal with the needs of households near the market bottom. Because the filtering process happens slowly, as the demand for housing from low income households increases, the price will be bid up. The lowest income households will be unable to compete for housing without increasing their bidding price or decreasing the quality or quantity of their demands (since there is a lack of lower quality properties).

3.3.1.2 Submarket connections through filtering

It is argued that submarkets are connected and interact together through the mechanism of migration activities. To explore these links, it may be possible to employ filtering theory and migration flows. The dynamics of the housing market play a central role in the operations of sub-markets. This process, as defined as ‘‘filtering’’, shows the relationship between changes in house price and quality with migration flows. The theory of housing market filtering provides us with a picture of the market dynamics and market reactions regarding house price, housing stock and housing quality. It also shows the shifts in housing supply and demand when changes occur in income, housing preference or housing cost, etc. For example, when household income increases at the highest level, those in the growing highest income groups demand higher quality houses, which lead to demand for the construction of new, high quality houses. When the construction is complete, higher income households move into their new homes, leaving their old houses vacant. These vacant houses will be added to the current stock at the same level and this may lead to a reduction in house price due to the excess supply of the same quality housing stock. These houses may therefore become affordable for households with lower incomes. These lower income households, in turn, vacate their current houses, which then

become available for the next lower income bracket because the excess quantity leads to a price decline. This process will continue to filter down as far as the lowest income households.

Figure 3.2 The process of housing market filtering based on Grigsby (1986)



Source: Grigsby (1986)’s own analysis

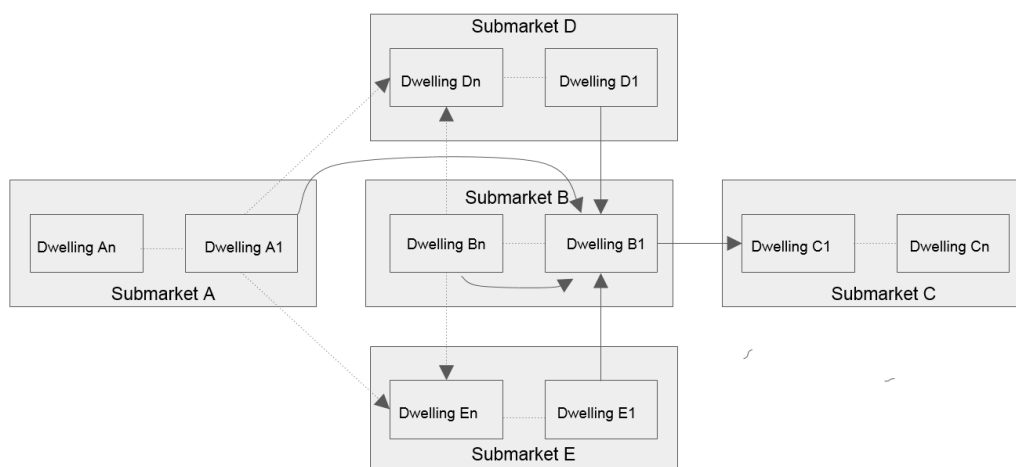
Figure 3.2 describes the process of housing market filtering. On the left of the figure are the factors that affect movement by households. Changes in social and economic characteristics include the number of households, household size and composition, income, preferences, housing cost, transportation, policies and investment. Demand for housing is influenced by a change in household number, size and composition. An increase in household number or household size and composition may lead households to consider other, bigger houses or they may choose to separate. Income plays an important role in the filtering process. An income increase may lead households to move to more expensive houses which have more utilities and facilities in a better neighbourhood. In contrast, when income is reduced, households may stop

thinking of moving because, for example, of the related cost. In the worst situation, they may sell their current home and move to a cheaper house to save money. Migration is also influenced by households' preferences for housing. Similar income groups may have different preferences for housing. While some households may prefer to live in urban areas with great facilities, near shops, restaurants or schools etc., other households may prefer to live in quiet areas with more green spaces. Therefore, household preference will influence the demand for housing in such areas. Cost is another significant factor for households in making decisions on moving house. The costs of moving and transportation time are two major variables in urban mobility and may cause spatial difference in property price, density of built houses as well as travel-to-work flows. Housing costs, including mortgage payments, property taxes, and mortgage insurance, are seen as the highest cost when households consider migration. Transportation and commuting time are other considerations when households are thinking about moving, and may be the reason that households choose to live in the centre or in the urban fringe. For example, if the development of a new transportation system decreases commuting time to the outskirts of the city, households may consider moving there. In addition, housing policies and investment may be considerable factors affecting migration by households. For example, housing policies may set exclusionary zoning to allow the land to be used only for certain purposes; or the government may introduce housing laws to prohibit discrimination in the selling of housing; or the government may take action that has an impact on interest rates and mortgages. They may initiate urban renewal programmes to stimulate housing investment, kick-start the process by acquiring urban land, and sell the land to private developers to increase the housing stock.

As described on the right of the figure above, when they realise that changes are occurring in social and economic characteristics, market suppliers and intermediaries

may take action to influence the housing market. Builders and investors may realise there is a high demand for housing and build more houses in preferred areas, while brokers and lenders may widen their activities to suit the growing demand for housing. In this process, attention will be paid to household preferences to minimise the risk of mismatch. On the other hand, household movement occurs in relation to the dynamics of the submarkets. For example, as the figure above shows, households in submarket (i) may want to move to submarket (i+1) because they need a bigger house, or want to live in a better neighbourhood, in which case there are two options open to them: not moving but upgrading the current house or moving to a better house. For the first option, households need to take action to repair their current houses if it is possible to do so at acceptable cost. Otherwise, they will decide to move to another house of higher quality. It is usually the case here that structural repair of properties is more likely than neighbourhood deterioration through such as crime, noisy neighbours, dirty public places, etc. This process will start the movement from low to high value house and the decline in housing condition from new to abandoned. This also leads to a decline in the price of dwelling units that makes them affordable for those with lower income. The process continues until the group of households with the highest income decide to move to new-built dwelling units in luxury areas.

Figure 3.3: The dynamics of housing submarkets



Source: The thesis author's own analysis

Figure 3.3 shows the dynamics of submarkets in a local housing market area. Within each submarket, there is a group of dwelling units with similar characteristics. The dynamics of submarkets can be seen as the process of household movements. Households living at Dwelling B1 in Submarket B would expect to move to a Dwelling C1 in Submarket C. This movement attracts other households to move in. Households living in Dwelling Bn would expect to move to Dwelling B1 within the same submarket B. This movement is not a move up or down outcome but a movement to a similar level of housing quality. This type of migration may happen because of movement closer to family, relatives or friends or moving closer to the workplace. Also, young people may want to move out of their parents' home to a house nearby, or the movement may be caused by family breakup. Mostly this type of movement is explained by the life cycle. Elsewhere, households from other submarkets may want to move to Submarket B. Their current houses may be of either lower or higher quality and their main reason for moving is because they find their current homes do not meet their preference or aspiration.

When demand for submarket B is high, but the number of households wanting to move out is low, the price may increase because of excess demand compared to limited supply. Or if the number of households wanting to move out is high but there are limited numbers of people wanting to move in, there is a decline in price. Realisation of the excess demand and limited supply may act as a signal to builders or investors to build new houses. However, construction activity takes a long time to respond to the lack of supply and therefore an imbalance between supply and demand will exist. By exploring the migration flows between submarkets, we can find out the underlying reasons why people move. In similar submarkets, they move because of life cycle, job, or family break-up, whereas movement down or up may be because of income. We may also find out which submarket is the most attractive to movers upward and downward and whether distance is important factor. The areas with high attractiveness are often those with high searches but low migration numbers. Those areas with high migration may not be highly attractive areas, but those with lots of available houses, and because of the high availability, prices will not be really high. In those areas with less migration the reason for this may not be that they have limited stock but that the area is deteriorating and people don't want to move there. To understand why, we need to use price and price change data as well as search and migration data.

3.3.1.3 Different levels of submarket connection and isolation

The term 'neighbourhood connection and isolation' is popularly used in regional analysis (see Rae, 2009, 2011; 2012 or Hincks, 2015), but seems not to be used in the analysis of housing market systems. Studies of regional connection and disconnection have been based on the spatial analysis of the Index of Multiple Deprivation to identify the most and least deprived areas and explore their connections with the

wider area. In the UK, a comprehensive report by Rae et al. (2016) highlighted connection and disconnection within cities across the UK at the local level. The report focused on the disconnection of the poorest neighbourhoods in terms of economic growth based on the exploration of commuting patterns and households' moves. They found that many neighbourhoods had poor connection with the wider area and also showed that different deprived neighbourhoods had different levels of connection in terms of housing and labour opportunities. In a deeper analysis, Hincks (2015) paid attention to the patterns of changes in deprived neighbourhoods in Greater Manchester. He demonstrated that changes in deprived neighbourhoods may take place in different ways over time and tend to be associated with socioeconomic and demographic factors, household migration, and spatial contexts. Elsewhere, Clark and Mass (2016) examined the probabilities of moving up and down in the overall interchanges, the connection of advantage and disadvantage areas, especially exploring the isolation level of the disadvantaged areas compared to other better areas. They highlighted substantial mobility activities within-decile and also across rich and poor scales in Australia and the role of income and social status in the chance of making upward movements. Further, the disadvantaged areas still had connections to the wider area and were not isolated. In their study, the advantage and disadvantage deciles were defined based on family and social status, occupational measures, economic and educational characteristics. On the other hand, Ferrari and Rae (2011) tried to find connections between deprived areas and house price and found that differentials in house price are connected with the level of deprivation. Particularly, poor neighbourhoods are often linked to those areas with low house price and associated with longer distance patterns of residential mobility. They recognised a spatial disconnection between disadvantaged housing market areas and advantaged housing market areas.

In short, it is worth considering the connections of neighbourhoods through residential movements in or out. This is important because households' movements and characteristics have a significant impact on original or destination neighbourhoods (e.g. Bailey and Livingston, 2007). In the analysis of a housing market system, the notion of 'connection and disconnection' between submarkets is new and needs to attract more attention. In this thesis, Chapter Six intends to explore this issue in more detail. Particularly, it investigates the proportions of moves between a range of submarkets based on price differentials (significantly low, low, medium, high and significantly high) and examines the connections of high-end price and low-end price submarkets.

3.3.2 Housing search process

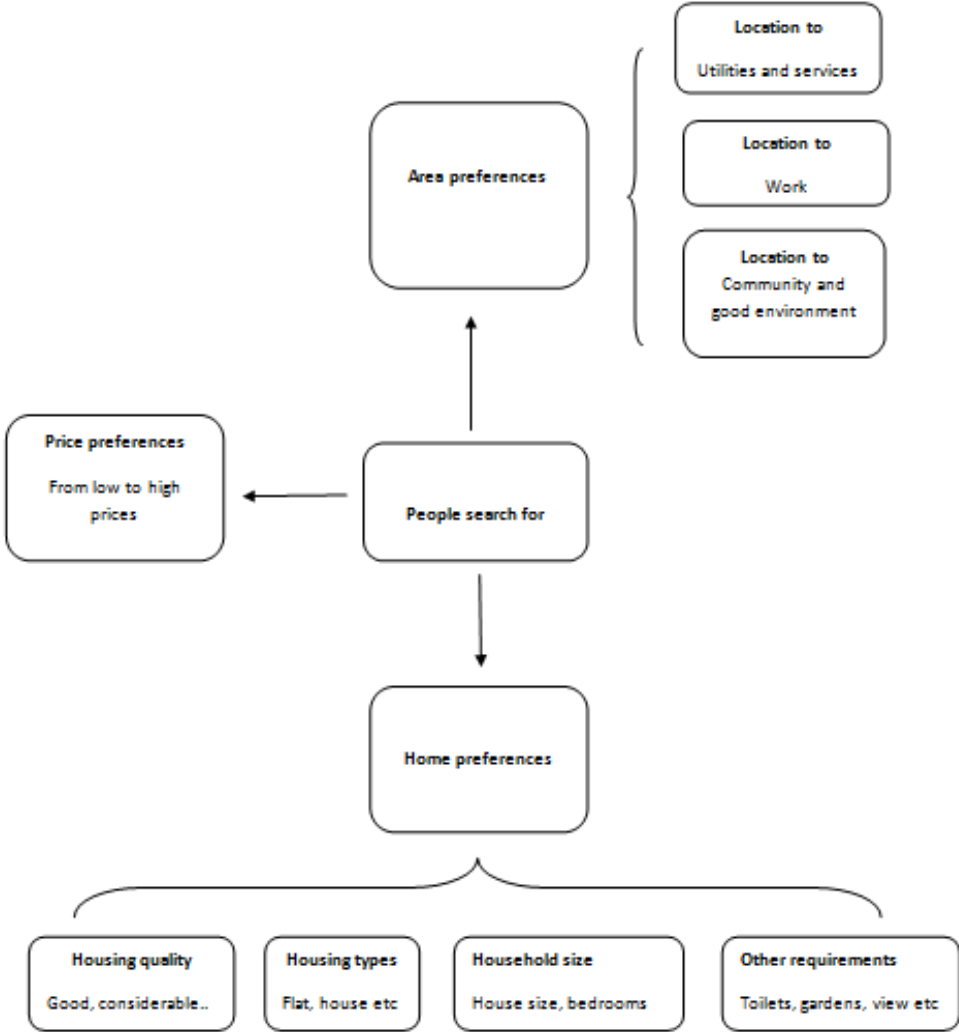
Search process plays an important role in the mobility decision-making process. During the search process, households may face market constraints and restrictions that then may cause them to revise their aspirations. This makes the household decision-making process more complex. In order to understand the concepts of search, five important points should be taken into account (Clark and Flowerdew, 1982, p. 9). First, housing search is a process in which households have decided their targets. They have a search strategy with initial expectations, and will not choose their new homes randomly. Second, during a search process, households need a strategy to collect a great deal of information to support their decision-making process. Therefore, search can be considered as a hierarchical process. Third, household decisions are subject to risk and uncertain situations. Fourth, households must determine when to stop their search, and make a choice. Households make their decisions based on the best options they have, the probability of achieving a better choice in future, and the cost if the search process continues. Finally, during the

search process, market constraints and restrictions influence household aspirations, search strategy, and mobility behaviour.

The search process is the most important part of household movement and of growing concern among researchers. The analysis of the search process will provide us with information about excess demand and help us assess the supply side of the market. Therefore, exploring the search process may help us understand households' housing preferences regarding such as areas, price bands, house structures and quality. From the information about households' aspirations, it is possible for researchers to predict price changes, and explore search patterns to estimate future demand in the local housing market.

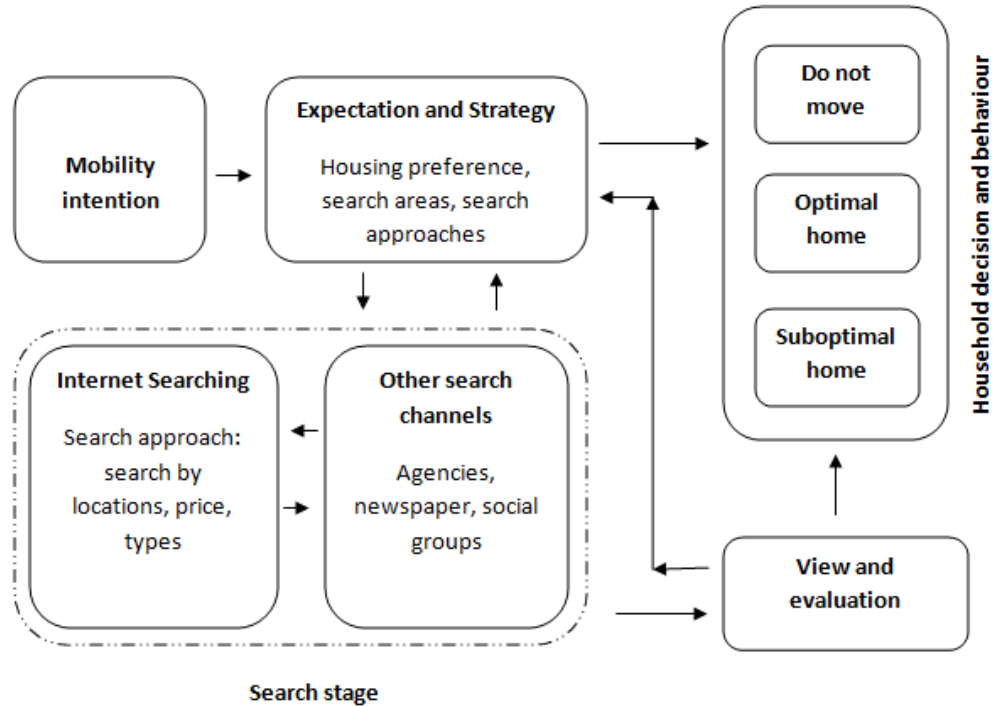
Figure 3.4 presents a breakdown of information about households' search preferences. During the search process, households may prefer to find their homes based on house price bands, areas, or house structures. Regarding neighbourhood preferences, attention may be paid to the locations with easy access to utilities and services or close to workplaces. Households also prefer to live in a good community and environment. Regarding house structures, household tastes may differ in terms of different house types, such as flats, detached, semi-detached, terraced, or house sizes, such as number of bedrooms, or house quality. Searchers may also pay attention to other factors such as gardens, house views, etc.

Figure 3.4: Households' search preferences



Source: The thesis author's own analysis

Figure 3.5: Household mobility processes



Source: The thesis author’s own analysis with reference to the works of Clark & Flowerdew (1982), Maclennan & Wood (1982) and Marsh & Gibb (2011)

Based on reviewing the works of Clark & Flowerdew (1982), Maclennan & Wood (1982) and Marsh & Gibb (2011), the housing search process can be divided into a number of stages as illustrated in Figure 3.5.

First, households make the decision to move. A number of researchers have identified factors affecting the decision of households to move, for example, marriage, having another family member, an increase in income or neighbourhood dissatisfaction. Next, having formed the intention to move, households need to build their strategy based on their home aspirations. In this stage, households decide in which areas they would like to live, their budget range, house type and size and home quality, based on the information and experience they currently possess. Information channels are important to build their strategy, although possession of imperfect information may

cause households to have unrealistic expectations and they may have to revise their strategy. With their strategy and aspirations in hand, they enter a search stage that involves simultaneous use of the internet, newspapers, agents, and other channels. For example, households may conduct a home search through the internet using property portals like Rightmove or Zoopla. During the search process, households update their market information and consider whether their aspirations can be met or not and may need to revise their aspirations. Once they find some suitable homes, they enter the viewing stage. In this stage, households need to choose whether to buy or continue searching or postpone their home purchase based on further detailed evaluation of dwellings, amenities, and facilities and examining a small numbers of dwellings in depth before offering a bid.

3.3.3 Household migration

3.3.3.1 Mobility intention

Households often express moving desires and expectations before they start searching for dwellings and making decisions. Moving desires and expectations are distinct pre-move thoughts, and are affected differently by a number of variables. Moving desires are strongly associated with residential dissatisfaction, while moving expectations are related to life events (Coulter et al., 2011). Households may desire to move home, but may not expect their mobility to occur quickly. This can be explained by the theory of planned behaviour: households may lack the control necessary to escape unsatisfactory houses and neighbourhoods (Ajzen,1991).

The relationship between mobility intentions and actual mobility can be examined across longer periods of individuals' lives. This helps us distinguish those who move ephemerally from those who persistently desire to move (Coulter & Van Ham, 2013).

This also provides understanding of how households experience and react to housing disequilibrium over the life course (Coulter & Van Ham, 2013). On the other hand, a recent and growing literature has investigated the relation between mobility intentions and actual moves over short periods (Coulter et al., 2011; De Groot et al., 2011; Lu, 1999; Watkins et al., 2011). The strength of mobility intentions was found to be affected by household age, housing tenure, recent mobility history, and life cycles, and had a significant effect on predicting future moves (De Groot et al., 2011; Watkins et al., 2011). Especially, Watkins et al. (2011) explored mobility expectations in order to support estimation of local housing demand. They found that household expectations and aspirations are important factors and can provide us with the information to estimate household movement. However, this information should be used with statistical models that identify different groups of households with different characteristics. This is because the reality of the moving intention is different for different groups. Moreover, it is also necessary to construct an appropriate theoretical framework to analyse the drivers of mobility.

3.3.3.2 Decision to move

Household formation and mobility decision can be investigated based on economic and/or non-economic factors. From the financial perspective, households evaluate constantly the benefits of their current dwelling and new alternatives. They also consider possible options to seek utility maximisation, and choose the most beneficial ones. Households make decisions based on a cash flow analysis to calculate a present value in relation to a number of economic variables. The two most important factors have been identified as household income and mobility cost (Ermisch, 1999; Ermisch & Di Salvo, 1996). Households may postpone their mobility intentions if they are

unable to afford the moving costs associated with the mobility process, and/or the current house price (Ioannides & Kan, 1996).

From a non-economic perspective, households do not constantly evaluate their current dwellings, and only move home when certain triggers occur (Mulder, 1996, p. 211). These triggers can be related to important events in a household's life (De Groot et al., 2011; Ermisch & Di Salvo, 1996; Clark & Huang, 2003;), or to residential dissatisfaction (Wolpert, 1965; Clark & Dieleman, 1996, p.44). Life events occur throughout an individual's life, and can include birth, marriage, parenthood, divorce, retirement, and unexpected events. These events play an important role in mobility decision-making. For example, family break-up, marriage or childbirth may lead households to move home, while job loss or unemployment may prevent households from mobility because of income uncertainty. Residential dissatisfaction, meanwhile, has been related to household income and education level and has found to influence mobility decision-making (Clark & Huang, 2003; Fischer & Malmberg, 2001; Parkes & Kearns, 2003). Households with high income or education may demand a high quality home offering a good neighbourhood and amenities.

3.3.3.3 Tenure choice

Housing tenure choice can be analysed based on economic and non-economic factors. Housing is considered to be a good investment; therefore, tenure choice is mainly examined through investment decisions (Henderson & Ioannides, 1983). Before choosing housing tenure, households consider risk and expected yields between different tenures. They compare the cost of capital to become a homeowner with the cost of renting a house. An investment comparison is made through a cash flow analysis to calculate a present value based on house value, moving cost, opportunity

cost and occupancy length (Mills, 1990, p. 325). An investment decision is subject to the influence of market conditions, such as house price and vacancies. An increase in house price may prevent renters from becoming homeowners, and lead them to move into another rented house (Ioannides & Kan, 1996, p. 360). In terms of household consumption, housing tenure choice can be considered as part of a competitive process based on assumptions of perfect information and market competition. In this case, homeownership demand was determined as a function of household income and wealth (Andersen, 2011, p. 184; Haurin & Morrow-Jones, 2006; Linneman & Wachter, 1989).

Analyses of household tenure choice have not been based merely on applying mainstream approaches to all households (Davies & Pickles, 1991; Ferrari et al., 2011, p. 23). A number of studies have tried to explain housing tenure choice through the influence of life events: partnership break up and unemployment (Ermisch & Di Salvo, 1996); family composition and societal changes (Clark & Dieleman, 1996, p. 81; Raya & Garcia, 2012). On the other hand, housing tenure choice can be investigated through consideration of psychological factors. Homeownership decisions can be based on households' desire for freedom or independence, better psychological feeling, or their sense of attachment to the housing unit (Ben-Shahar, 2007).

3.3.3.4 Location choice

A number of studies have advocated the use of mainstream theory to examine the influence of amenities and space on location choice (Chen & Lin, 2012; Clark et al., 2003; Eliasson & Mattsson, 2000; Turnbull et al., 1991; Zhu, 2013). These studies were built on the assumptions of rationality, utility maximisation, and perfect information. Most households preferred areas with shorter commuting time, lower

transport costs, great amenities and higher quality schools (Bayoh et al., 2006). Additionally, households expected to live in areas with less risk of decline in house prices, even though they might incur higher transportation costs (Turnbull et al., 1991). Thus, different households have different preferences for amenities, consequently leading to differences in location choice (Clark et al., 2003).

Social ties play an important role in decision-making in relation to location choice, and are a significant source of inertia (Ferrari et al., 2011, p. 23). Households may postpone their mobility intentions because they prefer to live close to family, relatives or friends. Households often make frequent visits to their connections; therefore, they consider locations at short distance. Emphasising the importance of social ties, Spilimbergo & Ubeda (2004) found that family ties were the main reason why black people were likely to be less mobile than white people. Additionally, Knies (2013) investigated residential mobility associated with friendship formation, and showed that people preferred to live in areas with a larger number of their close friends nearby.

3.3.3.5 Time on market

House price fluctuation and vacancy rate influenced search cost, search duration, and expected time on the market (Baryla et al., 2000; Head et al., 2014; Wheaton, 1990, p. 1270). Both sellers and buyers tend to bargain for a reservation price; the longer this process goes on, the longer the property remains on the market. As a result of the bargaining process, market price has a strong relationship with housing stock. On the other hand, in a housing market with a limited stock of dwellings, households compete among themselves for expected houses, and stop their search activities as soon as their expectations are met. Households may risk losing the current best matched dwellings if they continue their search.

Household search intensity can be affected by search cost, household income, the available market information, and the role of estate agencies. It has been found that households search longer and with less intensity if they have a high income, and search with more intensity if search costs are high (Elder et al., 1999). Households with less experience and less market information search longer than those with more experience and market knowledge (Baryla & Ztanpano, 1995). On the other hand, estate brokers, by providing home searchers with market information and advice, help them to reduce information asymmetries in decision-making (Baryla & Ztanpano, 1995).

Buyer time on the market can also be influenced by seller motivation. Sellers with sale motivation are likely to set a lower price, and prefer to sell dwellings to those who have made earlier offers (Glower et al., 1998; Knight, 2002). In contrast, sellers without sale motivation are likely to set a high price, and wait for a relatively high offer from buyers. Marking-up of the price leads to an increase in expected time on the market, and costs sellers both time and money (Anglin et al., 2003).

3.3.3.6 Information acquisition and asymmetries

Households collect and use information to identify dwelling vacancies, neighbourhoods, and house price during the search process. The process of information collection is associated with household aspirations established from the current market knowledge and household experience. Households' aspirations may be unrealistic and may be changed within the market constraints and restrictions.

Recently, there has been a decline in the use of estate agencies to provide information related to different locations, house types and price. Most households now prefer to use the internet as the main information channel for their housing search (Dunning &

Watkins, 2012). The internet can provide a great deal of online property information at less cost. However, this advantage can sometimes make potential buyers spend more time in the market (D'Urso, 2002). The searching duration may be longer because home buyers need to search for a range of dwellings, and carefully evaluate them to find the optimal one.

The process of information collection is costly. Institutional experts may utilise market information to serve their own interests, and distort the housing market (MacLennan, 1982, p. 134). Estate agents tend to possess more market information than buyers, and know how to make high profit from a particular market. For example, using their market expertise, estate agents may prefer to keep their own dwellings on the market for longer to seek the most profitable deals (Rutherford et al., 2007).

Information is not only costly but also influences utility maximisation. The study from Akerlof (1970) showed that information asymmetries are potentially a significant constraint to the maximisation process. Later, a number of studies further stressed the importance of information and information asymmetries in the housing market. The study by Baryla and Zumpano (1995) found that experienced households with more market information tend to spend less time during their purchasing process. Meanwhile, potential buyers can also reduce their time on the market through the support of estate agents. Similarly, the importance of information asymmetries was mentioned in the studies of Levitt and Syverson (2005), Merlo and Francois (2004) and Garmaise and Moskowitz (2002). The housing market may be distorted when property agents are better informed.

3.4 Market system models

Based on the structures and dynamics of the market system, many studies have paid attention to the development of analytical models to investigate how the housing market system works. These models were based on three theoretical perspectives: neo-classical, institutional and behavioural economics. Neo-classical models have become dominant, but have failed to reflect the behavioural aspects of households. To improve on these models, institutional and/or behavioural approaches have been developed. According to Ferrari et al. (2011), behavioural analytical frameworks can be grouped into two categories: New Behavioural Economics and Old Behavioural Economics. The former category includes behavioural approaches associated with the works of Kahneman and Tversky (1979), while the latter is associated with the work of Simon (1976; 1986) and the works of institutional advocates (Veblen, 1919; Lewin, 1996; Twomey, 1998). It has been noted that association of Old Behavioural Economics with (Old) Institutional Economics has more potential for the development of housing analysis frameworks (Ferrari et al., 2011).

This section provides a review of different analytical models applied in the housing market: Tu and Goldfinch (1996); Speare, Goldstein and Frey (1975); Wong (2002); Maclellan and Wood (1982); Maclellan (1982); Marsh and Gibb (2011); Rae (2015a) and Levy and Lee (2004). In the case of each model, this study will discuss its content, main implications, strength and limitations. These models are divided into three groups that reflect a reduction in rational level from rational to less rational and then behavioural: neo-classical, old behavioural frameworks based on the 'Simon' notion of satisfaction, old behavioural models based on (Old) Institutional Economics and behavioural models based on social cultural frameworks.

In particular, Tu and Goldfinch (1996) and Smith, Rosen and Fallis (1988) adopted a neo-classical approach to develop a search and choice model based on relaxation of certain assumptions, for example, perfect information. Speare, Goldstein and Frey (1975) and Wong (2002) advocated an old behavioural framework associated with the satisfaction notion from the work of ‘Simon’ to build a search and choice framework. On the other hand, Maclennan and Wood (1982) and Maclennan (1982) developed a behavioural search and choice framework based on Old Behavioural Economics and associated with the previous studies of (Old) Institutional Economics. Later, and importantly, Marsh and Gibb (2011) and Rae (2015a) extended the models of Maclennan and Wood (1982) and Maclennan (1982) to include behavioural factors (Marsh and Gibb, 2011) and search-related factors (Rae, 2015a). The final group includes a framework devised by Levy and Lee (2004) that took account of the significant role of social and cultural factors in the decision-making process.

3.4.1 Neo-classical models

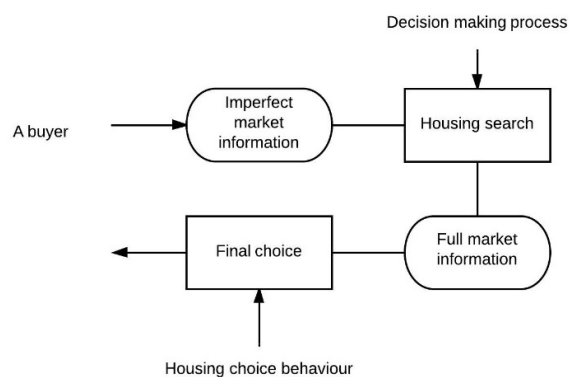
3.4.1.1 Tu and Goldfinch (1996)

Tu and Goldfinch (1996) developed a neo-classical search and choice framework. They investigated how households make mobility choices in the housing market, including the search process, by constructing a two stage model. This model is closely linked to the neo-classical approach in particular. According to the authors, before starting their home search, households perceive incomplete knowledge of the housing market but they then gain full market information during their search. After having full knowledge, households seek to maximise the utilities from their possible options. Tu and Goldfinch (1996) argued that:

“A buyer’s housing market information level will influence his/her final choice only if the choice is made under imperfect market information. As a result, this choice is probably not his/her maximum utility choice. However, this will not happen very often. The reason is that buying a dwelling is the largest expenditure and probably one of the biggest decisions that a household makes. A household will therefore be very careful in choosing a dwelling. If they cannot find a suitable dwelling they may quit the market. So it is reasonable to assume that each buyer will buy a dwelling only after obtaining full market information. Under this assumption, a buyer’s final choice will not be influenced by his/her market information level.” (Tu and Goldfinch, 1996, pp. 519-520)

The model by Tu and Goldfinch (1996) made an assumption that households’ expectations and aspirations do not change during the search period. What is more, they assumed that there is no limitation how searchers obtain market information.

Figure 3.6: A model from Tu and Goldfinch (1996)



Source: Tu and Goldfinch (1996)’s own analysis

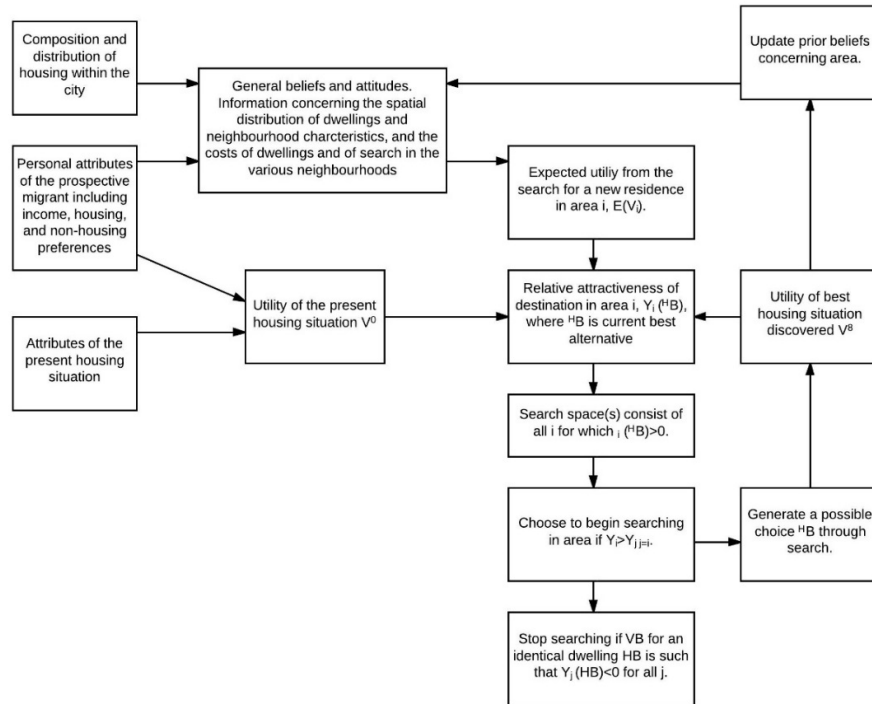
The model emphasised the structure of submarkets, household choices, housing search and imperfect market information. The main implication of the model is to

forecast demand for housing units through providing a framework to investigate the structure of housing submarkets. The strength of this model is that it investigated the structure of the market based on the theory of random choice and utility maximisation. The model is seen to be linked closely to the theoretical restrictions of the neo-classical approach in terms of the utility function. It paid less attention to the role of information acquisition and the decision making process. Therefore, this model limited the ability to explore the behavioural aspects of households during their search process. Also, it has not taken into account the outcomes of movements (market dynamics) such as upward moves, downward moves, or suboptimal choice, or interaction between submarkets.

3.4.1.2 Smith, Clark, Huff and Shapiro (1979)

Those who embrace the neo-classical approach tend to assume utility maximisation based on perfect information. However, in reality, information is limited and households have to make their decisions under uncertainty. They do not know or are unable to predict the benefits of their choices in future. To examine the impact of uncertainty on housing choices, Smith et al. (1979) constructed a model of the search and mobility process to deal with uncertainty when advocating utility maximisation. Similarly, this can be seen as a search and choice framework based on the neo-classical approach.

Figure 3.7: A model from Smith et al. (1979)



Source: Smith, Clark, Huff and Shapiro (1979)'s own analysis

According to Smith et al. (1979), this model is linked to the mainstream approach through the assumption of utility maximisation. However, the model made an improvement by taking into account the impact of uncertainty on household mobility decisions. According to the model, buyers do not have perfect market information, therefore they are unable to know all possible housing opportunities before they start searching for housing. They need to gather information and adjust their preferences. The search process tends to improve their market knowledge, at the cost of collecting information. According to the model, buyers maximise utilities during the process of computing and comparing housing alternatives to choose the best housing option. This process of utility maximisation includes sequential decision making under uncertainty and with risk aversion.

The model was built with the aim to predict the probability that a household will search for a new home in a neighbourhood by engaging in the search process. It emphasised the relationship between household preferences and aspirations, the external environment, and the actual choice. The main implications relate to the important roles attributed to the search, the decision to search and the search process. It not only paid attention to spatial aspects of search and choice but also the preferences, constraints, and the levels of risk. The main strength of the model lies in the simplicity of analysis built around a number of decision rules based on optimal search. The model considered spatial and temporal aspects of housing choices and the uncertainty. The limitations of the model include its use of optimal choice and that it ignores the role of behavioural acts when households face difficulties or restrictions. In such cases, households may take shortcuts to make their decisions. Also, Smith et al. (1979) assumed the homogeneity of property characteristics within neighbourhoods. Further limitations of this model lie in the time and cost involved for households to reach the level of perfect market information.

3.4.2 Models based on satisfaction, following Simon

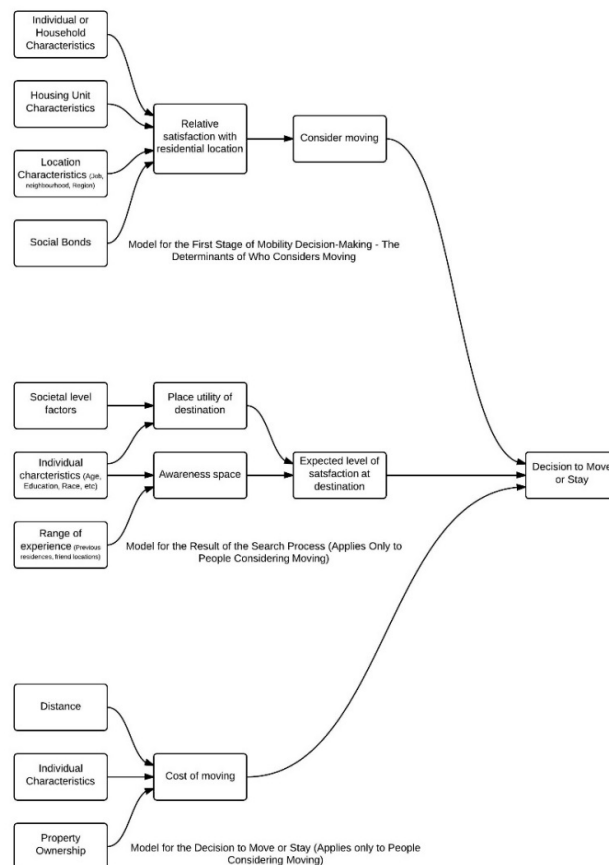
3.4.2.1 Speare, Goldstein and Frey (1975)

Regarding the behavioural approach, particularly bounded theory, the model by Speare, Goldstein and Frey (1975) has played an important role in expressing the importance of behaviours on decision-making while lessening the influence of neo-classical economics. It can be seen as a behavioural search and choice framework. Their model was constructed on the theory of Herbert Simon:

“This work grows out of a conception of human decision making that is perhaps best represented in the work of Simon (1957). Simon views the

individual decision maker as limited in the capacity to formulate and solve problems and to acquire and retain information. To cope with these problems, the individual constructs a simplified model of the situation and acts rationally with respect to that model. Simon suggests that in this simplified model only a subset of the alternatives is perceived and payoffs are evaluated only as satisfactory or unsatisfactory. No action is taken if the current state is judged to be satisfactory. If it is unsatisfactory a search is made for outcomes that are satisfactory and the search is terminated when a satisfactory alternative is found (Simon, 1957:198-201)” (Speare, Goldstein and Frey, 1975, pp. 172-173).

Figure 3.8: A model from Speare, Goldstein and Frey (1975)



Source: Speare, Goldstein and Frey (1975)'s own analysis

The model by Speare, Goldstein and Frey (1975) included three stages: a stage of considering a move, search stage, and stage of calculating the cost of moving.

The implication of the model is to forecast the probability that a household will make the decision whether to move or stay based on consideration of the level of satisfaction in terms of current house, new destination, and the cost of moving. Households' mobility decisions tend to be dominated by behavioural factors.

The strength of this model is that it paid attention to households' satisfaction and dismissed the notion of utility maximisation. In deciding whether to move or not, households' satisfaction with their current house is an important factor. Households decide to move when dissatisfaction reaches a level above their stress threshold. In this model, information plays an important role in limiting the possible alternative opportunities. Meanwhile, this model does not assume that households have perfect market knowledge. The model also considers social and household characteristics, household experience as factors that influence the level of satisfaction in terms of the destination choice, and the role of the search process in decision making is emphasised. Households also make their decision to move or not move based on the calculation of the moving cost.

However, this model has the limitation of simplifying household behaviour. It does not mention the influence of market restrictions, the structure of submarkets, or household preferences and aspirations. It is simply a model to forecast a household's decision to move or stay based on their satisfaction level, without paying attention to their housing choices.

3.4.2.2 Wong (2002)

The model by Wong (2002) applied economic theory to consider the process of decision making to move. After the decision to move, the model used bounded rationality theory to consider the search process.

The model represents the application of the satisficing notion to the housing search process. First, households need to decide to move, then they need to choose new housing units. The model includes the types of decisions linked to standard economic approaches, ranking of housing preferences, and computation ability along with imperfect information. This approach is discussed more explicitly later:

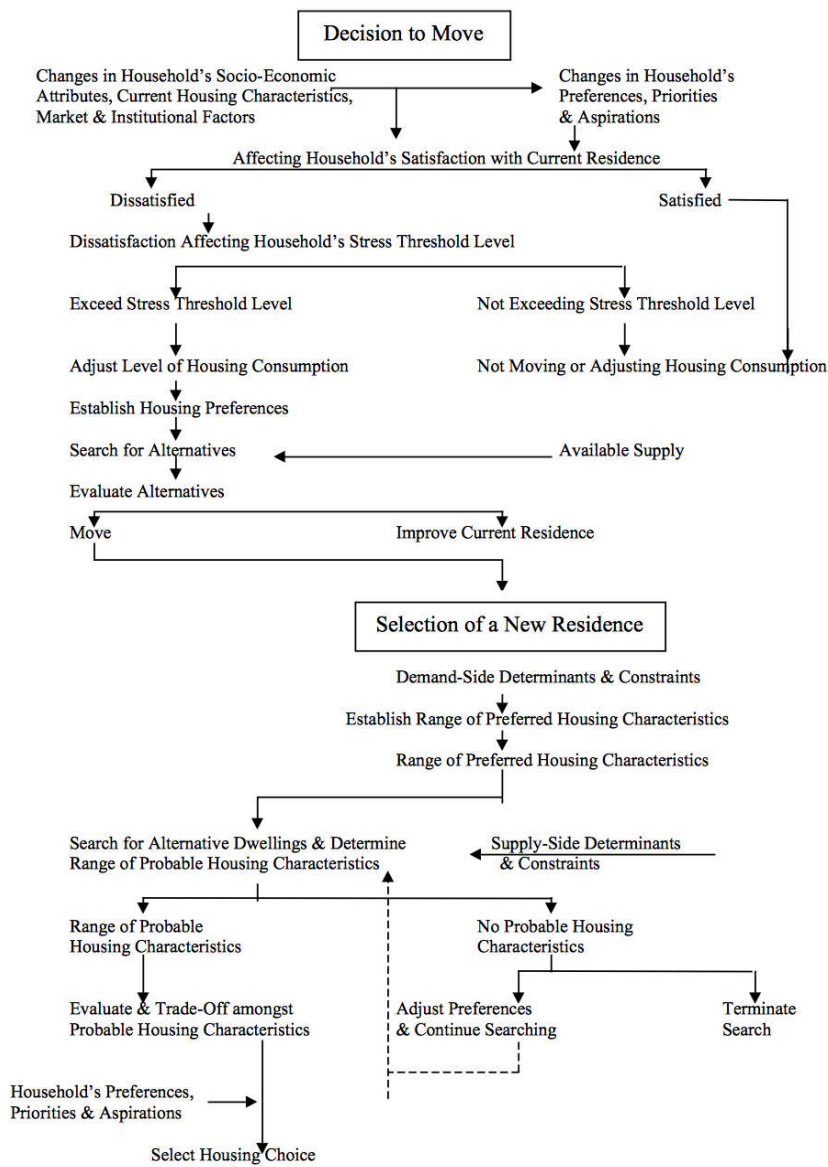
“According to the “utility satisficing model”, the household would first of all establish and rank its housing preferences, followed by a heuristic search for alternatives including moving to a new home and improving the existing residence.” (Wong, 2002, p.225)

Based on this model, households take sequent steps in the process of search and then make decisions:

“the household conducts a heuristic search for alternative dwellings where in the course of the search, supply-side constraints are taken into account in the housing selection process. In view of the available housing supply, the household decides which are the probable housing characteristics and then establishes a range of housing options that are likely to be a reduced version of the range of preferred housing characteristics. From this limited range of probable housing options, the household then proceeds to select the bundle of housing characteristics that best satisfies its housing preferences.” (Wong, 2002, p. 226)

The author made an effort to apply behavioural theory to housing search by embracing the satisficing concept and dismissing the assumption of utility maximisation. The main implications are to model the decision to move and choice of new destinations based on the application of behavioural theory to housing search. Bounded rationality theory was used to consider the search process in relation to the satisficing notion. The strength of the model is its consideration of households' behaviours when they make decisions. It emphasised the levels of household satisfaction, households' preferences and aspirations as well as the process of aspiration adjustment and the influence of market restrictions and constraints. The limitation of the model is that it focuses too much on the demand side and overlooks supply side aspects such as the structure of the market, market dynamics and the influence of demand activity on the structure, as well as the impact of market structure change on the demand side.

Figure 3.9: A model of search and choice from Wong (2002)



Source: Wong (2002)'s own analysis

3.4.3 Old behavioural models based on institutional economics

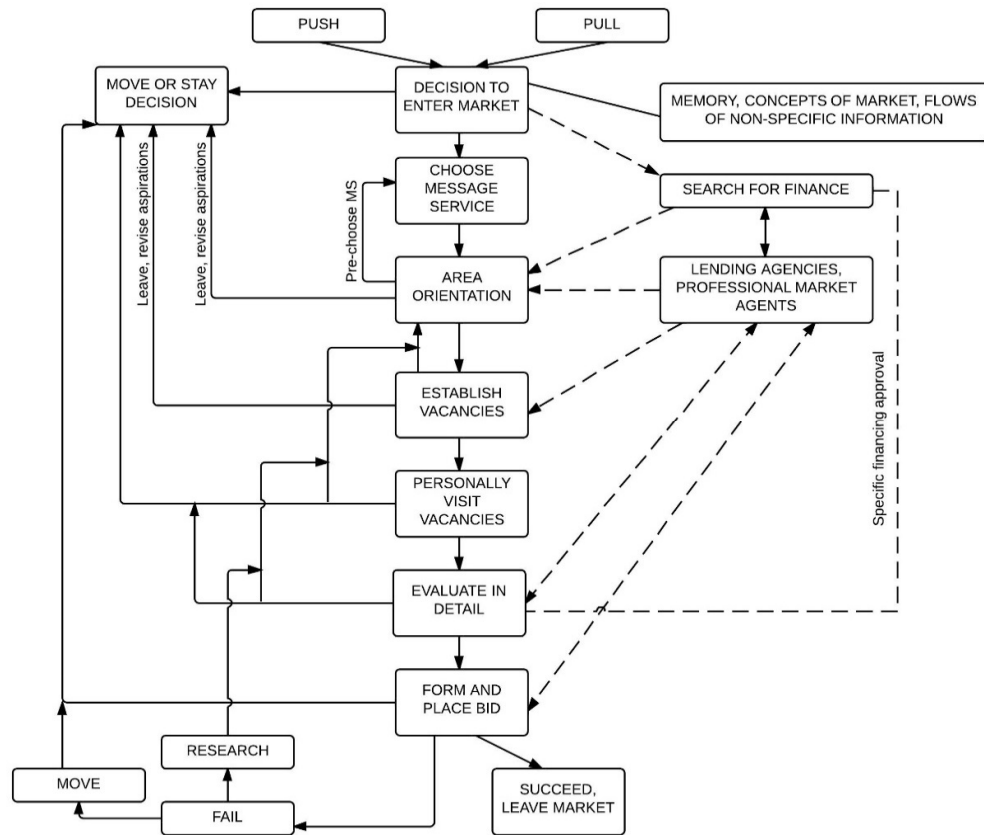
3.4.3.1 MacLennan and Wood (1982)

According to MacLennan and Wood (1982), information channels play an important role in the housing search process. In order to identify housing opportunities, households may need to build their search approach: search by house types, price, tenure, or search by areas and neighbourhood. Search approach can be based on household expectations and preferences shaped by their current market information, their experience, and advice from social groups. When households fail to secure homes in their initial areas of search, they may gradually expand the number of areas they are willing to consider; or they may extend search duration as a means of fulfilling their area preferences. On the other hand, within the market constraints and restrictions, households' expectations may be unrealistic, and thus their search approach may be ineffective. As a result, they may need to revise their aspirations and search strategy. The revision of household expectations and search strategy may reflect the market constraints, and the level of households' information about the housing market, and household behaviours.

The main implication of the model is to take into account the search process under certainty as it expresses the process of adjusting aspirations and preferences based on the information households currently have. The strength of the model is that it sets out the stages of the search process, with information given an important role in each stage. It highlights the importance of search approach, household expectations, market constraints and restrictions, and adjustment of current housing preferences and search strategies. However, the limitation of this model is that it does not mention restrictions relating to limitations of the decision maker's capacity, for example, external limitations including the sources and amount of information. Neither does it

mention the restrictions of time and cost affecting searchers and the likelihood that households may have to take behaviour-based shortcuts to make their choices under such restrictions.

Figure 3.10: A model from Maclennan and Wood (1982)

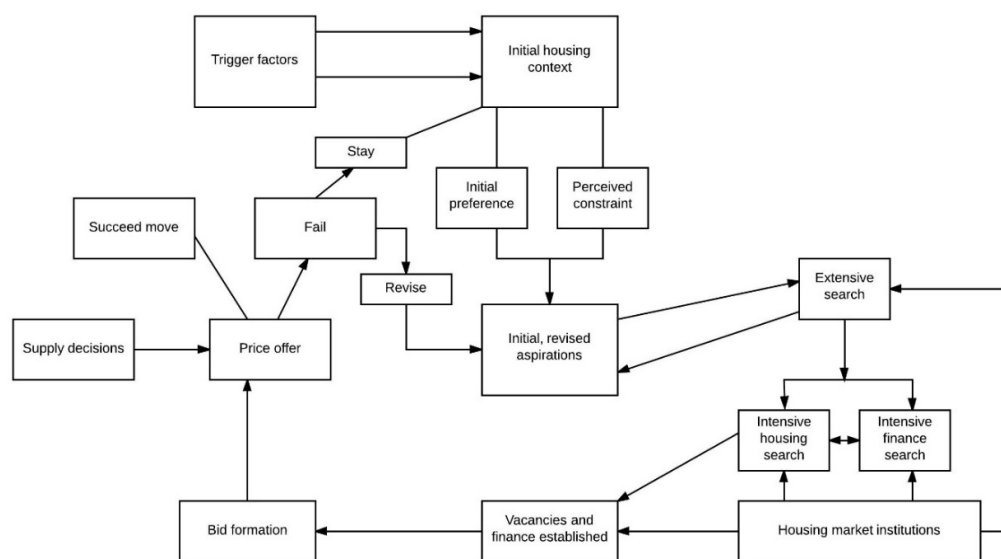


Source: Maclennan and Wood (1982)'s own analysis

3.4.3.2 Maclennan (1982)

Maclennan (1982) provided a framework to include the search process. It acknowledges that the search process is linked to households' aspirations and the process of adjusting aspirations and preferences. Regarding the model, the author stated that it is important to distinguish empirically between extensive search and intensive search.

Figure 3.11: A model including search from Maclennan (1982)



Source: Maclennan (1982)'s own analysis

According to the model, households may remain searching until they find their targets according to their current preferences. This sustained search process may start with initial aspirations and then go on to extensive search, followed by revision of aspirations, continuing to extensive search, etc.

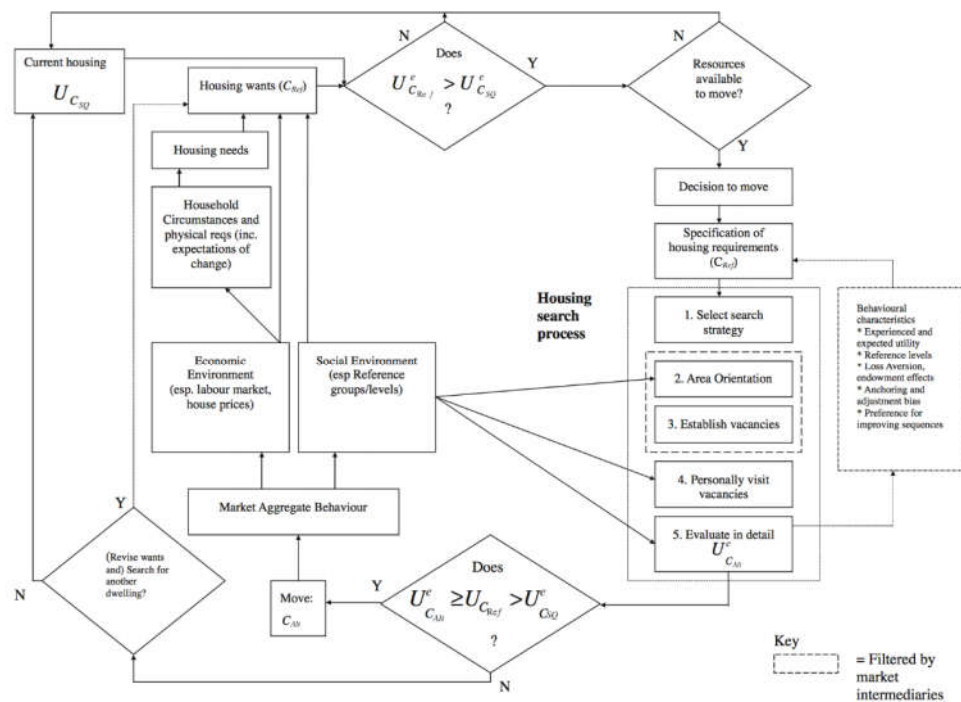
Like the previous model, this model also emphasised the process of housing search by including household preferences, aspirations and market constraints, and restrictions and the extensive search. The important part of this model is the impact of aspiration revision. The implications of this model are similar to those of the previous one with additionally taking into account the process of extensive search. The limitations are also similar to those of the previous model: the restrictions of time and cost affecting searchers and then households' behaviours when making their decision under those restrictions. In addition, the model neglected to look inside the structure of the market as a system of submarkets and market dynamics or to consider the influence of search and migration on the structure of the market system

3.4.3.3 Marsh and Gibb (2011)

According to Marsh and Gibb (2011), the use of mainstream theory to make decisions under uncertainty is not appropriate in the analysis of housing markets as the housing market and the process of search are complex. In addition, Marsh and Gibb (2011) also suggested making more robust behavioural assumptions in terms of household decision-making.

From the framework, the authors divided the search process into several themes: how to search, where to search, searching for properties, house viewing; evaluation, and decision to purchase.

Figure 3.12: An analytical framework from Marsh and Gibb (2011)



Source: Marsh and Gibb (2011) 's own analysis

The main implication of the model is to reject the application of neo-classical economic theory for understanding the housing market, and suggest alternative

approaches for potential research. The model embraced the role of institutional and behavioural economics to help us better understand the process of household mobility. The strength of the model is that it considers the strengths of the models from Maclennan (1982) and extends them to a more appropriate level by, for example, adding in behavioural factors. Marsh and Gibb's model is seen as incorporating behavioural and institutional approaches in a more appropriate manner. They considered household's behaviours and included the impact of micro and macro factors.

The limitation of the model is that it lacks mention of the notion of satisficing, particularly optimal moves and suboptimal moves. According to Clapham (2011), the model would have been more detailed if it had made the role of institutions in the housing market clearer. Further, it has mainly focused on the housing market system as a whole and has not looked inside the structures of the system.

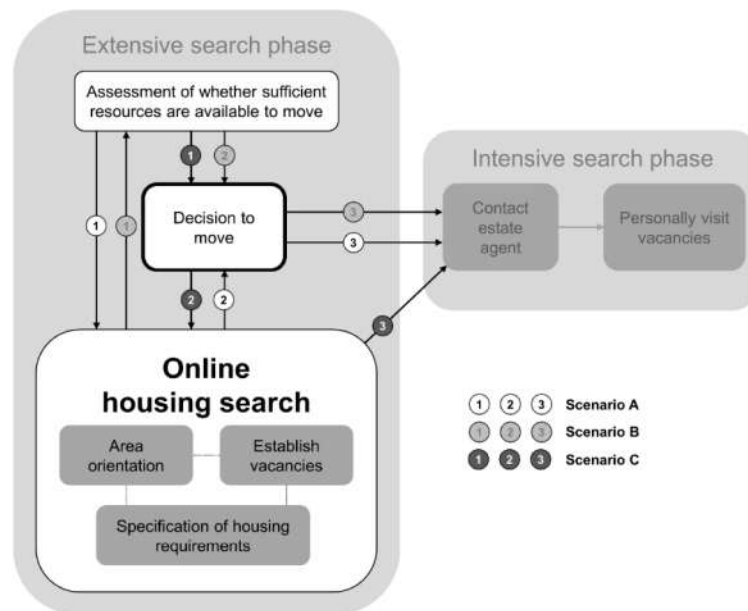
3.4.3.4 Rae (2015a)

Recently there has been a change in the way people search for new houses. Most households use the internet to search and then make their mobility decision. The internet has changed the way households traditionally searched for their new homes. To explore the role of online data in the housing market, Rae (2015a) has developed a conceptual model to analyse online search and produced interesting results in terms of submarkets based on housing search.

The main implication is to stress the importance of search data in the analysis of housing market, particularly the submarkets identified based on structural and spatial characteristics. Rae (2015a) explored the role of 'big data' in understanding the household search behaviours. The strength of the model is to highlight the role of

online search data and suggest a new model of housing search. The framework includes some of the works from Maclennan and Wood (1982), Marsh and Gibb (2011), and provides other important components. The model makes an important contribution in terms of development of a model based on search. However, because the model only focused on search data, the actual outcomes are unknown. It could have been improved by including actual choices from households and house price data for comparison with their search preferences. This would make it possible to explore the notion of satisficing and also the trade-off between search, migration and house price.

Figure 3.13: An analytical framework for online housing search from Rae (2015a)



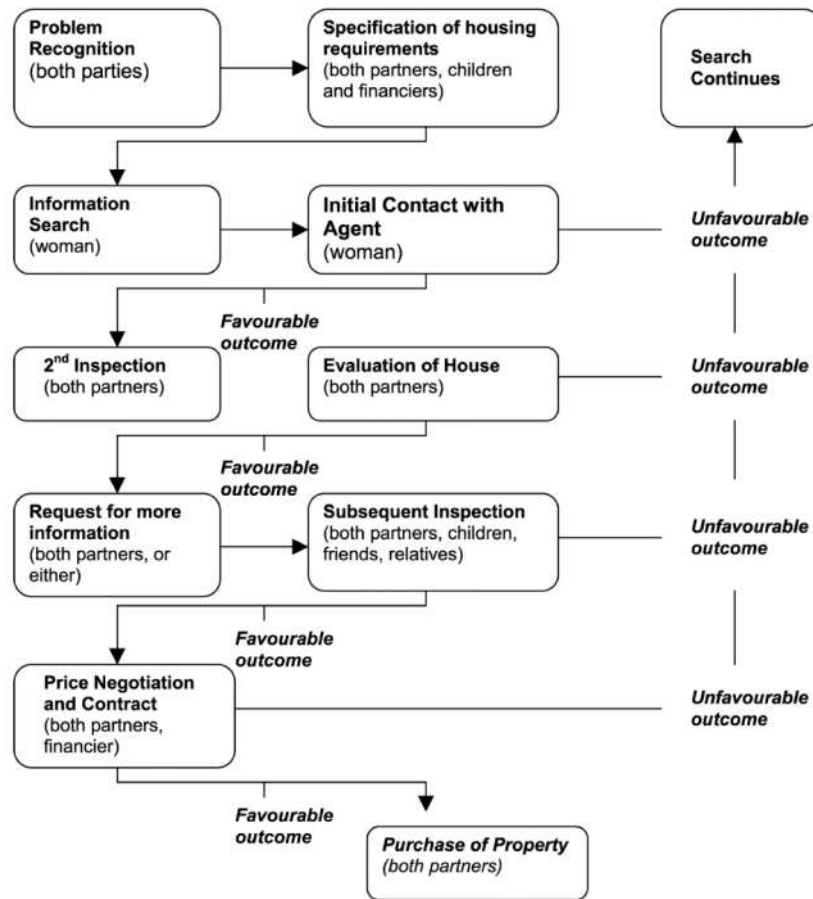
Source: Rae (2015a)'s own analysis

3.4.4 Social cultural model: Levy and Lee (2004)

The choice framework of Levy and Lee (2004) focuses on the process of decision making and divides it into sub levels. They also take into account the influence of individual family members during the search process. The model is based on a four-

stage approach: problem recognition, search, evaluation of alternatives, and final choice. However, product specification was also included as a result of estate agents' suggestion that a further decision stage occurred, in terms of location, price and other factors.

Figure 3.14: A framework from Levy and Lee (2004)



Source: Levy and Lee (2004)'s own analysis

The main implication is to explore the influence of family behaviour on mobility decision based on in-depth interviews with property agents. The strength of this model is to include and expand many contributions of previous research in terms of mobility research. It stressed the importance of different family members and their influence in the process of the decision-making. According to this model, information

gathering is an iterative and deepening process. In the framework, broad specification of requirements is first established, then households seek to gather more specific information. The limitations are that the model was based only on interviews with real estate agents and not on data from families involved in the decision-making process. Further, the model seems to focus mainly on the roles of family members in the mobility decision-making process.

3.5 An analytical framework

This thesis embraces an analytical framework that is based on a heterodox approach with mix of the three dominant schools of thought, namely Neo-classical, Institutional and Behavioural Economics. The housing market is so complicated and fragmented as it includes a system of linked submarkets and housing market areas (Jone et al., 2005) as well as a complicated search process (Rae, 2015a). Therefore, one single theory cannot provide a comprehensive understanding of how the market works. The neo-classical approach views the market as a unitary market and makes the assumptions that don't reflect the reality of the market, especially the search process. The influence of this approach is expressed through the investigation of the housing market outcomes with the assumptions of market equilibrium, rationality, perfect information in terms of price and migration. In contrast, the institutional approach views that the market is considered as an arrangement of inter-connected components and is influenced by institutions in terms of rules, social norms and behaviours. The behavioural approach similarly views that the market is seen as a system of linked components and its market actors make decisions based on behavioural shortcuts, such as the notion of satisficing, when facing market restrictions, for example a lack of information. The influence of these two approaches is expressed clearly through the structure of the market as a system of linked submarkets and HMAs, the process

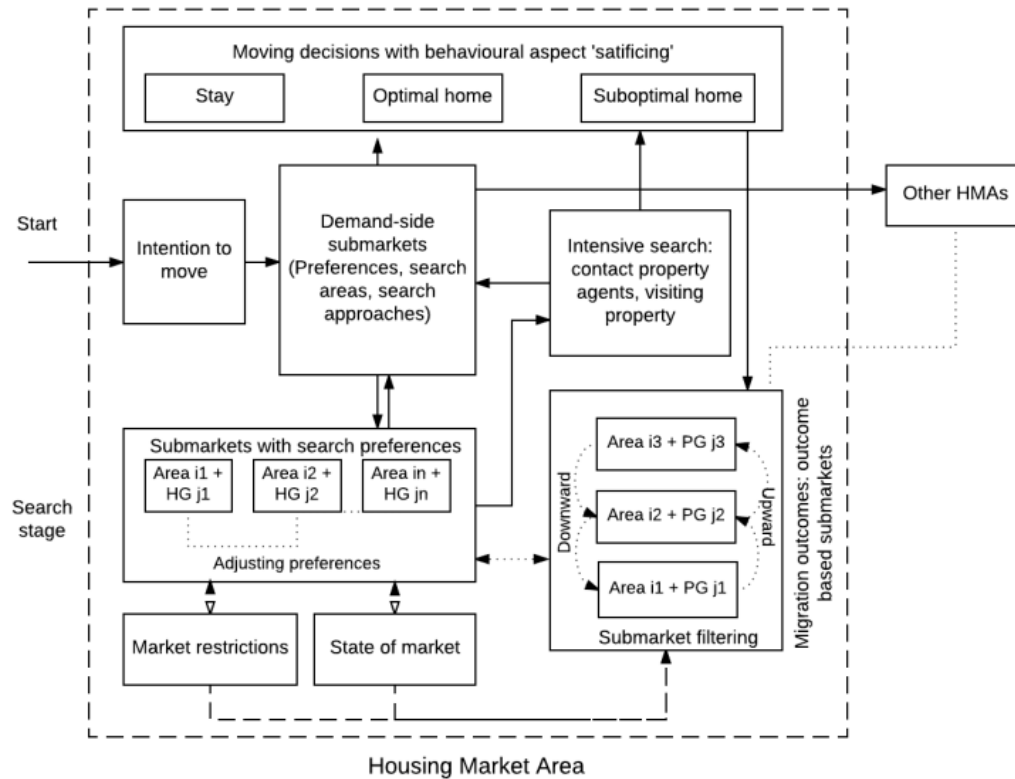
of housing search that involves the adjustment of households' aspirations and preferences, for example searching in school catchment areas or choosing the best available options.

It is argued that many researchers have constructed mobility models in relation to the search process to investigate and understand the process of household mobility as well as household behaviours. They not only have mentioned the process of revising aspirations and preference, the satisfaction and dissatisfaction factors but also have considered the notion of 'satisficing' as well as 'filtering'. Although the models above made an effort to include the role of household behaviours in the analysis, there is still a lack of models reflecting the structures and dynamics of the market system, for example, the links between submarkets within HMAs, the process of household 'filtering, or the influence of search and migration on the structure and dynamics of the market system.

The analytical framework of this thesis in Figure 3.15 advances the previous models in several points. First, this framework is based on the view that a housing market is better seen as a complicated system of linked submarkets and HMAs. In particular, it includes, within a synthesis study, the notion of submarket based on demand and supply side and the notion of HMAs as well as the connection between submarkets and between HMAs. These have not found in the previous models mentioned in this thesis particularly Tu & Goldfinch (1996), Smith et al. (1979), Speare et al. (1975), Wong (2002), Maclennan and Wood (1982), Maclennan (1982), Marsh and Gibb (2011) and Rae (2015a), Levey & Lee (2004). Second, in this framework the role of search is expressed clearly through the notion of submarkets based on search preferences such as area and dwelling characteristics as well as the issue of market restrictions through the relationship between search patterns and migration/price

patterns. This is an important extension of all of the previous models. Third, another advance of this framework is to include the process of market ‘filtering’ to investigate the flows of households moving upward and downward, which hasn’t also reflected in the previous models. Fourth, similar to the works of Speare et al. (1975) and Wong (2002), the framework also seeks to explore the notion of satisficing but makes a difference in terms of the investigation based on search patterns and migration/price patterns.

Figure 3.15 A model of the housing mobility process including the search and filtering processes



Source: the thesis author’s own analysis

The process of household mobility above is presented across six stages: mobility intention, expectation and strategy, search stage, intensive search, decision to move, and migration outcomes and include several influential factors. This mobility

depiction, from left to right, provides a framework to explore the relationships between stages as follows:

3.5.1 Intention to move

This process is associated with search analysis that includes the intention to search for new houses. First, households make the decision to move. A number of researchers have identified factors affecting the decisions of households in this stage. The models from Maclennan and Wood (1982) and Maclennan (1982) highlighted the trigger factors that lead households to move home. These mobility reasons may be related to the strength of mobility intention and are likely influenced by household characteristics, residential dissatisfaction, household expectations, and life events (De Groot et al., 2011). Households may move home because of a number of reasons: dissatisfaction with the neighbourhood or housing accommodation; the influence of life course, or other motivations, such as residential investments. Household characteristics may also reflect the decision to move and include: household income, household age, family composition, and moving history. For example, they may want to move because their income has increased and they demand bigger houses. On the other hand, marriage and job change are considered as the most important events to affect mobility intentions. Further, households may move because of marriage, gaining another family member, etc.

3.5.2 Demand-side submarkets: household aspirations and search strategy

This process is associated with search analysis that includes the establishment of submarkets based on search preferences (demand-side submarkets). Having formed the intention to move, households need to build their strategy based on their home aspirations. This stage was investigated in detail in the model of Marsh and Gibb (2011). Search strategy is seen to relate to household expectations established by the

information levels which households possess, prior experience, and the influence of social groups.

In this step, households decide which areas they would like to live in, their budget range, house type and size, and home quality. According to Marsh and Gibb (2011), households will build their aspirations and preferences in relation to house type and location, based on the information and experience they currently possess. In this stage, households choose housing tenure, and determine in which area and house type they expect to live. Search strategy focuses on information channels, search areas, and search intensity. Different households may choose different information channels: internet, estate agencies, newspapers, or friends and relatives. Since the information exchange process happens infrequently, household aspirations may prove unrealistic, and may be revised. Maclennan (1982) highlighted that households need to go through a process of adjusting their aspirations and expectations under market restrictions and constraints. The adjusting process takes place because the market has a lack of the desired housing units or households may possess imperfect market information. As a result, the market may not have the options to satisfy households' current demand, leading to a change in their preferences and strategy to enable them to find the best options available to them.

3.5.3 Search stage: submarket based on search preferences, market restriction, state of market

This process is associated with search analysis that includes the exploration of submarkets based on search preferences (spatial and structural requirements for searching). This stage is an important part of the search process and was examined by Rae (2015a), Marsh and Gibb (2011) as well as Maclennan and Wood (1982) and Maclennan (1982). Households rely on their search strategy to identify housing

opportunities to purchase. Property information can be obtained from the internet, market agents, or friends and relatives. The search process is subject to the cost of acquiring market information, and the influence of market constraints and restrictions. On the other hand, search intensity relies on the urgency to find a home, the assistance of market agents, fluctuation of house prices, and the flow of housing stock.

Nowadays, most households use the internet to search for housing opportunities and market information (Dunning & Watkins, 2012). Households can quickly search for dwellings and change their search approaches related to location, house type, or house price. Despite the advantages of the internet, search duration tends to depend on the urgency to find a new home. Households with high levels of urgency tend to search actively and intensively within a short searching period.

Surplus demand and vacancy rate tend to affect household aspirations, search approaches, and decision-making. Households may search over multiple areas with a considerable difference in the availability of housing opportunities. Areas with a low number of home searchers tend to be those with low house prices, and more housing opportunities. In contrast, areas with a great number of searches appear to be those with surplus demand and low vacancy rates, such as city centres. These areas tend to become an obstacle to mobility because of high house price, high housing demand, and problems with housing opportunities and affordability (Dieleman, 2001).

In general, household search patterns may be influenced by search strategies, and the market constraints and restrictions. Because the information exchange process happens infrequently, households may not know what housing opportunities are available on the market. Therefore, within the market constraints and restrictions, household expectations and search strategies may be unrealistic, and may have to be

revised to reflect the actual market. Depending on the likelihood of identifying an appropriate alternative dwelling, households may continue searching or revise their aspirations. The revision of household expectations and search strategy may reflect the market constraints, and the level of household information about the housing market, and household behaviours.

In terms of the state of market, this is associated with price analysis to help us understand the market conditions that may influence the search process.

Regarding market restrictions, this is associated with migration, search and price analysis in combination to help us explore the difference between what households searched and what they did actually choose.

3.5.6 Intensive search

The stage of intensive search was stressed in the models of Maclennan (1982) and Rae (2015a). When housing opportunities are identified, households may come to promising vacancies to make their assessment. After viewing, they need to choose whether to buy or continue searching by assessing whether the dwellings meet their expectations in terms of accommodation and neighbourhood. Most households may prefer to live in an area with a good reputation, safety, and close to schools, facilities, services, and transport links and also consider the house's condition, design, and whether there are any long-term and costly defects. If the dwelling satisfies their expectations, they may make a bid or express their purchase interest to the sellers or agents.

When revising their aspirations and strategies after the viewing, they may find that their aspirations cannot be met and therefore may stop searching and postpone their home purchase, or may need to revise their requirements and continue searching. As a

result, the processes of revising aspirations, searching and decision-making may happen simultaneously.

3.5.7 Moving decisions

This process is associated with migration analysis that includes the notion of satisficing. The household mobility decision may be affected by market constraints and restrictions, market information levels, and household aspirations. Because households possess imperfect information, they may rely on their behavioural characteristics to make decisions during the search process (Marsh and Gibb, 2011, p. 218).

In markets with high demand, different households likely need to compete among themselves for expected dwellings. Households may postpone their mobility intentions, or revise their aspirations, if they believe that they are unlikely to find the expected homes. As a result, the final choices in the mobility decision-making process are either optimal or suboptimal homes, or households postpone their moving intentions. The final choices may depend on the level of housing demand, the restrictions on household time, and the level of imperfect information.

3.5.8 Migration outcomes

This stage is associated with migration analysis that explores the filtering process between outcome submarkets. This stage provides a picture of market filtering based on the links between submarkets. Whether households settle in optimal or suboptimal homes, they may move upward to a better neighbourhood with higher house price, or move downward to a lower quality neighbourhood with lower house price, or even move within similar neighbourhoods. The reasons for these movements are various but mainly due to income change and life-course cycle.

In short, the framework above highlights the likelihood that different households will form different submarkets based on their aspirations through the total search process and make their decisions to choose suitable submarkets based on the supply availabilities. The constraints and restrictions in the housing market are likely to cause a mismatch between household preferences and actual available options, leading to three options for the outcomes: staying, moving to the optimal home, moving to a suboptimal home. Also the migration outcomes provide a picture of household filtering from upward movements, downward movements or movements within similar submarkets. There is a likelihood that some households will move quickly from defined aspirations and motivations to visiting opportunities, whilst others may take significant time over the search phase, prior to visiting a dwelling, during which their very aspirations may change. Whilst each household's experience of the housing mobility process will be unique, this framework may provide an overview of the major stages along with some key influential factors in the mobility process, and therefore will provide the possibility to explore the interactions between search, migration and house price.

This framework is slightly different from the previous models discussed earlier. In the framework, the process of housing search engages with adjusting of preferences and aspirations, but not with the assumption that households move from imperfect to perfect market information. The framework considers that households tend to make decisions under uncertainty, which highlights the role of information sources. However, the framework does not assume that households will maximise utility under uncertainty, or have a stopping rule for their decisions.

To apply the behavioural approach, this framework uses the search process and considers the submarkets based on households' preferences, which are subject to

change during the search process. The focus in this study is explicitly to examine the roles of search and migration in the structure and dynamics of the local housing market, particularly as a system of interconnected submarkets within an array of HMAs. It is not concerned with the wider economic environment and therefore does not link the micro and macro-levels of the market. The framework does not suggest that all households explicitly identify their precise housing requirements. The search process is examined on the basis that households seek to find available housing opportunities which may satisfy their aspirations and preferences.

This framework is a simplification, and avoids some of the assumptions in the mainstream approaches. In addition, it suggests that households may move 'backwards' as well as 'forwards' through the mobility stages. The major contribution of this framework is to highlight the interaction of housing search, migration and house price through making links between HMAs, submarkets and the dynamics of the local housing market. Finally, the framework is intended to identify influential factors for the purpose of prediction modelling.

3.6 Conclusion

This chapter reviewed the structure of the market system and the market dynamics. The market system is seen as an arrangement of housing market areas and submarkets which interact and connect in various ways. The connections between the components of the system are considered as system dynamics associated with the process of market filtering, housing search and migration activities. To understand how the system works, it is important to analyse the influence of households' activities regarding searches and movement on changes in the structure of the system.

A wealth of research has supported the importance of identification of housing market areas and submarkets in analysis of the local housing market. While housing market areas can be identified based on travel to work and migration data, submarkets may be defined based on a supply and demand approach. Regarding the supply side, researchers traditionally employed datasets including house price, migration, and transactions to group dwelling units with similar characteristics. These data reflect the choices of households and do not include information about the search process. On the other hand, researchers may analyse search data to explore the submarkets through search patterns alongside information about households' preferences. These search data provide information about excess demand, and when combined with outcome data it is possible to investigate the restrictions of the supply side. Use of such search data could play a vital role in helping us to understand more about households' preferences than is possible if outcome data are employed exclusively.

The dynamics of the system relate to the process of market filtering, housing search and migration. This notion of market filtering relates to the specification of submarkets and provides us with information about the changes in house price and quality when households migrate. The definition of market filtering can be tracked through the work of Grigsby (1963, ch. 2). The Grigsby conceptualisation has laid the foundation for other studies to continue the development of filtering frameworks to understand subjects relating to market segmentation, the motive for mobility, exploring changes in housing prices, or building new houses.

The chapter also discussed the process of housing search. A most important factor in the search process is that households may change their aspirations and preferences during their search. This happens because of households' lack of market information or due to restrictions of the market limiting the supply of their preferred housing

stock. Once realising the restrictions of the market, they need to revise their preferences according to the actual availability. Finding out about changing preferences during the search process is important as it provides information about excess demand and restrictions.

Many researchers have conducted migration studies focusing on outcome data, such as migration data and house price to investigate the stages of household migration: making a decision on whether to move or not; making housing choices in relation to housing tenure, house type, location; household time on market, search intensity, and information acquisition. However, it seems that in considering the housing search researchers have ignored the role of household behaviours for two main reasons: first, researchers have adopted a neo-classical approach to simplify the search process for the purpose of model construction based on a number of assumptions; second, it seems that the number of studies on households' behaviours has been limited by lack of data.

The chapter reviewed a number of analytical models which could potentially influence the framework of this thesis. It seems that methods of modelling the housing market can be grouped into neo-classical, institutional and behavioural approaches. A high volume of studies has been carried out based on the mainstream approach with the assumption of utility or satisfaction maximisation, and perfect information. In reality, these assumptions impose important restrictions, especially regarding households' adjustments of their aspirations and preferences. To cope with these limitations, many studies have developed analytical models to offer an alternative or to improve the traditional approach by providing more reflection of household behaviours. However, less attention has been paid to insights into the market structure, such as market dynamics associated with filtering, search and

migration, and the influence of search and migration on the structure of the market system.

Based on the literature review of housing market structure, market dynamics and housing market models, the thesis proposes an analytical framework designed for its own purposes. This framework is based on a system approach with an interdisciplinary perspective based on Neo-classical, Institutional and Behavioural Economics. The housing market is seen as a complicated system of linked submarkets and HMAs in which the dynamics are associated with the process of market filtering, housing search and migration outcomes under the influence of constraints and restrictions as well as the impact of house price change. The dynamics could be reflected by exploring the interactions between submarkets and HMAs based on the changes in house price and market activity. Based on this framework, this study intends to highlight the role of search and migration as the drivers of changes in the structure of the housing market system.

Chapter Four: Research design

4.1 Introduction

Chapter two showed that each of the schools of thought has a slightly different emphasis that reflects their various economic philosophical stances. The thesis argued that the neo-classical approach alone is inappropriate for application to investigation of the housing market and needs to be supplemented by institutional and behavioural perspectives. These two approaches consider the institutional and cultural context of household behaviours, especially the attitudes and motivations as well the processes, timing and behaviours. Chapter three reviewed the structure of a housing market system, system dynamics, and a number of housing market models. From this review, the need emerged to consider a housing market as a system of linked HMAs and submarkets and gain more insights into the structure of the market system and how activities from the demand side such as housing search and migration influence that structure. For the purpose of this study, a theoretical framework was developed in chapter three based on a system approach and applying a blend of neo-classical, institutional and behavioural economics. Before beginning the analysis of search and migration, it is important to have a research design.

This chapter first repeats the aims and questions of the thesis. Second, the study area is specified. Next, the data sources are outlined and the method for analysing house price, housing search and migration is described. Finally, the conclusion is presented.

4.2 Research aims and objectives

The aim was to explore the role that migration and search can play in shaping the structures and dynamics of a local housing market system and explore the potential to construct a model based on search and migration indicators for predicting the flows and impacts of migration and search in future. It has tried to fill the gap in the literature relating to the links between submarkets, search behaviour during housing search processes, and the relationships between search, migration activity and house price.

This aims were fulfilled by addressing the following objectives:

1. To develop a conceptual framework to explore the role of migration and search in the dynamics of a market system
2. To explore the role of migration data in understanding the structure and dynamics of a market system by examining the links between HMAs and the interconnections between submarkets.
3. To explore the role of search data in understanding the structure and dynamics of a market system by examining the submarkets based on households' preferences and the mismatch between demand and supply.
4. To examine the possibility of using search and migration data to develop an analytical model for predicting the flows and impacts of migration and search in future.

4.3 Study area

Greater Manchester was chosen as a case study to explore the role of search and migration in understanding the dynamics of a market system. The analysis is based on a market systems approach built upon an inter-disciplinary framework. The study only considers the owner-occupied housing market and therefore deviates from the system approach proposed by O'Sullivan et al. (2004). The time periods for migration, house price data and search data were different; in particular, the time period was from 2010 to 2011 for migration analysis and house price, and 2013 for search analysis. To investigate migration, house price and search in combination, the study assumes that migration and price patterns in 2013 were similar to those in 2011.

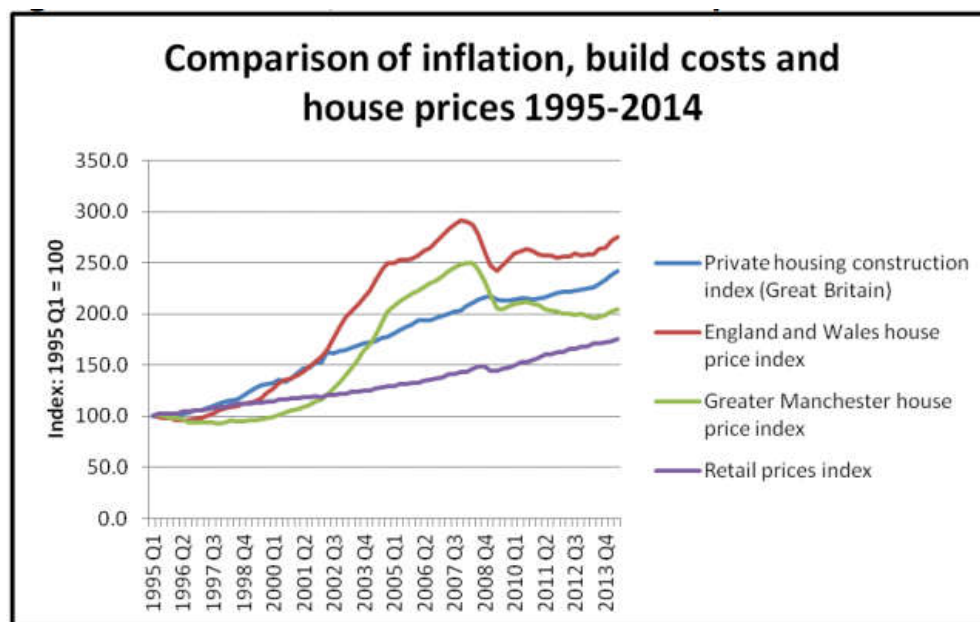
4.3.1 Why Greater Manchester?

This thesis takes Greater Manchester as a study area because of its market size. According to The Office for National Statistics (2005), it is the third most populous urban area in England after Greater London and West Midlands. Outside London, all other urban areas have smaller market sizes, except for West Midlands. In addition to the large size of its housing market, Greater Manchester is considered as a geographical and political centre of the north of England with influence comparable to London in the south (Financial Times, 2015). Moreover, it is polycentric, having ten metropolitan districts and a central district, and is seen as the most complex urban area outside London.

It is argued that as each housing market differs in size and geography there is no such thing as a 'typical' housing market. For example, London may be composed of a number of submarkets associated with a range of trends that distinguish the London housing market from other markets in England. The differences can be reflected in

market size, in-migration and house price change. In contrast, Greater Manchester can be seen as a good example to present wider trends in housing economics in England. As can be seen in the figure below, the trend of house price in Greater Manchester followed the trend of the national market.

Figure 4.1: Inflation, build costs and house prices



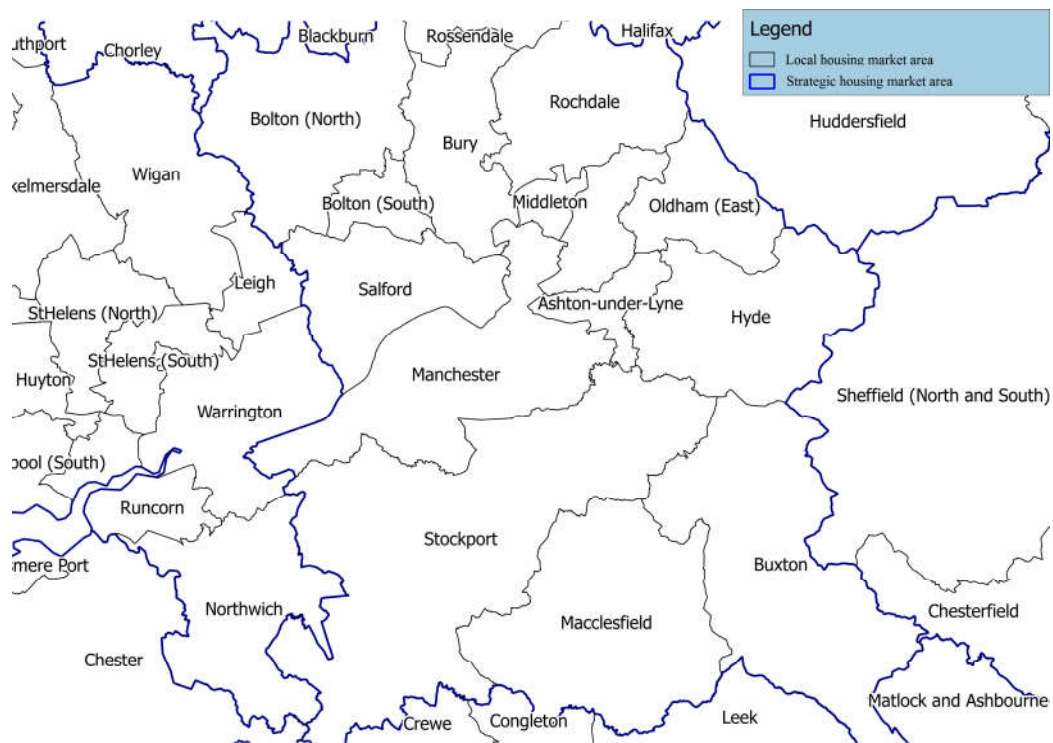
Source: The own analysis of Department for Business and Skills/H M Land Registry

Another reason to take Greater Manchester as a case study is the availability of search data for this metropolitan area from Rightmove. This advantage together with the availability of migration data from Census 2011 and house price data from Land Registry has opened up an opportunity to explore the role of migration data and search data in understanding the dynamics of the housing market system as well as to assess the potential to use both migration and search data to develop a predictive model for future market activity.

A housing market system is composed of a number of linked HMAs and submarkets. HMAs were identified in the Strategic Housing Market Assessments. In Greater

Manchester there may be four housing market areas, namely North West (Wigan, Bolton, Salford, Bury), South (Trafford, Stockport, Manchester South), Centre (Manchester central), North East (Rochdale, Oldham, Tameside), based on the Greater Manchester SHMA published in 2008 and updated in 2010. However, to improve the analysis, it is important to divide the Greater Manchester system into a larger number of HMAs. Therefore, this study used the HMAs for Greater Manchester from the study conducted by The National Housing and Planning Advice Unit (NHPAU) in 2010 which constructed the geography of HMAs in the UK. The HMA boundaries included three tiers with the boundaries as mapped in Figure 4.2 below.

Figure 4.2: Housing market areas by NHPAU in 2010

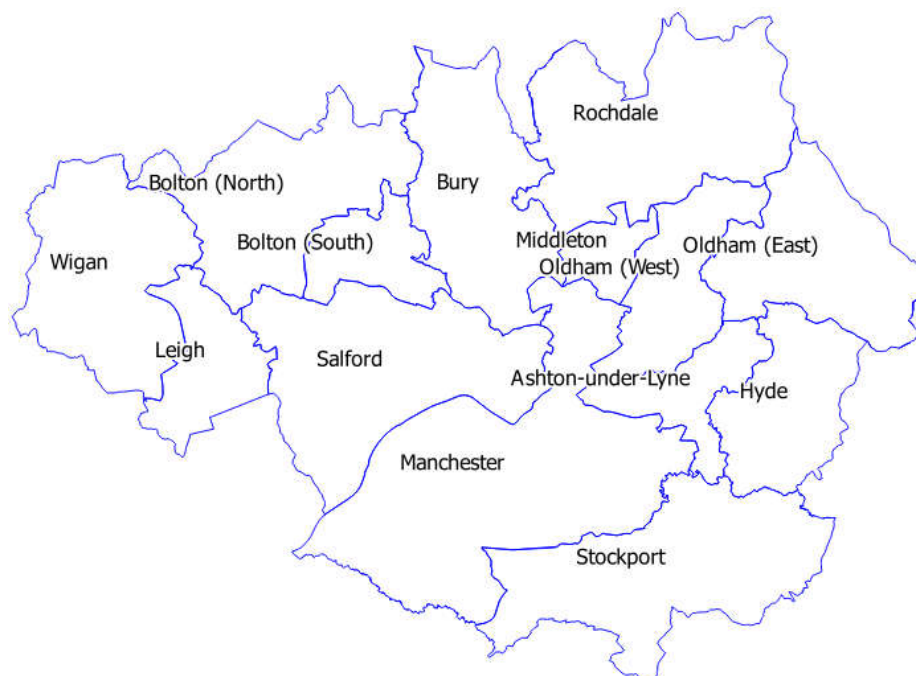


Source: the own analysis of Jones et al.,(2010)

When combined with the administrative boundaries of Greater Manchester, 14 housing market areas within Greater Manchester can be identified as in Figure 4.3.

This is considered a reasonable number for analysis of a GM system as a number of HMAs and submarkets. Within these HMAs, there is a range of submarkets which may include the boundaries of 10 boroughs and small towns. The market size of Greater Manchester seems to be suitable for the analysis.

Figure 4.3: HMAs for Greater Manchester



Source: the thesis author's own analysis

4.3.2 An outline of Greater Manchester




Greater Manchester is one of the biggest metropolitans in England, with population of 2.8 million. It includes a number of boroughs: Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford, Wigan, Manchester and Salford. Greater Manchester has borders with Cheshire, Derbyshire, West Yorkshire, Lancashire and Merseyside. Most of the land in Greater Manchester is urban, with Manchester city centre and the surrounding areas of Salford and Trafford as its central districts. Otherwise, the area is polycentric and has ten metropolitan districts. Each district has its own major centre








and outlying suburbs. The system of central business district, major towns and smaller towns makes this metropolitan area the most complex outside London.

Greater Manchester is well-known as a centre of business, finance, retail and administration. It has an advanced transportation system including light rail, roads and motorway, and canals. With the tied links based on political and economic factors, Manchester city centre and neighbouring Salford and Trafford have become important metropolitan-level centres in England, and are seen as central business districts and thriving economic centres of the region.

To the south of Greater Manchester, Stockport and Trafford and the southern neighbourhoods of Manchester such as Didsbury and Chorlton, Fallowfield and Withington have become attractive or desirable places to live. This is because they offer large suburban housing areas and plentiful green space as well as strong public transport networks and road connections. As a result of being the most preferred areas, these areas are in need of new housing development as demand is high relative to supply.

Figure 4.4 Administrative areas in Greater Manchester

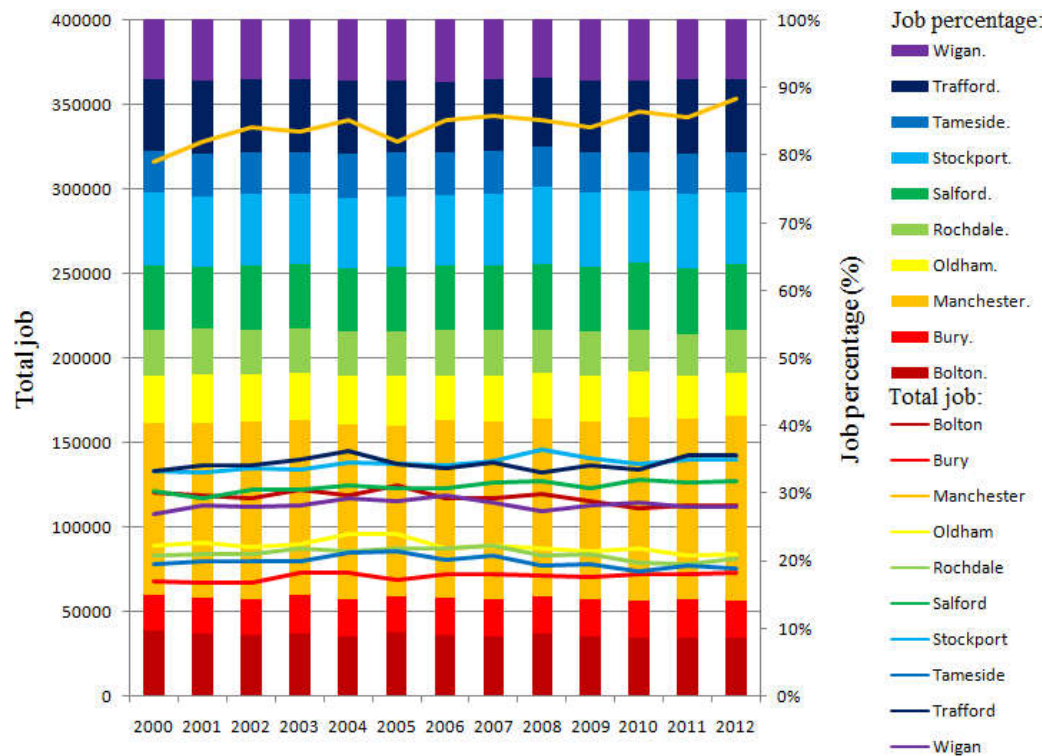
Area	Map	Sub-areas
Bury		Prestwich, Radcliffe, Ramsbottom, Tottington, Whitefield
Bolton		Blackrod, Farnworth, Horwich, Kearsley, Little Lever, South Turton, Westhoughton
Manchester		Blackley, Cheetham Hill, Chorlton-cum-Hardy, Didsbury, Ringway, Withington, Wythenshawe

Oldham		Chadderton, Shaw and Crompton, Failsworth, Lees, Royton, Saddleworth
Rochdale		Heywood, Littleborough, Middleton, Milnrow, Newhey, Wardle
Salford		Eccles, Clifton, Little Hulton, Walkden, Worsley, Salford, Irlam, Pendlebury, Cadishead, Patricroft, Monton
Stockport		Bramhall, Bredbury, Cheadle, Gatley, Hazel Grove, Marple, RomileyWoodley
Tameside		Audenshaw, Denton, Droylsden, Dukinfield, Hyde, Longdendale, Mossley, Stalybridge
Trafford		Altrincham, Bowdon, Hale, Sale, Urmston
Wigan		Abram, Ashton-in-Makerfield, Aspull, Astley, Atherton, Bryn, Golborne, Higher End, Hindley, Ince-in-Makerfield, Leigh, Orrell, Shevington, Standish, Tyldesley, Winstanley

Source: the thesis author's own analysis

Over the 13 year period, the central area of Greater Manchester appeared to have the highest numbers of jobs, more than double compared to any other district. According to Figure 4.5, Trafford, Bolton, Salford, Stockport, and Wigan were in the medium group, while Bury, Rochdale, Tameside and Oldham were in the lowest group. The total numbers of jobs in most districts seemed to remain relatively stable, except for in Manchester, where there was a gradual increase in the total numbers of jobs. On the other hand, Greater Manchester experienced extraordinary changes in its population and job opportunities, especially in Manchester.

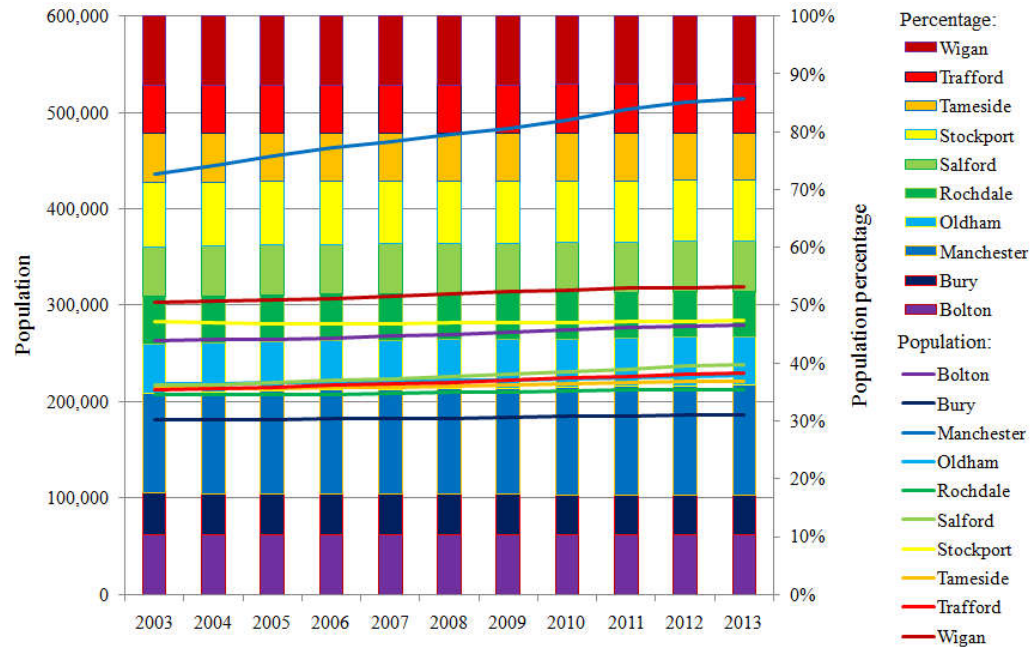
Figure 4.5: the total number/percentage of jobs in ten districts in Greater Manchester (Census 2011)



Source: the thesis author's own analysis

As can be seen in Figure 4.6, Manchester witnessed its highest population increase from 2000 to 2012. It has been argued that in wealthy areas such as Manchester, the high rate of population increase is due to migration flow from declining areas. This has led to significant changes that have caused issues in the Greater Manchester housing market, especially for those areas with a lack of quality housing stock.

Figure 4.6: Population and percentage in Greater Manchester from 2000 to 2013
(Census 2011)



Source: the thesis author's own analysis

It is argued that household population and the job market are the most important factors associated with the housing market. An imbalance in job opportunities and population between Manchester and other areas has influenced the housing market which affects significantly demand for dwelling units. Greater Manchester has witnessed high levels of migration in recent years, and an especially significant influx of economic migrants. The growing population is significantly boosting the demand for housing. As a result, while demand for housing is increasing, imbalance is emerging between areas, particularly in relation to the high demand in city and town centres. An increase in demand together with a relatively constant level of housing supply has put pressure on the housing market, particularly the supply side. Therefore, the rapid growth in population has tended to distort the demand patterns in those submarkets with a lack of quality stock. When this happens, it raises the

question of whether enough quality homes are being provided for the growing population in the various districts. With a lack of quality housing stock, households may be unable to find their preferred home, as a result, they may either choose a suboptimal home, or live far from their workplace. This situation is unstable as households may move home in future due to their neighbourhood dissatisfaction.

4.3.3 Greater Manchester Spatial Framework

To achieve the inclusive growth, it is important for Greater Manchester to focus on the spatial planning (Joseph Rowntree Foundation, 2017). The spatial framework is introduced with a new approach based on a social entrepreneurialism to deal with the imbalance between disadvantage and advantage areas and to boost the performance for the whole metropolitan regarding economic growth and sustainability (Joseph Rowntree Foundation, 2017). Based on its new strategy and program, much attention will be paid to the performance of the City Centre as the central hub in terms of business and job creation in the north of the UK, and also enhancing the role of main town centres in the metropolitan (AGMA, 2016). This framework will make sure the metropolitan as a whole will become a better place for business activities and new developments in housing as well as job creation through its key strategies for transport system, new home construction and improving facilities and services (AGMA, 2016).

The spatial framework focuses significantly on the role of transport system to improve access to other major cities via train and motorway network and access to other parts of the metropolitan through public transport and highway system (AGMA, 2016). Further, it pays attention to improving the quality of neighbourhoods through dealing with environmental issues, creating public spaces and providing supporting facilities and services (AGMA, 2016).

In terms of housing, it plans to build around 227,000 new dwelling units across the whole metropolitan for the next 20 years to meet a growing demand due to a significant increase in population (AGMA, 2016). It is crucial to consider not only the delivery of correct housing type, size, tenure in the right locations but also the issue of price affordability in order to make sure all types of demand are met (AGMA, 2016). To achieve this, it is necessary to pay attention to household preferences on one hand and to have an effective way to identify areas with housing problems on the other hand. In this context, the systems approach in this thesis may be of use to policy-makers, planners and analysts.

Table 4.7 the estimated requirement of new housing development

District	Total Requirement	Average Annual Requirement	Houses (%)	Apartments (%)
Bolton	16,800	840	85	15
Bury	12,500	625	85	15
Manchester	55,300	2,765	15	85
Oldham	13,700	685	85	15
Rochdale	15,500	775	90	10
Salford	34,900	1,745	30	70
Stockport	19,300	965	75	25
Tameside	13,600	680	80	20
Trafford	23,100	1,155	60	40
Wigan	22,500	1,125	90	10
Total for GM	227,200	11,360	55.60	40.45

Source: the own analysis of AGMA (2016)

In general, the main focus of the spatial planning framework is the new planning model to better intervene the market based on a set of effective policies. This new model is directly associated with the role of the Association of Greater Manchester Authorities (AGMA) and is based on a social entrepreneurialism (Joseph Rowntree Foundation, 2017). To build a large number of new houses, it is important to allocate sufficient land resource from the green belt with the necessary supporting

infrastructure. This requires the AGMA with its new powers gained from the process of transferring more powers from the central government to the local authority to make the planning system work more effectively. This will help it deal with housing problems through implementing planning strategies and interventions smoothly and co-ordinately between its involved authorities.

4.3.4 The Association of Greater Manchester Authorities and the controversies

The new model to planning in Greater Manchester is originally associated with the abolishment of the Greater Manchester Council in 1986 and the establishment of the Greater Manchester Combine Authority (GMCA) after that. Before the abolishment of Greater Manchester Council, there were the strong controversies among political leaders that whether the local authorities such as Greater Manchester Council (GMC) should work independently and minimise the influence of the central government (Ward et al., 2015). There is still a question whether to increase the role of the local authorities through the process of transferring more powers from the central government to the local authorities. The central government considered the models of combined authority as unsuitable and old-fashioned and worried about the noncooperation from local political leaders (Ward et al., 2015). However, the situation had gradually changed when the Association of Greater Manchester Authorities (AGMA) was established in Greater Manchester representing for the cooperation of ten local authorities (Ward et al., 2015).

The Greater Manchester County Council was abolished in 1986 and replaced by the AGMA to bring together the ten local authorities of Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford and Wigan into a combined authority. This is the first one of its kind in the UK to develop and implements a set of policies and strategies smoothly and cooperatively for each area

in the whole metropolitan regarding transport, planning, housing, and economic development for Greater Manchester (Deas, 2014; Ward et al., 2015).

As a result, Greater Manchester has been admired for its new role and position which sometimes known as the term “Manchester miracle” associated with the pioneering projects such as city branding, urban entrepreneurialism, and the development of models of territorial governance (see Harding et al, 2010). What is more, it also made various interventions associated with urban renewal initiatives and how to reduce the gap between deprived and less-deprived neighbourhoods in Greater Manchester (Harding et al, 2010). The success of the AGMA in Greater Manchester, especially a history of local authorities working well together and the Manchester miracle, has contributed to the devolution through the 2014 Devolution Agreement.

4.3.5 Devolution Manchester

The imbalance between region economies in the UK, especially the southern and northern cities, exists for a long period of time and requires a strategy to rebalance the performance of these regions in terms of productivity and growth (Haughton et al., 2016). To deal with this, the concept of devolution is introduced to transfer powers from the central government to the city-regions in the north of England, known as the term “Northern Powerhouse” and Greater Manchester is seen as a pioneer in this new model with the role of the AGMA (Haughton et al., 2016). An important event happened in 2014 when the central government has agreed to transfer more powers to the Greater Manchester Combined Authority regarding several key themes: transport, housing, planning and policy (Haughton et al., 2016). The devolution process to the Northern Powerhouse, particularly to Greater Manchester, is known “Devo Manc”. As a result, the AGMA will have new powers not only to effectively improve existing transport system and build new ones but also to focus on regeneration and

development, supporting local business and having more control of the process of allocating land resource (AGMA, 2016). Importantly it will have funding for building new housing projects to meet a growing demand for over ten years (AGMA, 2016). In general, with more power into the hands of local decision-makers, the AGMA can have a better set of strategies and policies to intervene the economy in general and the housing market in particular.

4.3.6 Previous financial crisis

In this thesis, the impact of the previous financial crisis is not included in the analysis and this is admittedly an important shortcoming of the study. However, it is necessary to highlight the impact of this crisis on Greater Manchester here.

Greater Manchester experienced the previous financial crisis starting from the middle of 2007 to the middle of 2010 with a severe consequence (Harding et al., 2010). It became clear when the crash of housing market in line with a fall in building new houses happened in the last several months of 2008. The impact on the housing market was really dramatic, particularly a drop in house prices by 10% in 2008 and continued to decline in 2009, in some areas with 25%–30% for flat (Harding et al., 2010). Together with the impact on house price, the number of sold dwelling units was declined significantly (75% from the boom in 2006–2007) (Harding et al., 2010). As the result of the lack of housing demand and the financial problems, Greater Manchester witnessed an increase in mortgage foreclosures, forced sales and the discontinuation of lending activity as well as the impossibility for many developers to complete the construction to sell new dwelling units. The situation had started to change in the last several months of 2010 with some positive signals from the indicators of unemployment and job opportunities (Harding et al., 2010). The recovery of Greater Manchester after the crisis was associated with the role of Greater

Manchester Combined Authority (GMCA) which has officially established in 2011 with the main focus on economic development and transport system (Ward et al., 2015).

4.4 A GIS-based visual approach

The research is based on a statistical foundation with the use of SPSS and QGIS, ArcGIS. The study is mainly based on the visual analysis of maps. These maps are produced from the use of QGIS an ArcGIS, which is a geographic information system application that allows us to view, edit or analyse data. This software is similar to other GIS soft-wares and provides us with the platform to create maps. Maps can be produced as layers, in raster or vector format, and with features such as points, lines, or polygons.

4.4.1 Principles of GIS

GIS is known fully as Geographic Information System. It is designed to handle geographic data and provides tools for data integration, spatial analysis, and collaboration. With GIS applications, it is easier for researchers to integrate all the factors which influence decision making. GIS also provides geospatial visualisation to enhance the data analysis and is used to create a series of visual maps for either analysis or illustration during the data analysis (Longley, 2005).

With GIS, binary digits are used to represent phenomena with useful information as a combination of 0s and 1s. GIS is a powerful tool for the tasks highly associated with spatial and time factors as well as a wide range of variables' characteristics. Attributes can be defined as nominal, ordinal, interval, ratio, and cyclic. To work with GIS, geographic data can often be displayed as points, lines, or areas. Each of these objects can be attached with its own attributes for the analysis purpose. Based on

objects' attributes, it is possible to process tasks such as filtering, grouping, mapping, spatial analysis, distance analysis, overlaying (Longley, 2005). Moreover, with GIS, attributes and geometries can be imported and exported from/to other soft-wares such as Excel or CAD. Another advantage feature is the possibility of connecting with web data services that provide a source of spatial data, maps from other parties. In short, with a great number of analysis tools, GIS has strengthened the power of visual methods that help researchers and analysts deal with complicated datasets.

Human behaviour is spatially often a reflection of past patterns of behaviour (Longley, 2005). In application of GIS, it is important to understand the concept of temporal and spatial autocorrelation. Temporal autocorrelation can be used to identify connections between consecutive events in time, given that present and future events are sequentially connected to past events. On the other hand, to identify the relationship between consecutive events both in time and space, spatial autocorrelation can be used. Temporal autocorrelation has some similarities with spatial autocorrelation. With time aspects, the relationship between consecutive events is in one direction only. However, when dealing with time and space simultaneously, the relationship between spatial events needs to be considered in two dimensions. In general, analysis in time needs to consider only the past, but analysis in both time and space must take into account all directions simultaneously (Longley, 2005).

The analysis of spatial autocorrelation is based on the degree and nature of spatial heterogeneity (Longley, 2005). It is argued that the correlation associated with space is significant when there is the similarity of objects' attributes with similar locations. In contrast, with negative spatial autocorrelation, objects with close spatial distance are more likely to have dissimilar attributes than objects with far distance. On the

other hand, in the case of zero autocorrelation, objects have attributes that are independent of location. In general, Longley (2005) described spatial autocorrelation as follows:

“ Spatial autocorrelation measures tell us about the interrelatedness of phenomena across space one attribute at a time. Its measurement is key to formalising and understanding many geographic problems, and it is central to locational analysis in Geographic. Another important facet to the nature of geographic data is the tendency for relationships to exist between different phenomena at the same place – between the values of two or more different fields, between two or more attributes of a set of discrete objects, or between the attributes of overlapping discrete objects. The interrelatedness of the various properties of a location is an important aspect of the nature of geographic data and is key to understanding how the world works. But it is also a property that defies conventional statistical analysis, since most such methods assume zero spatial autocorrelation of sampled observations – in direct contradiction to Tobler’s Law.” (117)

To best apply this GIS-based visual approach, a number of guiding principles should be applied based on the work of Rae (2011): expansive inclusion, iterative loss, simplicity from complexity, and optimal compromise.

1. Expansive inclusion: the study will include the full original dataset to create the best result from the spatial analysis. During the analysis process, the study may remove some data to achieve best fit with the whole analysis result.

2. Iterative loss: the study employs a GIS approach to analyse the dataset spatially through a number of repetitively experimental stages. Important objects are made visible while some unimportant objects are eliminated.
3. Simplicity from complexity: the study will create simplicity from complexity for the spatial analysis. This practice relies on skill in handling the complexity of the spatial datasets.
4. Optimal compromise: the process of spatial analysis is based on the principle of 'optimal compromise'. The study tries to make maximum use of visual maps while at the same time minimising the impact of non-displayed objects.

4.4.2 The use of GIS

The use of GIS is associated with working with different maps at the same time, for example, a base map and other data layers with the same coordinate system. Based on these layers of information, data analysis is undertaken based on the statistical and analytical tools in GIS software to produce visual maps. These maps provide patterns and trends to help us understand and solve our problems or questions. In general, GIS is used in several common areas:

4.4.2.1 Creating visual maps

Data mapping is the most important function of GIS and creates a visual representation of information. This function of GIS allows us to store information in a database and provide an effective way of interpreting such data through visual maps. Through these visual maps, it is possible to understand spatial patterns and relationships (see Rae, 2014; Rae, 2015c or Rae, 2011 for example). In the housing market, GIS can be used to identify the patterns of house price, house types or sizes and price changes to help us in making decisions related to housing planning (Rae,

2015a; Pryce and Evans, 2007). It is also used to identify patterns of residential mobility in order to review policies relating to migration (Ferrari and Rae, 2013).

4.4.2.2 Proximity analysis

Proximity analysis is a process of calculating and analysing distance to identify the connections between locations or areas spatially (Luc et al. 2006). This is popularly used by commercial businesses, such as high street retailers, commercial banks or commercial service providers, to assess or find potential business locations (Longley, 2005). This analysis takes into account factors capturing social and economic demographics and the influence of various important locations. In general, this function of GIS is often used to answer questions related to distance between locations, distance from a specific location to a set of other locations, distance of a specific location to other locations associated with time or cost, or distance from a specific location to the nearest area (Longley, 2005). To enhance the effectiveness of proximity analysis, a “buffering” function can be used to identify the influential area of a given location. With this function, it is possible to draw a zone around a given location or area based on a specified distance as a useful method of spatial overlay analysis. Distance analysis is also used to find the nearest location to a set of locations or areas (see Goodchild et al. 1992).

4.4.2.3 Grouping analysis

GIS provides a set of tools to help us group locations, areas based on specified requirements. It is possible to identify clustering patterns based on distance criteria (connectivity), the mean value of the cluster, statistical distribution, specific density, and other specific attributes (see Luc et al. 2006).

4.4.2.4 Overlaying maps

This is a basic technique in GIS for overlaying additional data layers onto the existing layers. For example, layers of points can be put onto layers of areas. This overlay analysis takes into account many different factors. For example, in the housing market, this technique can be employed to identify the locations of new-built housing projects based on land cost, distance to existing services, existing housing stocks, the patterns of house price, price change and other factors. With overlay analysis, it is possible simultaneously to create connections among all considered factors (Luc et al., 2006). Through these connections, desirable locations are identified based on the specified criteria. This feature plays an important role in the housing studies (see Wong et al, 2015).

4.4.2.5 Location analysis

Location analysis is employed to assess and find optimal locations that meet specified criteria. This field of application is widely used by commercial organisations to explore, model, evaluate, investigate, and understand their local markets through assessing factors such as sales, costs, profit drivers, and customer characteristics, or other relevant factors (Goodchild et al. 1992). The analysis is also associated with assessment of retail performance, for example, identifying where and why stock is turning over quickly and this might lead to out-of-stock events, or analysing the performance of competitors (Anselin and Getis, 1992).

4.4.3 A geospatial approach to analysing the housing market

The use of GIS in spatial analysis has become increasingly common due to the availability of census datasets and other rich datasets, for example, from commuting and migration data sources (see Rae, 2011 for more information). In the housing

market field, the GIS approach has previously been used to provide representation of spatial interaction data in the analysis of deprivation, house price differentials, and identifying submarkets, housing markets areas.

In the housing market, spatial deprivation and house price volatility have attracted significant attention from political and academic researchers. To examine spatial deprivation in the UK, Rae (2009) employed GIS together with spatial statistical approaches with the Index of Multiple Deprivation 2004 to produce maps for visual analysis. From these maps, he assessed which areas had serious problems that needed to be taken into account. It is noted that spatial deprivation and house price volatility are closely connected. Ferrari and Rae (2011) examined house price changes in the UK from local and regional areas using a range of existing data and GIS analysis to highlight the differences between areas in house price differentials and spatial deprivation.

GIS is best known for its use in the practice of identifying HMAs, as exemplified in the works of Jones et al. (2002), Jones et al. (2005), Jones et al. (2010), Jones et al. (2012). In the study conducted by NHPAU in 2010, Jones et al. (2010) used GIS to construct a network of HMA geographies. They employed the GIS tools to analyse complicated datasets on commuting and/or migration. Before that, Brown and Hincks (2008) used GIS to identify HMAs by examining migration flows between areas from 2001 Census data together with information obtained from property agents. Further, Hincks and Wong (2010) investigated travel-to-work patterns to explore the relationship between housing and labour markets based on travel-to-work data and GIS software. Other studies that have employed GIS include DTZ Piedad (2004b), Coombes et al. (2006) and Coombes et al. (2009) which applied GIS to define HMAs in North East England based on 2001 census data. Finally, Hincks and Baker (2012)

used GIS to analyse commuting patterns and migration flows to define HMAs in North West England.

Whereas the above studies used GIS to identify HMAs, Pryce and Evans (2007) employed a GIS approach to identify submarkets. The study applied econometric and Geographical Information System (GIS) methodology based on visual illustration to identify submarkets in Kent. They concluded that future applications of this approach should include other relevant factors, such as the impact of new supply; increased densities; rising sea-levels and flood risk; school performance; council tax revaluation; and urban regeneration. This demonstrates the capacity of GIS to cope with models based on large samples.

Other studies have also embraced the usefulness of GIS in the analysis, for example Wong et al. (2011) examining the relationship between housing market and neighbourhood, Hincks (2012) exploring the connection between housing market and labour market or Hincks (2015) who investigated neighbourhood changes and deprivation. On the other hand, Rae (2014) used GIS approach to explore the geography of mortgage lending in the UK. Methodology based on spatial analysis, location quotient analysis and socio-economic classification was used to explore the allocation of mortgage finance and differences in the lending pictures of several commercial banks. Furthermore, the use of GIS was importantly highlighted in the study of online search data conducted by Rae (2015a). Again GIS was used to analyse search data to examine housing submarkets as defined by structural and spatial characteristics. From these studies it can be seen that GIS has become a powerful tool to deal with bid data, especially the strength of GIS mapping overlays as mentioned in the work of Wong et al. (2015).

From the review of the use of GIS approach, it is worth noting that GIS is useful to analyse large datasets to produce visual communication. Although GIS has been used previously in housing market research to analyse migration data and search data, the two datasets were considered in separate studies. It seems that there is a lack of research using GIS to explore both online search data and migration in a synthesis study. Therefore, this study attempts to employ a GIS-based approach to explore the role of migration and search data in the structure and dynamics of the housing market system.

4.5 Data

4.5.1 Census data

The Office for National Statistics (ONS) collects census data every ten years to provide detailed information about national demographics. These datasets play an important role in analysis of the housing market. The study used the most recent UK census conducted on 27 March 2011. The datasets were collected through questionnaires posted to around 25 million households. Alternatively, households had an option to complete the survey online. The datasets contain large samples of household migration (flow data) as well as important information relating to housing analysis, such as population, age structure, family status, household composition, employment, ethnic group, religion, houses' characteristics, tenure, households' social and economic characteristics.

4.5.2 Flow data

In terms of this study, the important part of the 2011 Census is the internal migration statistics for the UK. The data provide information about the flows of households who have moved between two areas in the year before the Census. Therefore, these data

show the interactions between original areas and destination areas and provide information on movements between original and destination locations. The migration dataset includes a number of variables such as family status, ethnic group, age, long-term health problems or disability, economic factors, household composition, dependent children, housing tenure. For the purposes of this study, only total number of migrants was taken into account. The migration flows were collected from the Web-based Interface for Census Interaction Data (WICID). This website provides current migration data from the 2011 Census including Output Areas and Merged Wards. The study linked these datasets to the Census boundary data to create migration flows from origin to destination across Greater Manchester.

4.5.3 Boundary datasets

Boundary datasets provide representation of the geography of the census areas. With the support of QGIS, these boundary datasets along with 2011 local area data on such as merged wards and output areas can be analysed to present the attributes in map form. . It is important to link the boundary data with the migration flow data to explore the mobility patterns spatially, as potentially this could allow closer examination of the target areas. Further, it is possible to link the boundary datasets from the 2011 census with other non-census datasets such as house price data from the Land Registry or housing search data from Rightmove to allow spatial analysis of the housing market.

4.5.4 House price information from the Land Registry

The Land Registry provides information on house sales in England and Wales. House price datasets such as price paid data, registered from 1995 and updated monthly, are available to the public from the Land Registry. These datasets, which can be

downloaded easily and in full, are available in the form of comma-separated value (csv) and a text file. However, it is necessary to consider the time lag between the updating and publishing of the transaction information.

The study uses the datasets as a source of price paid data. The information includes paid price, postcode, housing types. Using the postcode information, it is possible to present dwelling units as points on a map. From the maps it is possible to look at the patterns of paid house transactions. From housing types, it is possible to subdivide the house transactions into sub-groups such as detached dwelling units, semi-detached dwelling units, flats or terraced units. From this subdivision, it is possible to examine different patterns among sold houses.

4.5.5 Search data from Rightmove

Rightmove.co.uk is considered as one of the UK's largest property portals. The website is used by a high number of market actors, such as developers and lettings agents, to list their properties online. Therefore, it stores big datasets regarding property availabilities or listed properties. On the other hand, the website is also a place where households search for their future homes. Rightmove has created a number of ways to help households find their home easily based on their preferences, aspirations. Households can find properties by selecting preferred search criteria such as property type, number of bedrooms, price range, and search radius. Alternatively, households can use the 'Draw a search' feature to create polygons which limit their search targets on a map. This feature has become important for researchers as it shows us spatially the desirable residential areas. The thesis used both available properties and search polygons in Greater Manchester, listed from March 2015. These datasets are seen as important in exploring latent demand for housing in the local market.

4.6 An analysis outline

To answer the questions of the thesis mentioned earlier, a number of sub-objectives need to be fulfilled. This will be achieved by following the analysis outline in the table below. House price, migration, and search are examined together to help us understand: interaction between HMAs and the dynamics of submarkets, and to explore submarkets based on search preferences. The analysis also provides with information about latent demand patterns and housing stock availability, market restrictions and unrealistic search patterns or housing suboptimal choice and dissatisfaction. Further, the analysis helps us assess the possibility to develop predictable models to predict the flows of search and migration as well as their impacts. Based on this table, the following section provides details on the analysis of house price, migration, and search.

Table 4.8: An analysis outline of the thesis

Subject	Tasks	Analysis
① House price analysis	① Submarkets based on price differentials	House price cluster based on price range
② Migration analysis	② Interaction between housing market areas	Migration flows between HMAs based on distance.
	② Dynamics of submarkets	Migration flows between submarkets based on house price differentials, especially submarkets with the lowest and highest price levels

<p>③ ② ①</p> <p>Search, migration and house price analysis</p>	<p>③</p> <p>Submarket exploration</p>	<p>Submarkets are explored based on the spatial patterns of searches according to number of bedrooms and price bands</p>
	<p>③</p> <p>Search pattern and property availability</p>	<p>Examine the spatial patterns of searches and available properties according to number of bedrooms and price bands</p>
	<p>③ ② ①</p> <p>Market restriction and suboptimal choice</p>	<p>Explore the spatial patterns of searches and migration flows from/to search areas</p>
	<p>③ ② ①</p> <p>Assess the possibility to develop predictable models based on search activities and migration indicators.</p>	<p>Conduct a simple correlation analysis between searches and house sales and values, between migration indicators (net migration rate, turnover rate, churn rate) and house sales and values. The coefficients of determination (R²) are calculated for each case.</p>

① House price analysis is used in this step

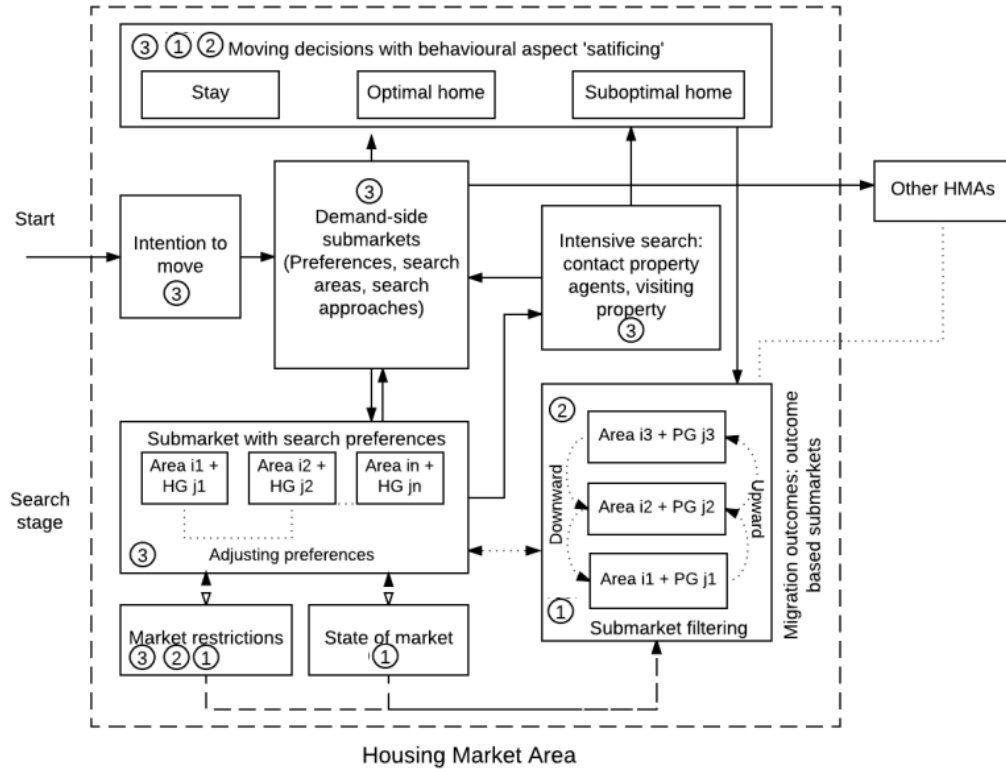
② Migration analysis is used in this step

③ Search analysis is used in this step

The analysis steps above are associated with the framework of thesis, helping us to explore the process of household mobility based on migration, search and house price data. These analysis steps are used in the analytical framework with the relevant

numbers, particularly 1 for house price analysis, 2 for migration analysis and 3 for search analysis. These are detailed as in Table 4.9 below.

Table 4.9: An analysis detail in the analytical framework



4.6.1 House price analysis

House price data were collected from Land Registry archives for the period from 2005 to 2014. The datasets contained postcodes for dwelling units as well as other important attributes such as price, house types, house condition (old or new). To analyse house price data using QGIS, it was necessary to convert postcodes to a latitude and longitude coordinate system before importing the data into QGIS. With QGIS, each housing unit is represented as a point on the map, each point being associated with its own attributes.

It is argued that submarkets may be identified based on price differentials. Based on the map, this study grouped together areas with similar house prices and housing types. The areas with similar characteristics may then be seen as submarkets.

In short, the process includes three steps:

- Collect house price data and convert postcodes to a latitude longitude coordinate system
- Import data into QGIS
- Group wards based on house price ranges using selected colours.

4.6.2 Migration analysis

This study used migration data to analyse mobility flows at the level of merged wards and output areas.

Migration flow data were collected from Census 2011 based on merged wards and output area for Greater Manchester. The data were accessed in the form of excel sheets from the WICID website and show all usual residents who stayed in a different home in 2010. Using this data source, migration flows could be drawn from the origin and destination of migrants. Each ward or output area has its own code number.

The study used census boundary data for Greater Manchester with merged wards and output area data. The boundary data were obtained from the UK Data Service and were prepared at the level of merged wards and output areas for Greater Manchester. These boundary data were imported into GIS for representation on maps, where each ward or output area had its central point based on a coordinate system (x,y). Then these maps were exported to excel sheets. It should be noted that each ward or output area has the same code as in the flow data from Census 2011. At this point, it is

important to join the flow data sheets to the boundary sheets based on the use of the same codes for each ward or output area.

After joining the two, a geometry column needs to be created which will represent a migration flow when imported into QGIS. To do this, the command ‘linestring’ is used to combine the two coordinates of a pair of origin and destination areas (for example, Table 4.8 below). The following step is to import this excel sheet into QGIS with all attributes needed for the analysis. At this point, QGIS shows all migration flows from origin to destination of migrants on a Greater Manchester map with the level of merged wards or output areas. With the support of QGIS, migration distance and the percentage of moves from one area to another area are calculated for the analysis. Also QGIS can represent different levels of distance on the maps. It is important to experiment by changing distance to observe the patterns of migration.

Table 4.10: An example of the excel sheet before importing into QGIS

Destination	E36000136
Origin	E36000022
X_ Origin	447473
Y_ Origin	515743
X_ Destination	365720
Y_ Destination	392133
Geometry	LINestring(447473 515743, 365720 392133)
Migrants	50

4.6.2.1 Analysis of interaction between housing market areas

The study examined the relationship between HMAs and migration flows. This involves a number of steps:

- First, it is necessary to calculate the percentages of moves between HMAs based on distance. The distance band is based on the mean, the standard deviation.
- Based on the number of migrants between HMAs, migration flows are drawn on the map to provide us with the information about the connections between HMAs.
- Further, a series of maps are created to show the patterns of household mobility activities based on distance across 14 HMAs.

Based on a number of visual maps, it is possible to see those HMAs with the most and least connections, and also explore the relationship between HMAs and migration distance. The analysis of migration flows helps us identify those areas with a majority of short or long distance moves. To try to understand these patterns, it may be necessary to realise the role of job opportunities and transportation system.

4.6.2.2 Dynamics of submarkets

The study explores the percentages of migrants who moved up and down as well as those who moved within similar submarkets. The submarkets are identified based on house price differentials. From this, the connections between submarkets are explored to provide information about the connections of low-end price and high-end price areas. The low-end price areas will be assumed as those with very low price while those with high price are seen as high-end price submarkets. The study examines several specific areas to best illustrate the connections of these areas to the other areas. This involves a number of steps:

- Calculate the proportions of moves between submarkets
- Identify submarkets based on house price range, especially low-end price and high-end price submarkets with the lowest and highest price levels respectively.
- Map migration flows between low-end and high-end submarkets.
- Finally, overlay the map of migration flows on the map of house price patterns

4.6.3 Search analysis

4.6.3.1 Submarket exploration:

To explore the search patterns in terms of submarkets based on spatial and structural characteristics, this study grouped search polygons according to price band and number of bedrooms. When representing data on a series of maps, it is possible to explore the spatial patterns of searches which provide a picture of submarkets based on search preferences. This is fulfilled via a number of steps:

- Select price bands and number of bedrooms based on distribution analysis (standard deviation)
- Create a series of visual maps based on price bands and bedrooms

4.6.3.2 Search pattern and property availability:

This is similar to submarket exploration but the study will add available properties on the map with the same price band and number of bedrooms. A series of maps are shown to provide a picture of the mismatch between searches and available opportunities. The steps are as follows:

- Using the property availability dataset, select price bands, bedroom numbers based on distribution analysis (standard deviation) with reference to search polygon dataset

- Overlay the maps of available properties on the maps of housing searches based on price bands, number of bedrooms and search radius to explore the differences and similarities

4.6.3.3 Market restriction and housing suboptimal choice:

To examine this problem, migration flows and search polygons are used. On the map, there may be a difference between areas with a high number of migrants and a high number of searches. The difference between the patterns of searches and migration could provide us with information about market restriction and unrealistic searches. Also, the difference between search destinations and migration destinations may show us some information about suboptimal choices. It is argued that through their search patterns, households show their aspirations and expectations regarding where they want to live. Therefore, if an area has a high numbers of migrants but a lack of searches, it may mean that the area is not a desirable place to live and in the long run households may be likely to leave. This area was only a suboptimal choice and they may leave in future due to dissatisfaction. The following steps are involved:

- Map migration flows based on the selection of migration numbers selected by distribution analysis.
- Map search polygons based on price bands, bedrooms and search radius with reference to the analysis of migration flows
- Overlay migration flows on search polygon maps to explore the patterns
- Overlay the map of search patterns on the map of migration flows and the map of house price patterns

4.6.4 Assess the possibility to develop a predictable model

4.6.4.1 Migration activities and market activities:

The study uses migration data from the 2011 census collected from March 2011. As the house paid price was collected after March 2011, it was possible for the study to investigate the influence of migration activities on house sales. The study carried out a correlation analysis for migration indicators and house sales (volume, value of sales). The migration indicators include net migration rate, migration turnover rate and migration churn rate. These ratios were calculated for each output area across Greater Manchester. On the other hand, the study also calculated the total value of housing sales and the total volume of housing sales for each of these output areas. To assess the potential to develop a model for predicting future market activities, the coefficients of determination (R^2) were calculated and scatter graphs were provided to give a better illustration.

4.6.4.2 Search activities and market activities:

To explore the relationship between search activities and housing market activities, the study used the simple analysis of correlation between detailed searches and house sales, house values. The coefficients of determination (R^2) were calculated to provide a simple assessment of the potential for developing a predictive model for forecasting future activities. Scatter graphs were provided to gain a better understanding.

A number of steps were followed:

- Calculate migration indicators including net migration rate, turnover rate, churn rate in 2011

- Calculates search numbers for each output areas

- Calculate house sale and values for each output areas with reference to the period of migration and search data
- Conduct a correlation analysis between migration indicators and house sales, values and between searches and house sales, values
- Calculate the coefficients of determination (R^2) and draw scatter plots.

4.7 Conclusion

The chapter set up the aims and questions for the analysis. The selection of Greater Manchester as a case study was also discussed. The analysis is based on a GIS-based visual approach with the application of QGIS, ArcGIS and the support of SPSS. The study used SPSS to explore the correlation between variables and examine the influential factors in the analysis. In addition, QGIS was used as an important study tool to produce a series of visual maps. From these maps it would be possible to visually explore, for example, submarkets, the connections between them, and the demand patterns showing household preferences. To analyse the housing market system, the study used several datasets including boundary data and flow data from Census 2011, paid house price from the Land Registry, and Rightmove data. The combination of these datasets in the analysis outline may help us understand better the market structures, the dynamics of the submarkets, and households' preferences through a Greater Manchester system.

Chapter Five: A Greater Manchester Market System

5.1. Introduction

The study aims to examine the roles of migration and search activities in the structures and dynamics of the local market system. Before doing this, it is important to investigate factors affecting the housing market, including house price, price change rate, housing supply. This chapter uses house price data in 2010 and in 2011 from the Land Registry and data from Census 2011. The case study, Greater Manchester, is investigated based on the 14 housing market areas from the NHPAU study in 2010.

House price and price change have been of longstanding concern for researchers because of their significant impact on the housing market. Particularly, considerable attention has been paid to the effects of spatial price differentials and imbalances on mobility. The fundamental factors causing house price differentials among areas are from the demand side, including such as population increase and job perspectives, and have a tied relationship with household migration patterns. Migration patterns can be both speeded up or constrained by house price differentials, and are reflected on the demand side of the housing market. It is argued that migration patterns have an impact on market price volatility, for example, by increasing or reducing housing market volatility in high and low priced areas (Ferrari and Rae, 2011). Although it is necessary to investigate the links between migration and house price, there is a gap in knowledge related to how residential mobility and housing price are interrelated spatially, and how house prices differ between areas through the mechanism of residential mobility. Before examining connections between the components of the housing market system through search activities and migration flows, it is important to review the main characteristics of this Greater Manchester housing market system.

The section will first conduct analysis of house price in 2011 and then investigate house price change from 2010 to 2011. It then explores the housing supply and demand based on house transaction data to identify any restrictions in sub-areas within each HMA. Finally, a summary table will be presented to show market information from each HMA before moving on to examination of the market system in combination with analysis of migration and search.

5.2 House price

Analysis of price differentials to identify housing submarkets can be based on the application of hedonic price analyses. This should go in line with considering the relationship between household mobility and house price structure because these provide further important information on the identification of submarkets (Jones et al., 2004). In order to examine house price in Greater Manchester, the study uses house price data from the Land Registry in 2010 and in 2011. The use of house price from these years reflects house price appraisal at the time households migrated. All house price transactions were based on postcodes from 1/1/2010 to 31/12/2011, and include 26152 transactions in 2010 and 25911 in 2011.

Table 5.1 provides information about house price transactions in terms of four house types: detached, semi-detached, terrace and flat. The average house price across the whole region was around £150,000. In terms of house types, detached houses were priced the highest, at more than double the terraced house price. The semi-detached house price was nearly the same as the average price for house types as a whole in Greater Manchester. It should be noted that terraced houses account for the most transactions, at around 36-36.5%, followed by semi-detached at 35%, flats at 14-15%, and detached 13-14%. Regarding average price, detached houses were the highest, and then semi-detached, flat and terrace, while the median house price was lower than

the average price for each house type. Between 2010 and 2011, the housing market experienced a reduction in house price at a rate of 2.42%. Prices of detached houses showed the highest rate of reduction at 4.52%, while the lowest rate was exhibited by terraces at 1.59%.

Table 5.1: House price transactions in 2011

House type	Property number	% Total	Average price (£)	Max price (£)	Min price (£)	Median price (£)	% change 2010-2011
Detached	3592	13.86	276512	6000000	31500	222750	-4.52
Flat	3705	14.30	120960	920000	16500	108000	-2.66
Semi	9294	35.87	153171	1200000	10000	135000	-2.88
Terrace	9320	35.97	106705	995000	10000	91000	-1.59
Total	25911	100	148950	6000000	10000	123000	-2.42

Source: the thesis author's own analysis

Table 5.2 shows the average house price across 14 housing market areas in Greater Manchester in 2011. Based on the statistical distribution, we divided the price range into three groups: low, medium and high as can be seen in the right hand column of Table 5.2. In detail, Manchester appeared to have the highest average price, at £188,000, while Bolton (South) had the lowest average price, at around £90,000. When compared to the average price in Greater Manchester, Manchester and Stockport were the areas with the highest prices while Bolton (South) and Leigh had the lowest prices.

Table 5.2: House price across 14 HMAs in 2011

<i>HMAs</i>		<i>Average price £</i>	<i>Price level</i>
1	Bolton (South)	89793	Low

2	Leigh	106592	
3	Oldham (West)	111044	Medium
4	Ashton-under-Lyne	114068	
5	Middleton	122424	
6	Rochdale	123353	
7	Salford	126080	
8	Wigan	128027	
9	Hyde	128476	
10	Oldham (East)	133878	
11	Bury	142020	
12	Bolton (North)	144546	
14	Stockport	178996	High
15	Manchester	188333	

Source: the thesis author's own analysis

The table above shows that house prices in Manchester and Stockport differed significantly from those in Bolton (South) and Leigh. The reason for such differences in house price among regions, among other aspects, is differences in population growth rates. In Manchester, population increased faster than in the other HMAs. High demand tends to push house prices upward, when supply in Manchester may be limited. Manchester and Stockport are seeing a rise in population, a rise in demand for housing, but supply cannot keep up. In Bolton (South) and Leigh, there is less population growth and the pressure on housing supply is much lower. On the other hand, prices may have been driven up by speculation and buy to let investment. The increase in house prices in Manchester and Stockport has attracted buy to let investors who are looking to benefit from rising asset prices. Therefore, an increasing house

price tends to encourage further demand. The difference in house price is likely to create many issues in relation to the potential movement of households in Bolton (South) or Leigh who seek better job opportunities with higher wages through moving to Manchester or Stockport.

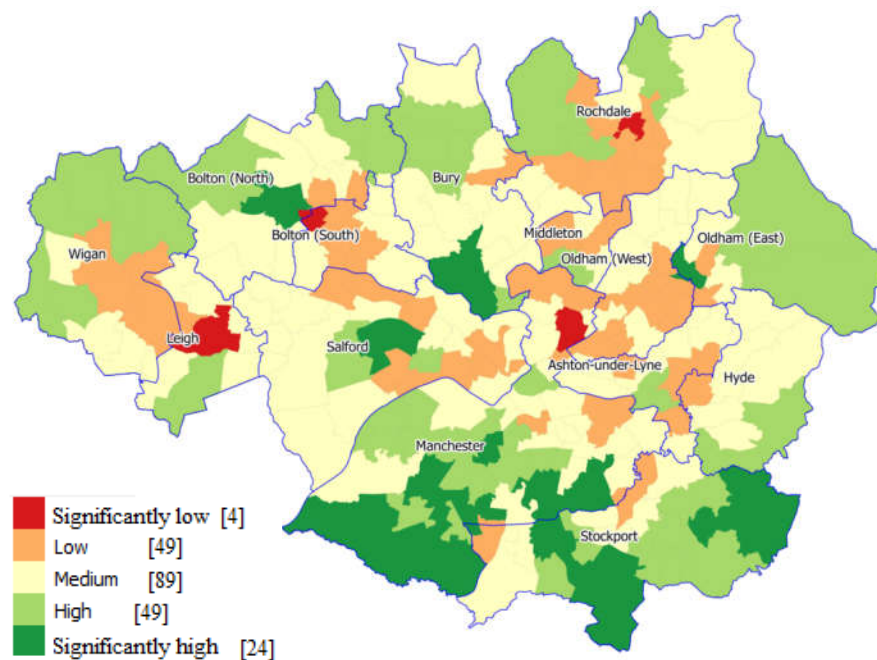
5.3 Submarkets based on price differentials

It is argued that housing markets may be better structured as a series of defined submarkets both spatially and structurally (Watkins, 2001). The interconnections between submarkets can be realised through the mechanism of household migration. By examining the links between submarkets, it is possible to review the housing supply in a local housing market and provide beneficial information regarding the construction of new houses, especially on where to build and what to build. The section starts with the discussion of submarkets based on price differentials.

Within local HMAs, submarkets tend to be self-contained and interact together via a mechanism of migration (Jones et al., 2004). To understand the connections between submarkets, it is necessary to understand why people move and what characteristics of submarkets make them suitable for movers. The reasons why people move from one submarket to another one are various. They may be considering wages, house prices and commuting costs as well as neighbourhood characteristics, costs associated with migration (Zabel, 2012; Plantinga et al., 2013). Also, households move from submarket to submarket because their preferences and aspirations change. They move from a flat to a house because they have more money, more space, or they need a garden, more private life. Therefore, there are reasons why people choose to move to this area but not that area. Although exploring such reasons is out of the scope of this study, examining the migration flows and submarkets based on price differentials may help us have a better understanding of the connections between submarkets.

The DCLG advice note provided information on how to identify local housing sub-markets based on house price differentials by grouping areas with similar house price together (DCLG, 2007). Therefore, areas with similar house prices tend to share similar characteristics, enabling them to be seen as a submarket. If we assume that submarkets can be identified based on house price differentials, we may also see connections between these submarkets when examining migration flows between them. Bearing this in mind, this section examines house price patterns based on segmentation by price band and investigates the connections between them via migration flows. To categorise house price levels, the study divides house price data into four levels: significantly low level with prices below £74000, low level with prices from £74000 to £100000; medium level with prices from £100000 to £143000; high level with prices from £143000 to £213000 and significantly high level with prices above £213000. These price ranges were determined based on the calculation of statistical distribution and are shown in the figure below.

Figure 5.3 Five levels of house price across 14 HMAs in Greater Manchester



Source: the thesis author's own analysis

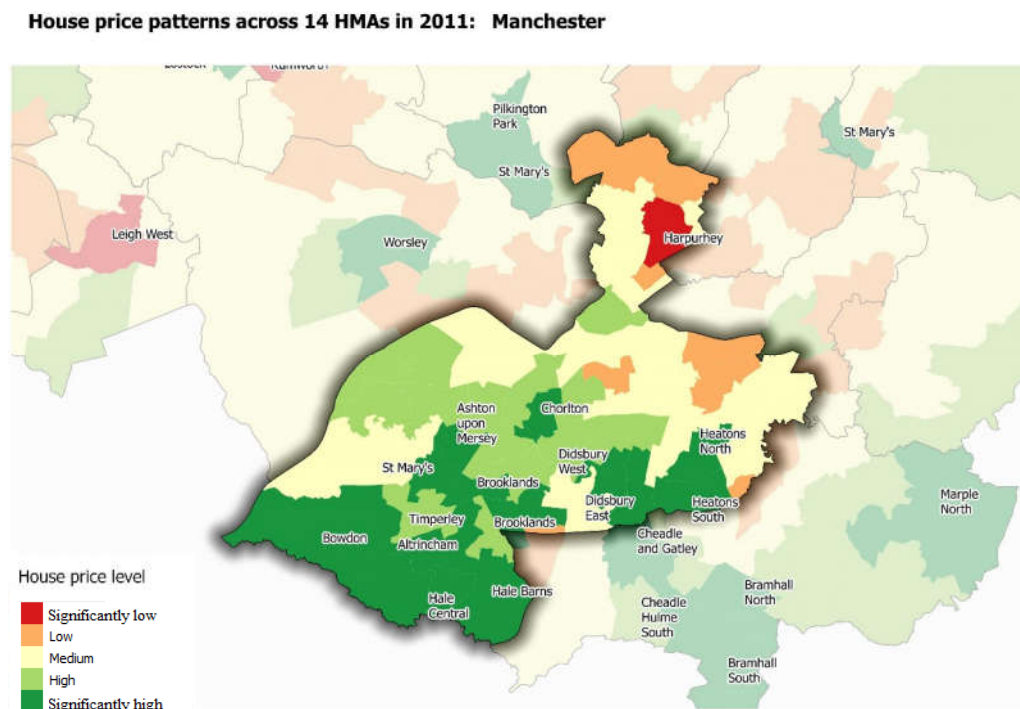
From the figure above, we can visually identify submarkets within the HMAs based on different colours representing the different price levels. The result is based on the five groups of house price: significantly low, low, medium, high and significantly high. There are 4 areas with significantly low price and 24 areas with significantly high price, 49 areas with low or high price, and 89 areas with medium price.

It can be suggested that if there is a similarity in house price between neighbouring areas, these areas may also have other similar characteristics. We could consider them as a submarket based on a similar price level. When taking this into account, the picture above can show a number of submarkets based on similar price levels. From Wigan in the west, Rochdale in the north, to Hyde in the east or Manchester and Stockport in the south, we can see patterns in house price levels. For example, the areas in dark green contain house prices at significantly high level and those in red are at the significantly low level. Manchester and Stockport clearly contain many of the areas with the highest house prices in Greater Manchester. In contrast, those areas with the lowest house price levels are, for example, in Leigh, Bolton (South), Rochdale and Manchester.

House price differentials depend on a number of factors: household migration, the stock of available land, house value trends, house and neighbourhood quality and housing policy (Evenson, 2002). However, among these factors, the trade-off between housing supply and demand plays an important role in the explanation of spatial price differentials between housing market areas or even submarkets (Ozanne and Thibodeau, 1983). When the housing demand in an area is significantly high relative to supply, the excess demand tends to lead the price to rise in this area. However, this excess demand may not influence the mechanism of house price in nearby areas, or

may take a long time to have an impact. This could lead to the price mechanism being different in different parts of the HMA. To deal with housing affordability in a particular area, increasing housing supply in one area may not lead to a price decline in the areas with housing shortages unless the migration patterns change. Therefore, it is necessary to consider locations for construction of new dwelling units and improvements to the transportation system as influencing migration patterns as well as the characteristics of the submarket itself.

Figure 5.4: a closer view of relative house prices across Manchester HMA.



Source: the thesis author's own analysis

Figure 5.4 shows a closer view of relative house prices across Manchester HMA. The figure identifies sub-areas with high price such as Bowdon, Altrincham, Hale Central, Hale Barns, and sub-area with significantly low price Harpurhey. If we identified sub-markets on the basis of areas with similar characteristics, the above maps would suggest that the HMA above would form separate sub-markets..

The observations above reinforce previous analyses that showed evidence of a north south divide in terms of price difference. The south of Manchester has notably high entry-level prices that create a barrier for first time buyers. On the other hand, the northern part of the Manchester HMA displays strong clustering of areas with below average house price. This contrasts with the south, where average house prices exceed the average.

5.4 Price change

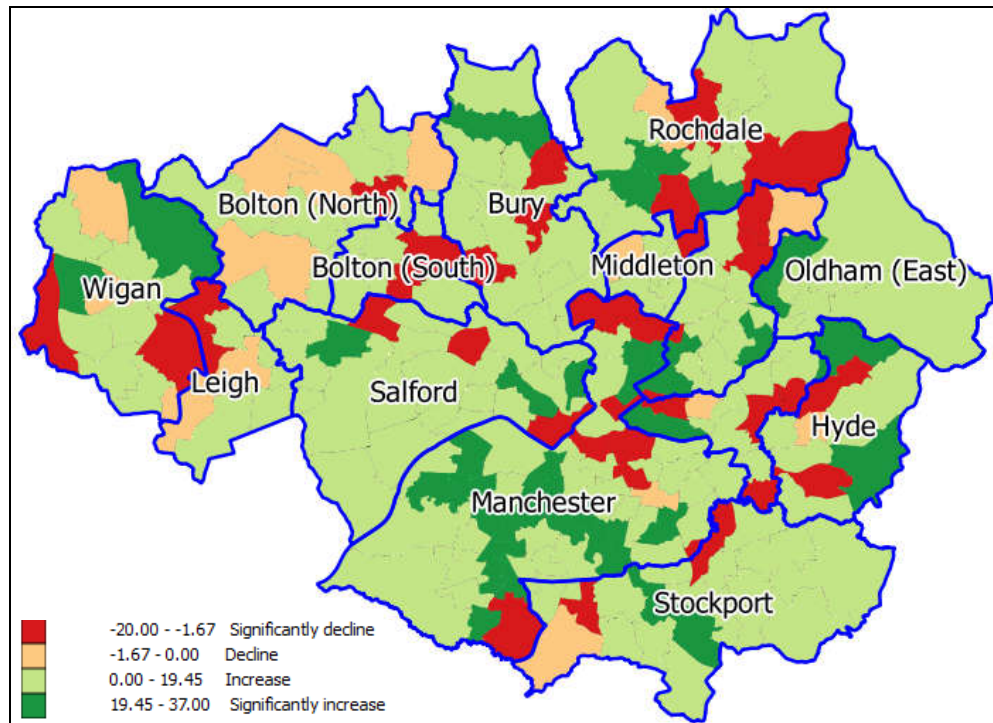
Price change has an important influence on households' decisions regarding migration. They make mobility decisions based on their near-sighted views of house price perspectives, and respond to the upside of the housing market by taking advantage of price increase trends. Therefore, it is necessary to analyse price change rates in the local markets.

First, the study looks at the long time rate of price change over ten years. It is suggested that examining price patterns over a long period may show us the persistence of house price differences or similarities and may help us identify sub-markets (Pryce, 2007). For example, long run increases in house prices may be caused by demand for housing outstripping supply. The areas with similar levels of price increase may have similar characteristics and may therefore form sub-markets. In contrast, house price patterns in the short run may just help us understand market restrictions over a short time period. Changes in house price in the short run may be because housing supply does not respond in a timely way to demand due to unexpected and unforeseeable changes in some economic and social conditions.

Figure 5.5 shows a map of rate of change in price over 10 years from 2005 to 2014. We can see that a high number of areas appear to have positive rates of price change

over the ten years. Moreover, several areas show a significant increase in price, in dark green colour, or a significant decline in price, shown in red colour. It is also noted that in Oldham (East) all sub-areas show a positive increase in price.

Figure 5.5 House price change over ten years, 2005-2014



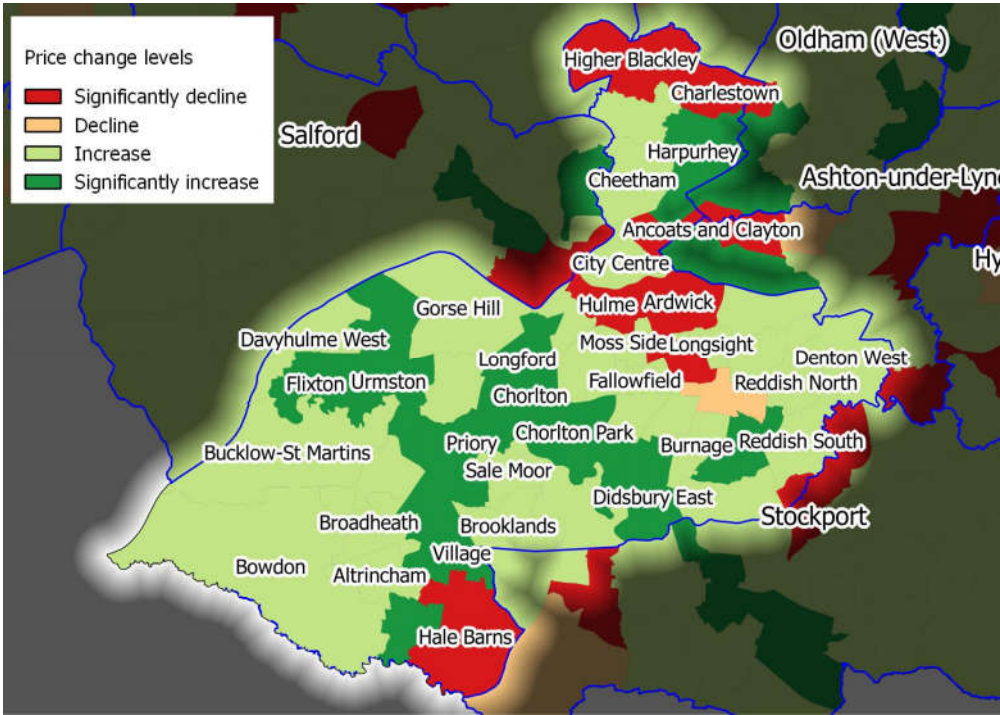
Source: the thesis author's own analysis

Regarding areas with a significant decline in price, it may imply that these areas have a lack of demand for housing and have a surplus of housing supply. In these areas, sellers may tend to reduce their asking price to attract buyers. Also, these areas are competing with nearby areas to attract movers, and therefore this may lead the price to decline. Further, it is important to mention the influence of sellers' intention to sell their houses. If the sellers are desperate to sell and the area has a surplus of supply, they tend to reduce the price to make a quick sale. Examples include the red areas in Bolton (North, South), Bury, Hyde, Leigh, Oldham (West), Rochdale, and Salford. In-migration rates in these areas may depend on the degree of price reduction and

housing demand. Some areas may have a significant decline in price but have high numbers of movers. In these areas there may be competition between sellers but a lack of housing demand as well as high competition from nearby areas.

Figure 5.6 provides a picture of price change over ten years in Manchester from 2005 to 2014. We can identify that several areas have significantly positive rates of change, such as: Village, Broadlands, Flixton, Umston, Longford, Chorlton, Chorlton Park, or Didsbury West. On the other hand, we can see that in several areas there was considerable decline in price, such as Hulme, Adwick, Rusholme, Higher Blackley, and Charlestown. If we can identify submarkets based on price change rate, these patterns may form sub-markets.

Figure 5.6: Price change in Manchester over ten years 2005-2014



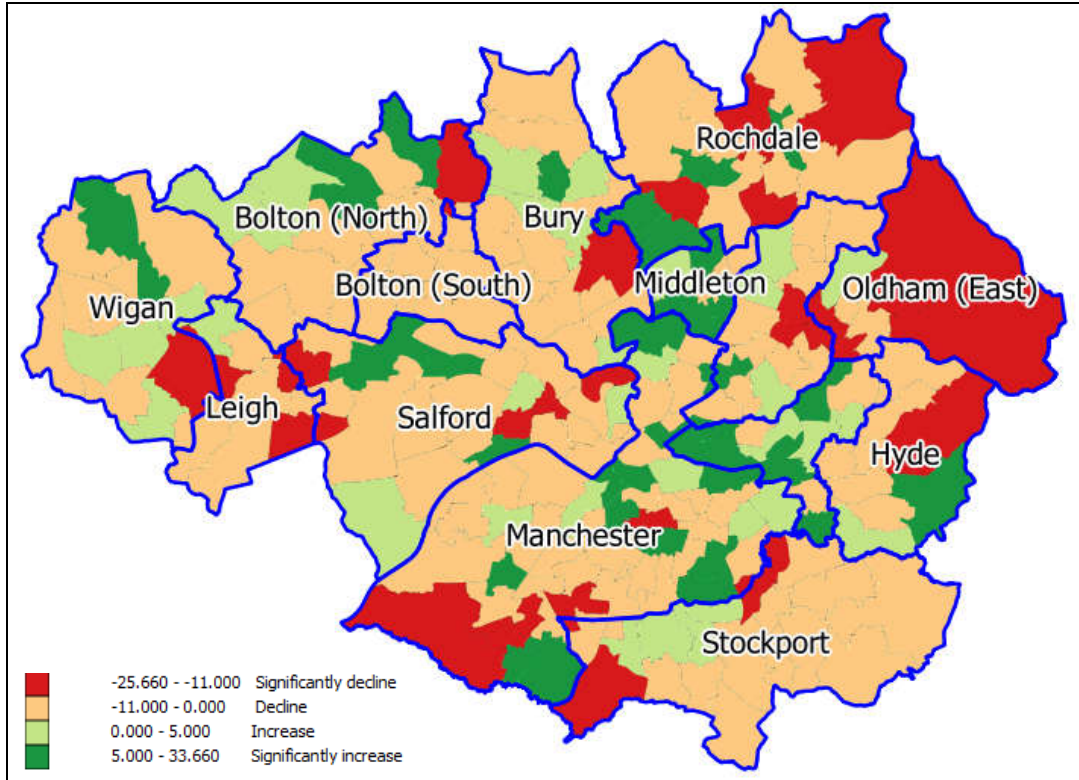
Source: the thesis author’s own analysis

It should be noted that house price volatility depends on long-run supply and demand factors which contribute heavily to the explanation of differences in housing price

across areas (Ozanne and Thibodeau, 1983). Lower demand areas may be more vulnerable to over-supply. House price tends to reduce at a high rate when housing stock exceeds housing demand and needs. In higher demand areas, housing supply may not respond in a timely way to the demand, and this may cause high demand pressure and an increase in house prices. In these high demand areas, a high number of flats may be built, as the construction time is shorter and the price is more affordable.

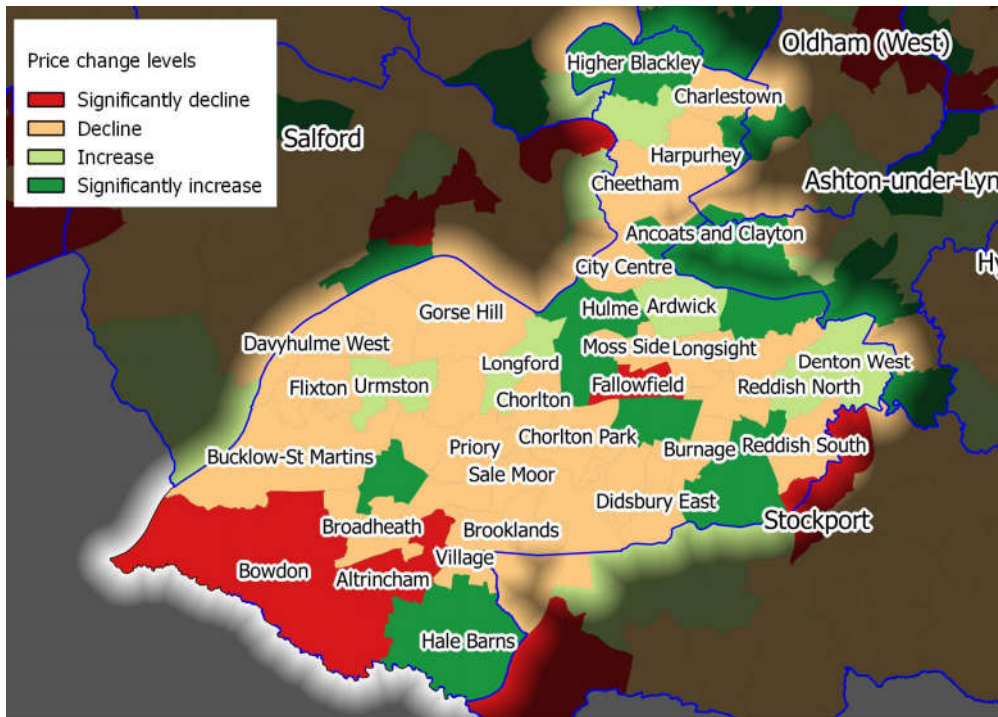
In order to take into account the influence of other factors, such as migration, on house price change, it is necessary to consider short time change during the migration process, particularly from 2010 to 2011. Figure 5.7 shows us the picture of price change from 2010 to 2011. We can see a number of price change patterns with different colours representing the similar rates of price change in the short time period. These patterns provide us with information about the trade-off between supply and demand in the short time period.

Figure 5.7: House price change 2010-2011



Source: the thesis author's own analysis

Figure 5.8: Price change in Manchester from 2010-2011



Source: the thesis author's own analysis

Figure 5.8 provides a picture of price change over one year in Manchester from 2010 to 2011. We can identify that several areas had significantly positive rates of change, such as: Hale Barns, St Mary's, Hulme, Clifford, Old Moat, High Blackley, Gorton North, Heatons North, and Heatons South. On the other hand, we can see that several areas had a considerable decline in price, such as Fallowfield, Bowdon, Altincham, and Brooklands. It is interesting that the patterns of price change in 2010-2011 were different from those in 2005-2014. This may imply that we should consider the length of time period when analysing the housing market.

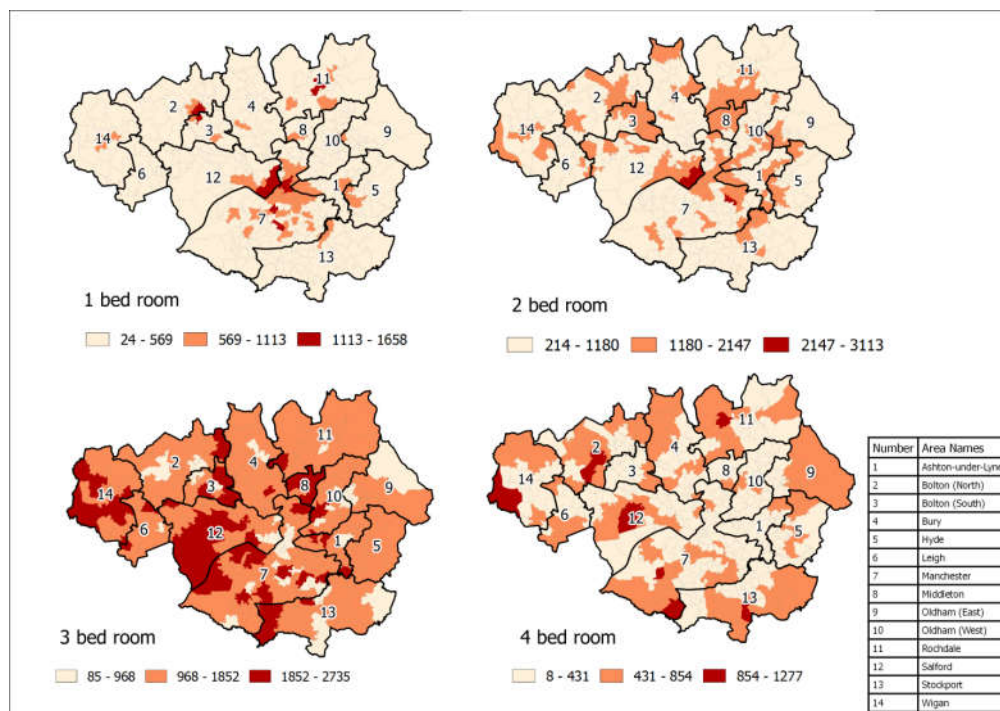
When examining the interaction between house price change and migration or search activity, it is possible to explore the impact of migration and/or search activity on the sub-markets and identify the level of excess demand relative to supply. Excess demand may cause the price to increase if there is a lack of supply, whereas a surplus of supply may cause the price to decrease if there is a lack of demand. Therefore, the analysis of migration flows, housing search and the rates of price change may help us to establish where high revealed demand comes from and identify the areas with excess demand or with excess supply.

5.5 Housing supply and demand

House price, housing stock and demand are closely connected. If an area has high demand but a lack of stock, price tends to increase. Therefore, it is important to investigate the housing stock across the 14 HMAs in Greater Manchester. The analysis below is based on Census 2011 and data on house transactions in 2011 from the Land Registry. By examining housing stock based on number of bedrooms, house types and transaction volume, we may be able to form a picture of the highest and lowest revealed demand for housing in the 14 HMAs.

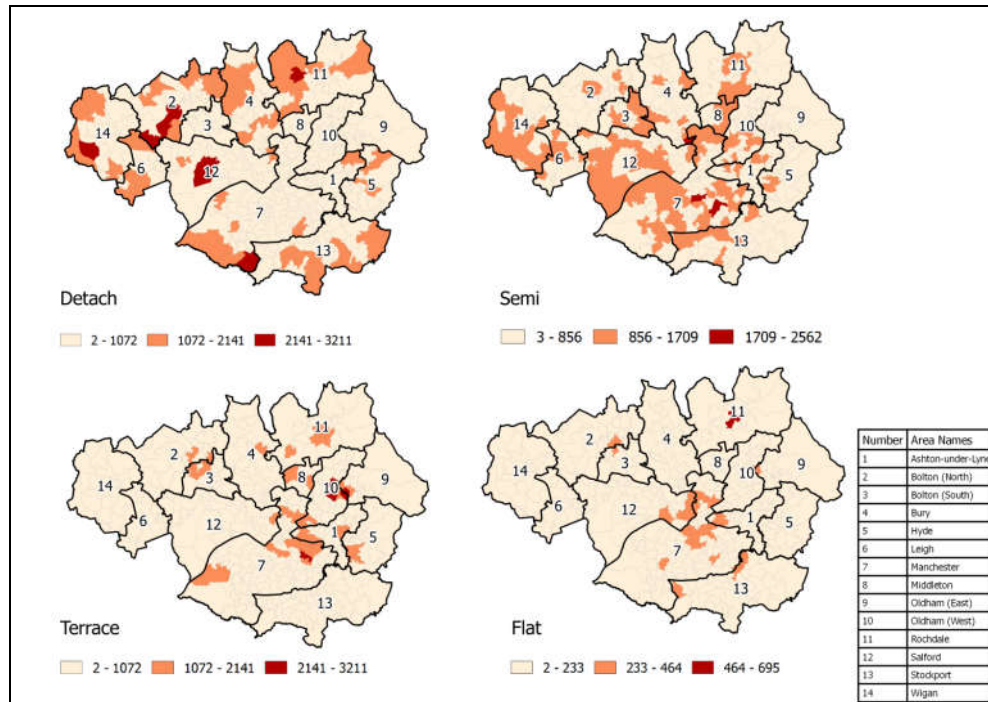
Figure 5.9 shows us the patterns of bedroom distribution based on Census 2011. Properties with one bedroom were mainly found in Manchester city centre and the adjacent areas in Salford. On the other hand, a high proportion of three bedroom properties can be seen on the west side of Salford, followed by Wigan, Bolton (South), Middleton and Manchester. Patterns for four bedroom houses, as shown by the pale colour, were spread fairly evenly across the 14 HMAs, while a few areas had the highest percentage of this type, as shown by the dark-red colour.

Figure 5.9: Bedroom distribution across 14 HMAs in Greater Manchester



Source: the thesis author's own analysis

Figure 5.10: House types across 14 housing market areas in Greater Manchester



Source: the thesis author's own analysis

Figure 5.10 shows us a picture of house type distribution across the 14 HMAs in Greater Manchester based on Census 2011 data. Red areas with high percentages of detached houses appeared in South Manchester, Rochdale, Bolton (North) and Wigan and Salford. Areas with lower levels of detached houses were Oldham (West and East), Middleton, Bolton (South), and Ashton-under-Lyne. In terms of semi-detached houses, high proportions of stock can be seen in Manchester, Salford, Wigan, Bolton (South) and Middleton. Oldham (East) and Hyde had lower levels of this kind of housing stock. Regarding terraced houses, areas with higher proportions of stock include Manchester, Middleton, and Oldham (West). Finally, flats can be seen dominantly in several areas in Manchester, Salford and Rochdale.

Table 5.11 shows transactions based on house type. Greater Manchester had the highest percentage of transactions in terraced houses and semi-detached houses at 35.97% (9305 properties sold) and 35.89% (9286 properties sold) respectively. In contrast, detached and flats accounted for 13.83% and 14.31% respectively, far lower than the semi and terraced houses percentages. These figures may signal a lack of detached houses in Greater Manchester. In terms of total house transactions in 2010-2011, the highest transaction percentages were in Manchester, Salford and Stockport respectively at 28.01%, 11.4% and 11.15%, while Middleton, Oldham (East) and Bolton (South) had the lowest percentages at 1.71%, 2.43% and 3.22% respectively.

Table 5.11: House transactions in 2011

Transactions	Sold property numbers / Transaction percentage (%)				
	Detached	Flat	Semi-detached	Terrace	Grand Total
Ashton-under-Lyne	105 0.41%	175 0.68%	427 1.65%	492 1.90%	1199 4.63%
Bolton (North)	368 1.42%	198 0.77%	521 2.01%	696 2.69%	1783 6.89%
Bolton (South)	58 0.22%	69 0.27%	283 1.09%	422 1.63%	832 3.22%
Bury	325 1.26%	203 0.78%	668 2.58%	701 2.71%	1897 7.33%
Hyde	136 0.53%	105 0.41%	294 1.14%	424 1.64%	959 3.71%
Leigh	161 0.62%	69 0.27%	299 1.16%	337 1.30%	866 3.35%
Manchester	669 2.59%	1700 6.57%	2614 10.10%	2265 8.75%	7248 28.01%
Middleton	70 0.27%	30 0.12%	182 0.70%	160 0.62%	442 1.71%
Oldham (East)	85 0.33%	60 0.23%	144 0.56%	340 1.31%	629 2.43%
Oldham (West)	120 0.46%	64 0.25%	491 1.90%	619 2.39%	1294 5.00%
Rochdale	236 0.91%	51 0.20%	452 1.75%	608 2.35%	1347 5.21%
Salford	329 1.27%	603 2.33%	992 3.83%	1025 3.96%	2949 11.40%
Stockport	612 2.37%	292 1.13%	1241 4.80%	739 2.86%	2884 11.15%

Wigan	305 1.18%	83 0.32%	678 2.62%	477 1.84%	1543 5.96%
Grand Total	3579 13.83%	3702 14.31%	9286 35.89%	9305 35.97%	25872 100.00%

Source: the thesis author's own analysis

In more detail, the areas with the lowest proportion of detached were in Bolton (South), Middleton and Oldham (East), while the highest percentages of detached were in Manchester and Stockport, especially these areas with the highest average price. For flats, the highest proportions of transactions were in Manchester and Salford at 6.57% and 2.33% respectively, while the lowest were in Middleton, Oldham (East) and Rochdale. According to semi and terraced house transactions, Manchester, Salford and Stockport had the highest percentages, while the lowest were in Middleton, Oldham (West) Bolton (South) and Leigh.

Figure 5.12 shows us the picture of transactions regarding the existing and new houses. The proportion of new houses was much lower than that of existing houses at nearly 10%. Also we can see that the highest percentages were in Manchester and Salford, while the lowest proportions were in Bolton (South), Oldham (East, West), and Middleton. It seems that housing stock had grown at a relatively slow rate under the dominance of existing houses.

Figure 5.12: House transaction based on new and existing houses in 2011

Transactions	Existing housing units		New-built units		Total housing units	
	Sold numbers	Sold percentage	Sold numbers	Sold percentage	Sold numbers	Sold percentage
Ashton-under-Lyne	963	3.72%	236	0.91%	1199	4.63%
Bolton (North)	1583	6.12%	200	0.77%	1783	6.89%
Bolton (South)	788	3.05%	44	0.17%	832	3.22%
Bury	1747	6.75%	150	0.58%	1897	7.33%
Hyde	833	3.22%	126	0.49%	959	3.71%
Leigh	787	3.04%	79	0.31%	866	3.35%
Manchester	6597	25.50%	651	2.52%	7248	28.01%
Middleton	378	1.46%	64	0.25%	442	1.71%
Oldham (East)	604	2.33%	25	0.10%	629	2.43%
Oldham (West)	1231	4.76%	63	0.24%	1294	5.00%

Rochdale	1241	4.80%	106	0.41%	1347	5.21%
Salford	2521	9.74%	428	1.65%	2949	11.40%
Stockport	2776	10.73%	108	0.42%	2884	11.15%
Wigan	1438	5.56%	105	0.41%	1543	5.96%
Grand Total	23487	90.78%	2385	9.22%	25872	100.00%

Source: the thesis author's own analysis

Figure 5.13 shows transaction percentages based on price levels and housing stock. The highest proportion of sales was at the medium price level, 40.88% of the total (10576 properties sold). The lowest was at the level of significantly low price, representing 1.62% (418 properties sold). High price and significantly high price areas had higher proportions of sales compared to the areas with low and significantly low prices. In terms of new built houses, the highest percentage of sales was also in the medium price areas followed by the areas with high prices. These areas had the highest percentages of flats and low percentages of new-built detached houses.

Figure 5.13: House transactions based on price level, new and existing houses in 2011

Price level	Existing units (Sold units / Percentages)					New units (Sold number /Percentage)					Total
	D	F	S	T	Total	D	F	S	T	Total	
Significantly low	7 0.03%	13 0.05%	95 0.37%	295 1.14%	410 1.58%	0 0.00%	8 0.03%	0 0.00%	0 0.00%	8 0.03%	418 1.62%
Low	236 0.91%	192 0.74%	1316 5.09%	2460 9.51%	4204 16.25%	23 0.09%	235 0.91%	56 0.22%	99 0.38%	413 1.60%	4617 17.85%
Medium	1057 4.09%	975 3.77%	3637 14.06%	3702 14.31%	9371 36.22%	128 0.49%	653 2.52%	166 0.64%	258 1.00%	1205 4.66%	10576 40.88%
High	1117 4.32%	764 2.95%	2564 9.91%	1532 5.92%	5977 23.10%	147 0.57%	228 0.88%	92 0.36%	146 0.56%	613 2.37%	6590 25.47%

Signifi cantly high	846 3.27%	548 2.12%	1340 5.18%	791 3.06%	3525 13.62%	18 0.07%	86 0.33%	20 0.08%	22 0.09%	146 0.56%	3671 14.19%
Grand total	3263 12.61%	2492 9.63%	8952 34.60%	8780 33.94%	23487 90.78%	316 1.22%	1210 4.68%	334 1.29%	525 2.03%	2385 9.22%	25872 100%

Source: the thesis author's own analysis

Table 5.14 provides information about percentages of house sale transactions in 14 HMAs according to the four selected price levels: significantly low, low, medium, high and significantly high. At first glance, Manchester had the highest percentage in the high and significantly high price bands (2160 high price properties sold, accounting for 8.35% and 2282 of significantly high price properties sold accounting for 8.82% respectively). Stockport also had a high percentage of transactions in the significantly high price band (812 properties sold and 3.14%), followed by Bury (205 properties sold and 0.79%) and Bolton (North) (153 properties sold and 0.59%). In the significantly low price band, Leigh had a high percentage (0.61% with 157 properties sold), followed by Manchester (108 properties sold and 0.42%) and Bolton South (90 properties sold and 0.35%), Rochdale (0.22% and 58 properties sold). Regarding the low price level, Manchester, Salford and Oldham (West) were areas worthy of further attention. At the medium price level, Salford, Manchester, Oldham (West) and Rochdale are noteworthy for their higher proportion of transactions. What is more, several HMAs had high transaction percentages at more than two levels of house price. For example, Manchester had higher percentages in the medium, high and significantly high bands, and Salford in the low price and medium price bands.

Table 5.14: House transactions in 14 HMAs: price levels, sold number, percentage in 2011

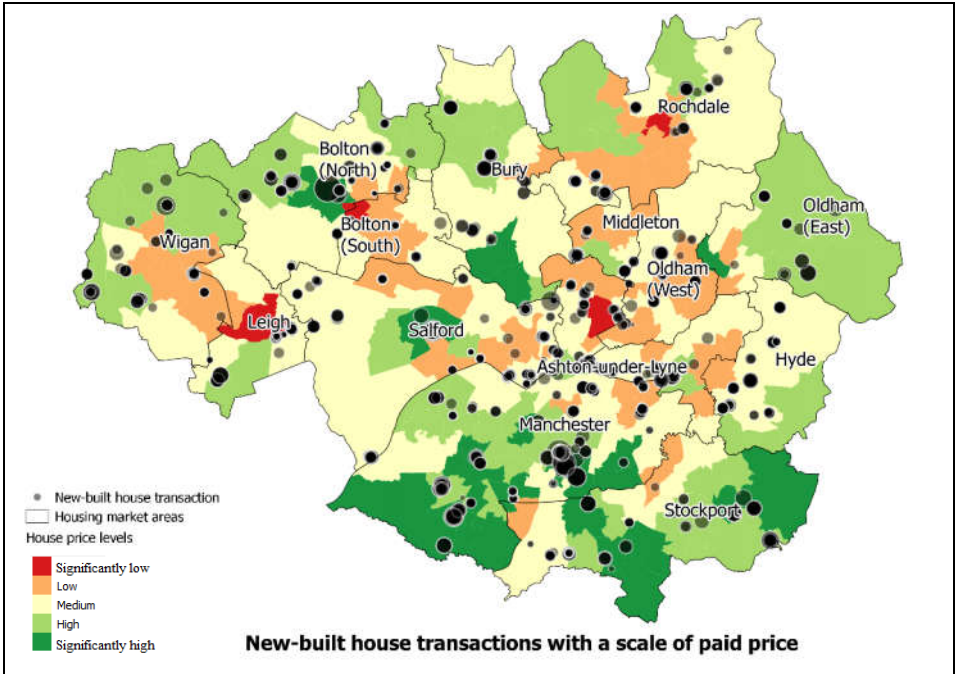
Transactions (Sold number / Percentage)	Significantly low price	Low price	Medium price	High price	Significantly high price	Grand Total
Ashton-under-Lyne	0 0.00%	395 1.53%	631 2.44%	173 0.67%	0 0.00%	1199 4.63%
Bolton (North)	5 0.02%	230 0.89%	826 3.19%	569 2.20%	153 0.59%	1783 6.89%
Bolton (South)	90 0.35%	345 1.33%	384 1.48%	13 0.05%	0 0.00%	832 3.22%
Bury	0 0.00%	172 0.66%	908 3.51%	612 2.37%	205 0.79%	1897 7.33%
Hyde	0 0.00%	104 0.40%	651 2.52%	204 0.79%	0 0.00%	959 3.71%
Leigh	157 0.61%	7 0.03%	586 2.26%	116 0.45%	0 0.00%	866 3.35%
Manchester	108 0.42%	657 2.54%	2041 7.89%	2160 8.35%	2282 8.82%	7248 28.01%
Middleton	0 0.00%	166 0.64%	142 0.55%	134 0.52%	0 0.00%	442 1.71%
Oldham (East)	0 0.00%	137 0.53%	187 0.72%	229 0.89%	76 0.29%	629 2.43%
Oldham (West)	0 0.00%	549 2.12%	737 2.85%	0 0.00%	8 0.03%	1294 5.00%
Rochdale	58 0.22%	526 2.03%	487 1.88%	276 1.07%	0 0.00%	1347 5.21%
Salford	0 0.00%	706 2.73%	1848 7.14%	260 1.00%	135 0.52%	2949 11.40%
Stockport	0 0.00%	138 0.53%	854 3.30%	1080 4.17%	812 3.14%	2884 11.15%
Wigan	0 0.00%	485 1.87%	294 1.14%	764 2.95%	0 0.00%	1543 5.96%
Grand Total	418 1.62%	4617 17.85%	10576 40.88%	6590 25.47%	3671 14.19%	25872 100.00%

Source: the thesis author's own analysis

Figures 5.15 and 5.16 illustrate the transaction distribution of new houses and existing houses respectively in 2011. We can see that some areas had high proportions of

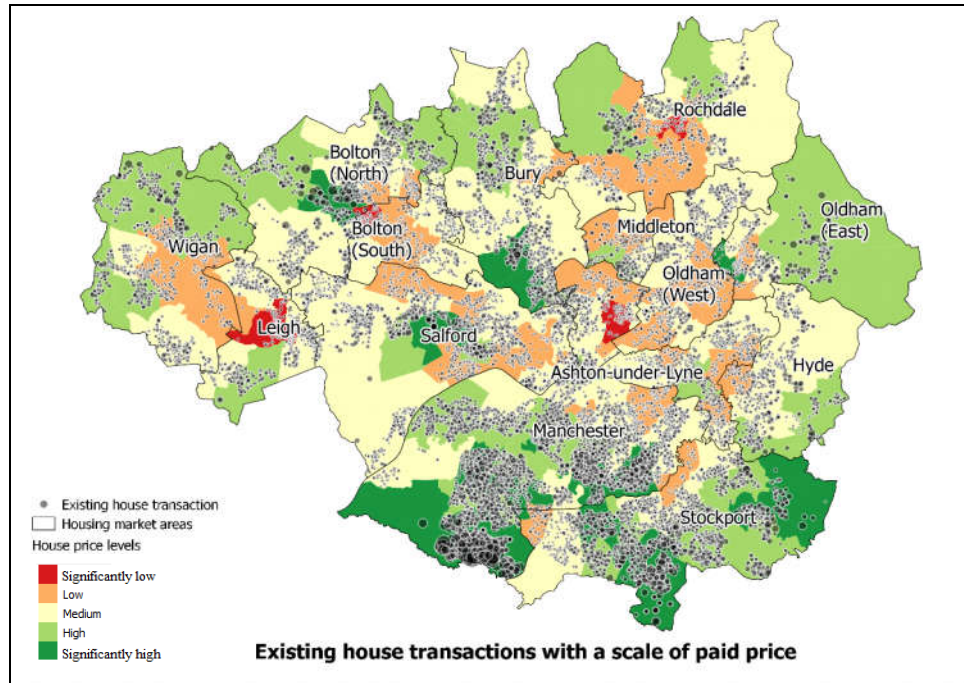
existing houses but low percentages of new built houses, for example, South Manchester has high representation of significantly high price areas and Stockport of high price areas. We also can see the differing picture between existing and new built houses in areas with medium prices (yellow colour), such as in Wigan, Leigh or Rochdale, Salford. These differences could signal a lack of supply compared to demand.

Figure 5.15 New built house transactions with a scale of paid price in 2011



Source: the thesis author’s own analysis

Figure 5.16: Existing house transactions with a scale of paid price in 2011



Source: the thesis author's own analysis

In summary, in central Manchester (city centre and its surrounding areas), there is an imbalance between housing demand and supply, for example low percentages of detached, semi-detached houses, but a great number of terraced houses, flats. A high number of housing units, predominantly flats, were found in Manchester and parts of Salford. This can be seen as the results of new development programmes and residential property investment in these areas. Demand for housing is strong but more significantly so for three bedroom housing due to supply restrictions for this particular segment. Demand is also high for one bedroom housing.

The south of Manchester and Stockport are traditionally the most expensive housing markets and include wealthy areas that are attractive to buyers. These areas are seen as desirable places to live and contain large suburban areas. These areas are well-connected to the city centre and the centre of Stockport with a high percentage of detached houses, relatively low proportions of terraced houses, and a high number of

flats. These areas had also witnessed addition of a high number of housing units to the supply stock, particularly flat developments, but very few detached housing units.

The areas in the north east of Greater Manchester had relatively few new-built housing projects, although there was a higher proportion of new housing stock in Oldham (East and West), Ashton-under-Lyne and Hyde. These areas had a great choice of housing types, with new detached houses and flats, and a high level of areas with lower percentages of detached and semi-detached houses.

The HMAs in the north west of Greater Manchester had relatively balanced housing types. However, Bolton (North, South) and Wigan had a high percentage of terraced housing units, also a higher proportion of new-built housing units. It is noted that Wigan had a high level of surplus housing stock compared to Bolton, which may be an issue in this HMA. Despite the low price, a high number of new-built projects had been completed in these areas, meaning that there was a demand for higher price housing. In these areas, demand existed for premium price housing, which has led to construction of a greater proportion of dwelling units.

5.6 Conclusion

This section provided description of the characteristics of the housing market by examining house price, price change rate, housing supply and demand across 14 housing market areas in Greater Manchester. With the boundaries of these 14 housing market areas were taken from the NHAU study in 2010, the following sections provide a summary of the analysis.

5.6.1 Characteristics of the Greater Manchester market system

It was noted that price differentials existed within each HMA and areas with similar price levels may be grouped to form a number of sub-markets. From the investigation

of housing supply and demand, it is suggested that a number of areas had high numbers of existing house transactions in line with low price. This may imply that lower price had an impact on migration and attracted potential buyers. It is also important to identify the patterns of house transactions based on price groups in each HMA to imagine a picture of housing demand across HMAs, and explore the areas with high demand in the different house price bands. Moreover, the patterns of new and existing house transactions associated with range of price may help planners in their decision-making processes.

Recently, with the high levels of migration, housing demand has been increasing, but it appears imbalanced between areas. In particular, Manchester has witnessed a significant problem with a lack of supply compared to a fast growing demand for housing. This issue has put increased pressure on the housing market, particularly the supply side. In 2008, the report to Greater Manchester authority raised concerns that the significant rate of in-migration has tended to cause severe housing problems in those areas suffering from the under-supply of quality housing (AGMA, 2008).

In order to tackle this problem, the market planners and policy-makers need strategically to focus on constructing new dwelling units based on a great choice of housing type and size, and allocation of suitable land resource for building affordable housing (AGMA, 2008). It is important to identify problematic areas and how much land to release to tackle the shortage of supply. This highlights the importance of estimating household needs and demand for housing. Practice in planning local land and housing supply cannot rely solely on market outcome, but must take into account household aspirations and preferences during market processes.

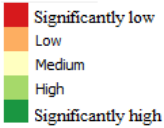


It is important to examine both market outcomes and market processes to truly understand the housing market. While housing market outcomes, including house

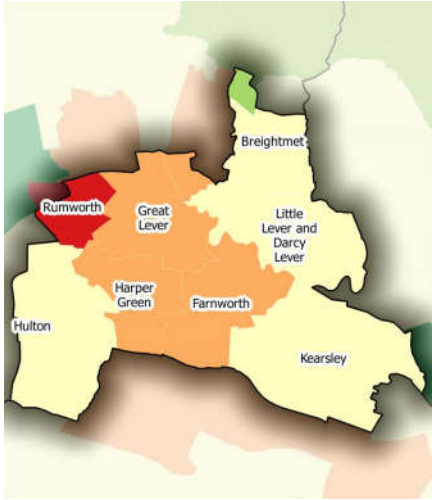


price and migration patterns, help to identify the structure of the local housing market, they show little about housing demand pressure and market constraints. Therefore, examining the search information may supplement the analysis of the local housing market, and help understand the housing market better. The current research is able to undertake this task due to the availability of data sources for Greater Manchester.


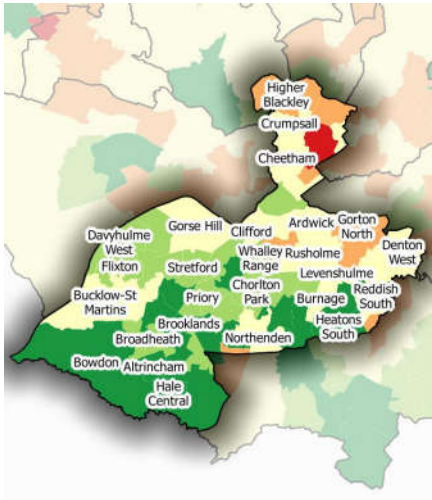

5.6.2 A summary table for each HMA


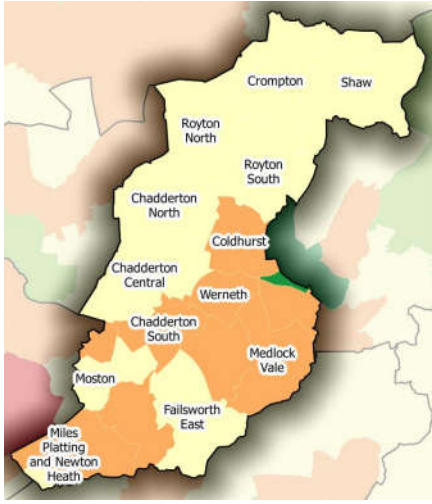

Table 5.17 below provides a summary of market information for each HMA in Greater Manchester. The information highlights the characteristics of the markets, and identifies the areas with high/low rates of price change, or with issues relating to housing supply and demand.

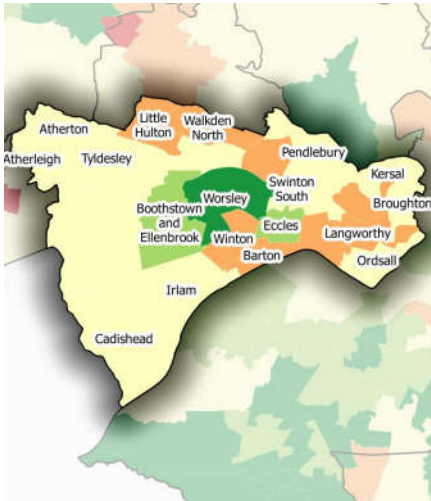

Table 5.17: Key characteristics for each HMA in Greater Manchester


HMAs	<p>Price-based submarket:</p> 	<p>Key characteristics:</p> <ul style="list-style-type: none"> - House price level - House price change 2010-2011 - Housing supply and demand
<p>Ashton-under-Lyne</p>		<p>Average price was at medium level. Significant increases in price occurred in Bradford, Ancoats and Clayton, Audenshaw, and Aston Waterloo. A number of new houses were built in Bradford. Houses with two and three bedrooms appeared dominantly. High numbers of three bedrooms were seen in Droylsden West and Ancoats & Clayton. High proportions of detached houses were found in Ashton Hurst.</p>
<p>Bolton (North)</p>		<p>This area had mostly terraced houses and semis, and a low proportion of detached houses. Average price was at the medium level. Areas with significant increase in price were found in Smithills, Bromley Cross. Bradshaw has seen a significant decline in price. High transactions can be seen in areas such as Bromley Cross and Bradshaw.</p>

<p>Bolton (South)</p>		<p>This area had low price levels. Rumworth had the lowest price. The whole HMA saw a decline in price within one year. Two and three bedroom houses were dominant. High numbers of three bedroom houses were found in Kearsley, Little Lever and Darcy Lever and Brightmet. High numbers of terraced house were found in Rumworth. High transactions were in Farnworth or Harper Green, Little Lever & Darcy Lever, Brightmet, Rumworth.</p>
<p>Bury</p>		<p>Bury had average prices at medium level. Prices in Unsworth significantly declined over one year, while Elton had a significant increase in price. High numbers of detached houses were found in North Manor, Tottington, Elton, Church, and Radcliffe North. High numbers of transactions can be found in East as a whole and in Sedgley, St Mary's and Elton.</p>
<p>Hyde</p>		<p>Average house price was at medium level. High transactions were concentrated in Dukinfield or Mossley, and Hyde Werneth. Most of the new-build houses sales were in medium price areas. Hyde had mostly two and three bedroom and semi-detached or terraced houses. In Stalybridge South prices declined significantly, while in Longendale they increased significantly. Hyde Werneth saw an increase in price while in the others prices declined, such as Dukinfield.</p>

<p>Leigh</p>		<p>Leigh West had the lowest price. Abram, Leigh South, Atherleigh experienced significant declines in price, while Hindley saw an increase. Three bedroom houses were dominant. A high number of four bedroom and detached houses were found in Lowton East and Golborne & Lowton West. Higher numbers of semi-detached houses were found in Abram. Leigh West, Leigh South, Leigh East or Hindley, Hindley Green and Lowton East saw high numbers of transactions.</p>
<p>Manchester</p>		<p>The price level was high. The lowest price was in Harpurhey. Prices had declined in Bowdon, Altrincham, Broadlands, Fallowfield and increased in St Mary's, Hale Barns, Old Moat, Heaton North & South, Hulme, Clifford, Gorton North, Higher Blackley. High numbers of one and two bedroom houses were found in the centre of Manchester. While four bedroom houses were concentrated in the south of Manchester such as in Bowdon, Altrincham, Hale Barns, as well as detached houses. High transactions were seen in Hale Barns, Altrincham, Harpurhey, Higher Blackley.</p>
<p>Middleton</p>		<p>Average house price in this HMA was in the medium range. A lack of transactions was seen in Hopwood Hall, but a higher proportion was found in North Middleton, West Middleton and South Middleton. There was a high number of three and two bedroom houses. Prices had significantly increased in South Middleton, East Middleton, Hopwood Hall, but declined in North Middleton.</p>

<p>Oldham (East)</p>		<p>This area had medium price levels with a number of price patterns: St Mary's with significantly high price; Waterhead and Alexandra with low price and Saddlewood North & South with high price; and St James' and Saddlewood West and Lees with medium price. Prices had significantly declined in Saddlewood North & South, St Mary's, Alexandra, while they had increased in St James'. High transactions were found in Waterhead, St Mary's.</p>
<p>Oldham (West)</p>		<p>This area had medium level prices and a lack of detached and semi-detached houses. High transactions were found in Coldhurst and Werneth, Moston. Chadderton South had a high number of three bedroom houses, while Coldhurst had a high proportion of terraced houses. Prices increased in Failsworth East, Royton North, Chadderton North, and the increase appeared significant even in Moston. A significant decline in price was seen in Coldhurst, Werneth and Alexandra.</p>
<p>Rochdale</p>		<p>This HMA had medium price levels. A significant decline in price was seen in Central Rochdale, Healey, Littleborough Lakeside, North Heywood, Balderstone & Kirkholt. A significant increase was seen in Smallbridge & Firgrove, Bamford, Hopwood Hall, West Heywood. High numbers of detached and semi-detached houses were found in Norden and Healey, Castleton respectively. High transactions were seen in Central Rochdale, Smallbridge & Firgrove, Kingsway.</p>

<p>Salford</p>		<p>High transactions were in Ordsall, Weaste & Seedley, Langworthy, Irwell, Riverside, Broughton, Atherleigh, Tyldesley, Little Hulton and Walkden South, Kersal, Irwell, Eccles. High numbers of flats were in Weaste & Seedley, Ordsall, and Broughton; detached houses in Boothstow & Ellenbrook; 4 bedroom properties in Boothstow & Ellenbrook; 3 bedroom houses in Cadishead, Astley Mosley Common. A significant price increase was in Little Hulton, Tyldesley, Walkden South, while a significantly decline appeared in Atherleigh, Kersal, Eccles, Claremont.</p>
<p>Stockport</p>		<p>This area had high average prices. A significant price decline was seen in Woodhouse Park, Brinnington & Central, while an increase was seen in Cheadle & Gatley, Sharston, Cheadle Hulme North, Edgeley & Cheadle Heath. There were high numbers of three bedrooms in Woodhouse Park, Baguley; four bedrooms in Bramhall South, Bramhall North, Cheadle Hulme South, Cheadle & Gatley, Marple North; and detached houses in Bramhall South, Bramhall North, Cheadle Hulme South, Marple North. High transactions were seen in Woodhouse Park, Sharston, Bredbury & Woodley, Manor or Davenport & Cale Green or Baguley, Brinnington & Central.</p>

<p>Wigan</p>		<p>This HMA had medium price levels. High transactions were seen in Ince, Wigan West, Douglas, Worsley Mesnes, Abram, Pemberton. A high number of detached houses was found in Winstanley, or Standish with Langtree or Orrell. A high number of four bedroom houses was found in Orrell, Winstanley. A significant increase in price was seen in Standish with Langtree, Wigan Central, or Ince, Worsley Mesnes, Winstanley, Ashton, while a significant decline in price appeared in Abram.</p>
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Source: the thesis author's own analysis

Chapter Six: Migration analysis

6.1 Introduction

A housing market may be composed as a system of linked housing market areas and submarkets (Jones et al., 2005); however, we need to understand how the market system works. This section aims to explore the structures and operations of the market system in Greater Manchester in relation to migration and house price data from 2011. In detail, this study looks at the interactions between HMAs based on migration flows and then explores how submarkets within HMAs are linked together. As submarkets based on the existence of price differentials should also have a close association with migration patterns, migration analysis may provide a better insight on the structures and operations and the dynamics of the housing market. This study intends to take the existing housing market areas from the NHPAU study as a benchmark and explore the role of migration patterns in the analysis of the housing market.

Housing market areas are the areas within which households, without necessarily changing jobs, search for alternative dwelling units (O'Sullivan et al., 2004). Households are assumed to move within the HMA unless they need to move long distance to another HMA due to job opportunities. If commuting time and cost are advantageous, households tend to stay in their current HMAs and commute to work in their workplaces in other HMAs. The introduction of advanced transport networks means that the long commute has a role to play as a substitute for migration due to the significant difference in house price between HMAs. However, Ferrari and Rae (2011) showed that gaps in house price may be explained by the level of connections between areas. Particularly, they found that poor connections between advantaged

and disadvantaged areas led to a lack of migration activities and thus limited the transfer of housing wealth. To examine this issue, data on household migration between HMAs are used to explore the proportion of moves between HMAs and patterns of inflow and outflow between HMAs.

In addition, the dynamics of submarkets across the HMAs are investigated to provide a picture of the filtering process with 'upward' moves, 'downward' moves or mobility activities between submarkets with similar characteristics. 'Upward' moves happen when households move from cheaper priced houses to higher priced houses. In contrast, 'downward' moves happen when households move from higher priced houses to cheaper priced houses. In this section, this study will analyse migration flows between areas at the highest and lowest ends of the price range. This process will identify the areas with high 'upward' moves or 'downward' moves or moves between areas with the same house price bands. Further, it will be possible to identify the most attractive areas among those with similar price characteristics. The analysis will help us understand the filtering process and identify the destinations of these migration flows to review the housing supply.

Furthermore, differentials in house price are connected with levels of deprivation (Ferrari and Rae, 2011). Poor neighbourhoods are often linked to those submarkets with low house prices. Many have paid attention to investigating the migration in and out of poor neighbourhoods and how mobility can reduce the level of deprivation, for example, through movement out of deprived neighbourhoods and significant spatial separation of the poor, or links between advantaged and disadvantaged areas (see, e.g. Bolt and Van Kempen, 2003; Fong and Shibuya, 2000; South and Crowder, 1997). From the literature review, these studies seemed not to investigate the picture of households moving upward and downward to explore the role of income in

area choices. Moreover, there are still concerns related to the patterns of spatial migration. Short distance move was the most common migration pattern within local HMAs but it is necessary to understand such movements. Particularly, these questions relate, as Clark and Mass (2016) mentioned, to what the probabilities are of up and down movement in a local market, what role income plays in the mobility process, and how the disadvantaged and advantaged neighbourhoods are connected with wider areas in the housing market system. To examine these issues, it is important to investigate the links between submarkets.

This section is structured into a number of sub-sections. First, it is necessary to consider migration statistics from the Census 2011. Further, the investigation of links between HMAs will identify patterns and proportions of short, medium and long distance household migration across the 14 HMAs in Greater Manchester. Next, the dynamics of the local markets will be explored through the investigation of mobility flows from/to high-end and low-end price areas with the highest and lowest prices respectively. The study will refer to City Centre and Rumworth as examples of high-end and low-end price neighbourhoods respectively. Finally, the section will provide the main findings from the analysis in the conclusion section and present a table summarising results for each HMA.

6.2 Migration statistics

The study needs to assume that Greater Manchester comprises the fourteen housing market areas taken from the NHPAU study. With these HMAs as a benchmark, the migration dataset from 2011 is employed to explore the connections between these HMAs and submarkets. Before continuing the main investigation, it is necessary to discuss the migration flow dataset.

The study analyses migration flows at the UK Output Areas level in Greater Manchester, based on Census 2011 data. The migration flows from Census 2011 provide information about all usual residents in 2011, who stayed in a different dwelling unit in 2010, within Greater Manchester. The data were organised at the UK Output Areas, which is the lowest geographical level for the migration data (Office for National Statistics, 2015). In Greater Manchester, there are 8684 OA areas within 215 wards and 10 districts. The minimum number of households and persons in OA area was 40 and 100 respectively (Office for National Statistics, 2015).

The data present the number of movers per flow in line with the number of flows, and migration distance from the previous home to the current home. Migration data from Census 2011 include 129089 flows within the Greater Manchester boundaries and the number of persons per flow ranged from 1 to 62 persons. The biggest number of people per flow is 62, while the lowest number of flows was 1. The information can be summarised as below:

Table 6.1 Migration statistics for mobility distance and flows in Greater Manchester

Distance (Km)	Number of migration flows (unit)	% Total	Max movers per flow (household)	Min movers per flow (household)	Mean movers per flow (household)
0 - 2	54145	41.94	62	1	2.044
2 - 4	29444	22.81	35	1	1.739
4 - 6	16446	12.74	16	1	1.615
6 - 8	9472	7.34	15	1	1.573
8 - 47.95	19582	15.17	15*	1	1.487

Source: the thesis author's own analysis

* Two special cases with 27 people and 32 people moving distances of 16.672 and 17.309 Km respectively

Table 6.1 shows the distance that households migrated. It is noted that 41.94% of migration flows were of distances between 0 and 2 Km and 22.81% were between 2 and 4 Km. An increase in distance led to a reduction in the number of flows and number of movers per flow (number of migrates in the areas). Table 6.2 shows the number of movers per flow in relation to average distance. The results from the two tables indicate that households were more likely to migrate to areas within a short distance.

Table 6.2 Summary of migration statistics for migration flows in Greater Manchester

Summary of statistics for migration flows in Greater Manchester				
Movers per flow (household)	Number of migration flows	% Total	Max distance (Km)	Average distance (Km)
1	75634	58.59	47.95	4.85
2	29535	22.88	41.29	3.80
3	11417	8.84	36.507	3.25
4	7002	5.42	39.137	3.09
5	2596	2.01	35.057	2.89
6	1513	1.17	37.464	2.72
7	441	0.34	32.047	2.03
8	383	0.30	27.691	2.33
9	150	0.12	17.02	1.70

10	124	0.10	14.335	2.30
11-62	294	0.23	31.667	1.53

Source: the thesis author's own analysis

Table 6.2 provides information about migration flows in Greater Manchester. Flows with one person are dominant, accounting for around 58% of total movers, and more than double the flows comprising two persons. On the other hand, flows with more than 5 persons accounted for below 5%. In terms of migration distance, the average distance ranged from 1.53 to 4.85 Km and was linked with number of person per flow. It was found that longer distance flows involved fewer persons.

6.3 Interaction between housing market areas

6.3.1 Migration patterns between HMAs

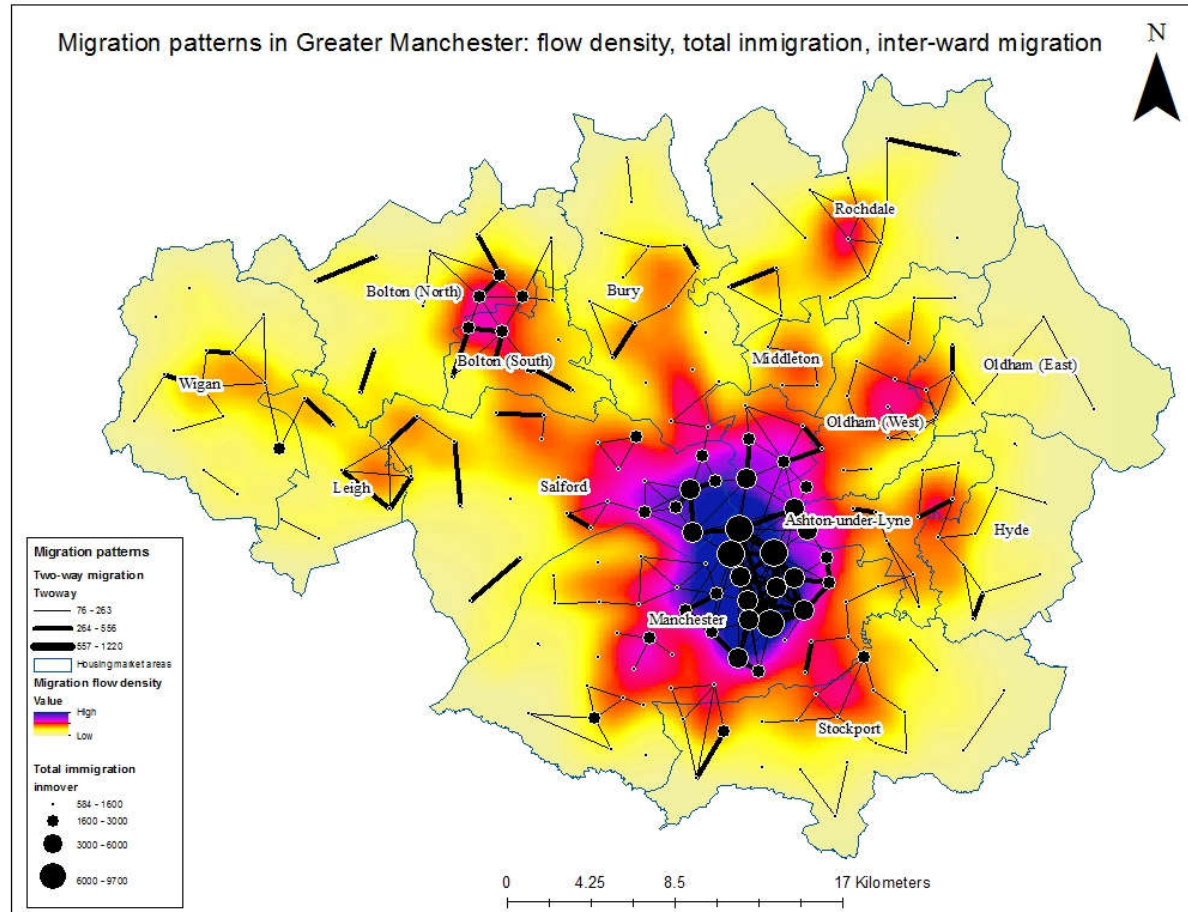
The migration statistics above provided us with information about household mobility. In order to explore the links between the HMAs, the migration data were analysed in more detail with the use of GIS softwares. This included the migration flows to and from each HMA to identify the proportion of movers between them.

Figure 6.3 shows us the picture of in-migration in each HMA based on the numbers of movers, flow density and two-way flows. Migration density pattern was mapped using the 'line density' feature in ArcGIS. The dark blue colour shows the areas with high migration density, while the dark yellow colour presents the areas with low migration density. The map also provides us with information about two-way migration flows and total in-migration number. Large dark circles represent the areas with high numbers of in-migration, while smaller black circles show the areas with smaller numbers of in-migration.

Migration activity seems to be more focused in several particular locations in Bolton (North), Rochdale, Oldham (West), Ashton-under-Lyne and the areas surrounding the city centre and parts of Salford and Stockport. However, from the map below, the highest number of in-migrants, highest flow density and two-way flows involving high numbers can be seen dominantly in Manchester and parts of Salford. This could be a sign that a high number of workers are attracted by job opportunities in this central area.

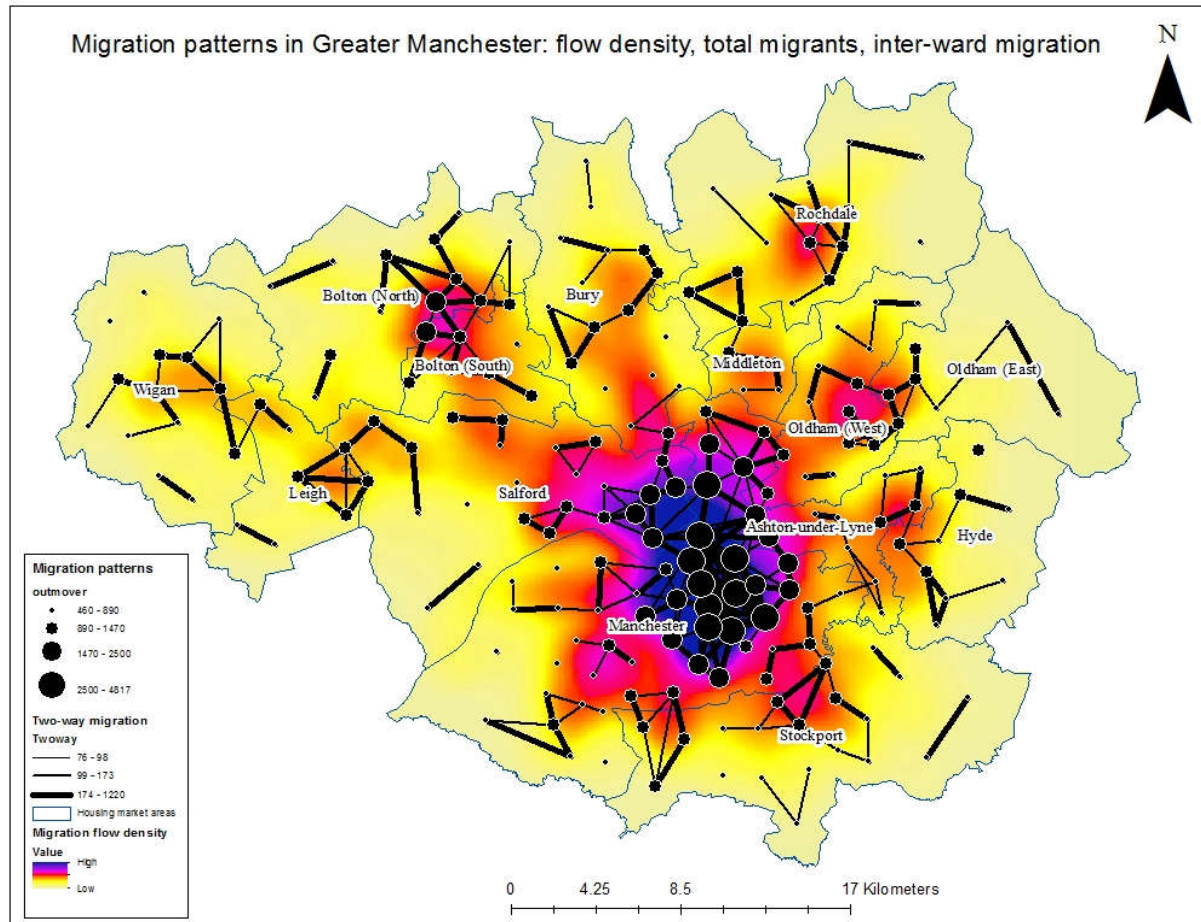
Figure 6.4 illustrates the patterns of out-migration together with flow density and two-way flows. These patterns of out-migration seem to be similar to those in Figure 6.3.

Figure 6.3: In-mover numbers across 14 housing market areas in Greater Manchester.



Source: the thesis author's own analysis

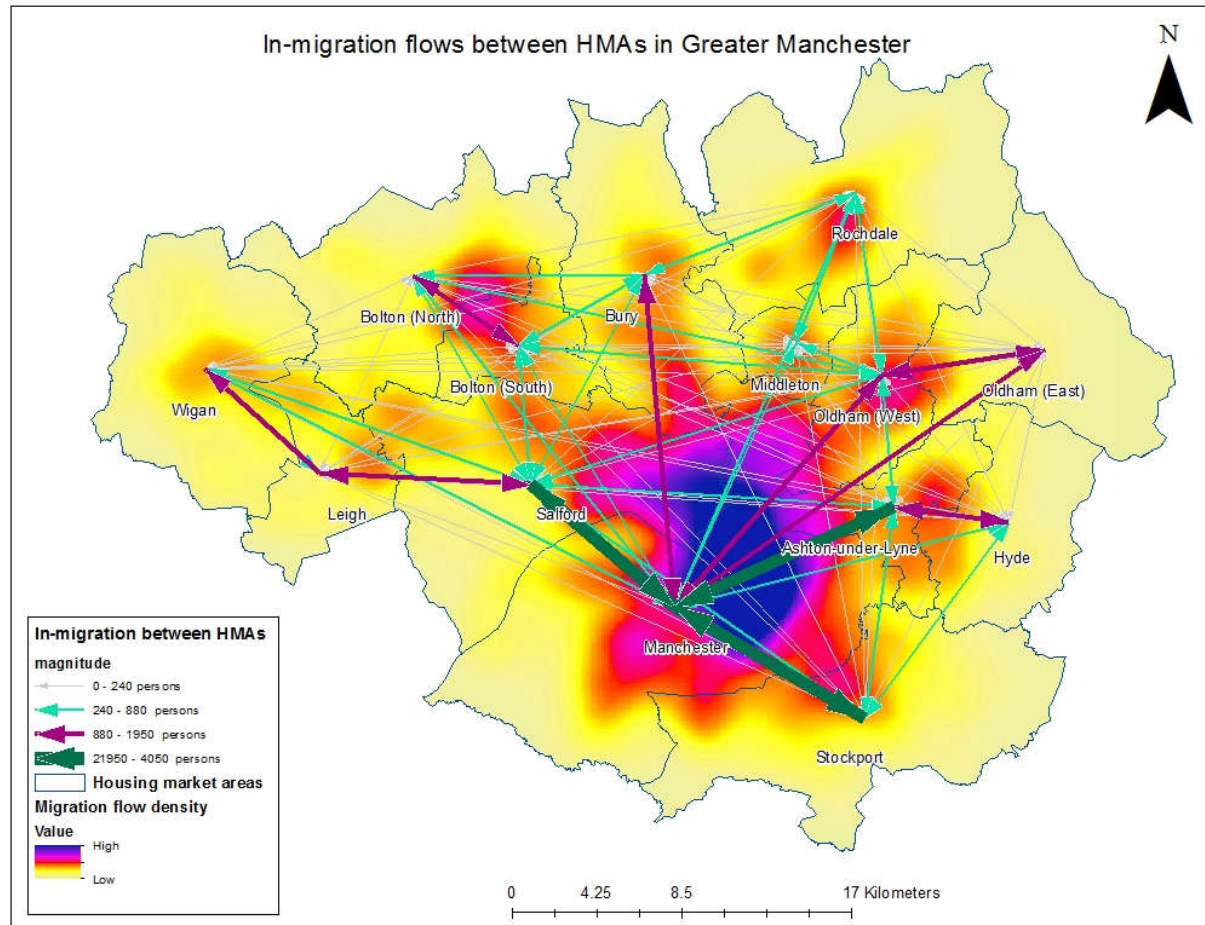
Figure 6.4: Out-mover numbers across 14 housing market areas in Greater Manchester.



Source: the thesis author's own analysis

The reason for the high numbers in-migrating to the central area could be that household mobility decision-making is significantly influenced by the consideration of economic factors, especially labour wage. In the case of local migration, wage is one of the major factors to influence mobility decisions. Meanwhile, long distance moves from one housing market area to another housing market area enable workers to adjust to the labour market by following new job opportunities (Sjaastad, 1962). Research has showed that workers tend to migrate to regions with higher wages (Greenwood, 1975; Shields & Shields, 1989; Bartel, 1979) to improve their current economic situation (Bartel and Borjas 1981, Boheim & Taylor, 2007), an especially important factor in the case of younger workers. Additionally, households enjoyed much higher income when they moved for new jobs compared to those who did not move home for new career perspective (Boheim and Taylor, 2007). Households also achieve a higher level of income if they migrated for job opportunity compared to those who changed their workplace but did not migrate (Yankow, 2003).

Figure 6.5: In-migration and migration density across 14 HMAs



Source: the thesis author's own analysis

Figure 6.5 shows us the links between the 14 HMAs based on migration flows in 2011. It is interesting that Bolton (North) and Bolton (South) have a tied connection when it comes to migration. Also, we can see high levels of migration activity between the adjacent areas of Oldham (West) and Oldham (East). Moreover, Manchester appears not only to be the most attractive areas to movers but also to have a high number of households leaving it. These migration activities came into play between Manchester and other HMAs including Stockport, Salford, Ashton-under-Lyne, and a smaller number from/to Bury, Oldham (West) or Middleton. In general, Manchester has become the centre of Greater Manchester and has strong links to a number of areas, significantly with Salford, Stockport, Ashton-under-Lyne.

It is argued that households make their mobility decision based on the consideration of various factors including social environment, low rate of crime, health service, green space, house price, career perspectives, time and cost associated with travel to work (Rogerson et al., 1989). Among these, one of the most important factors for the choice of migration location is the commute to the workplace (Breheny, 1999). For example, households tend to choose locations close to transport links, which helps to maximise their employment opportunities (Green, 1997). The high number of outmigration from Manchester can be explained by the improvement of access into Manchester. Gordon (1975), Molho (1982), Jackman and Savouri (1992) mentioned in relation to the commuting and migrating decisions that if the cost of commuting is cheap, the choice of location will be affected more significantly by relative housing market variables. In contrast, if commuting is not considered as cheap, the variables of relative labour market tend to have less effect and the choice of locations can be

made more independently from consideration of the location of the workplace. It can be argued that when commuting with longer distance households could buy houses with much lower price. For this reason, households tend to consider leaving Manchester and commuting to their workplaces in the centre as they can typically earn higher incomes and at the same time live in bigger homes with lower prices. For example, an average house in Manchester costs £185,000, which is a much higher price than in Bolton (South) (£90,000) or Wigan (£128,000) and Rochdale (£123,000) or Bury (£140,000), which are all around half an hour from the city. Households consider their mobility decisions based on taking into account the trade-off between commuting and migration.

To examine the proportion of moves in more detail, Table 6.6 below shows the information about migration percentage across 14 HMAs. The proportion is defined by numbers of in-migrates from an area and the total in-migrants. At first glance, several areas inside the HMA have percentages of migration above 70%, including Bury with 72.9%, Manchester with 78.2%, Rochdale with 80.8%, Wigan with 82%, Salford (70.9%) and Stockport (71.2%). Ashton-under-Lyne and Oldham East have quite low percentages at 51.1% and 55.3% respectively. These numbers also provide us with information about self-containment areas based on migration. If we set the self-containment threshold at above 70%, Bury, Manchester, Rochdale and Wigan all satisfy this requirement.

Table 6.6: Percentage of movement from origin to destination for 14 HMAs

Origins	Destinations													
	Ashton-under-Lyne	Bolton (North)	Bolton (South)	Bury	Hyde	Leigh	Manchester	Middleton	Oldham (East)	Oldham (West)	Rochdale	Salford	Stockport	Wigan
Ashton-under-Lyne	51.1%	0.4%	0.3%	0.9%	16.6%	0.3%	4.1%	1.9%	2.6%	2.8%	0.6%	1.7%	1.9%	0.3%
Bolton (North)	0.2%	62.7%	20.8%	2.2%	0.2%	3.1%	0.3%	0.2%	0.4%	4.6%	0.4%	1.6%	0.3%	2.0%
Bolton (South)	0.2%	16.6%	61.8%	2.8%	0.3%	1.5%	0.3%	0.5%	0.3%	2.3%	0.4%	2.1%	0.2%	0.5%
Bury	0.9%	2.2%	3.6%	72.9%	0.6%	0.4%	2.0%	3.2%	0.6%	1.3%	3.1%	2.1%	0.3%	0.2%
Hyde	12.3%	0.1%	0.1%	0.3%	64.9%	0.1%	0.6%	0.2%	3.7%	1.1%	0.4%	0.3%	2.2%	0.1%
Leigh	0.1%	1.9%	0.8%	0.2%	0.1%	61.9%	0.1%	0.1%	0.1%	0.3%	0.1%	3.6%	0.2%	7.8%
Manchester	22.1%	3.3%	2.4%	9.3%	6.1%	3.0%	78.2%	8.6%	7.9%	11.2%	3.7%	13.3%	20.2%	2.7%
Middleton	0.3%	0.1%	0.1%	0.7%	0.1%	0.1%	0.5%	55.4%	0.8%	1.9%	4.3%	0.3%	0.2%	0.1%
Oldham (East)	1.4%	0.1%	0.1%	0.4%	2.9%	0.1%	1.2%	1.5%	55.3%	8.4%	0.9%	0.2%	0.1%	0.0%
Oldham (West)	3.2%	6.4%	3.4%	1.3%	1.5%	0.4%	2.2%	7.0%	24.1%	59.3%	2.9%	0.8%	0.6%	0.3%
Rochdale	0.7%	0.3%	0.5%	3.0%	0.6%	0.2%	0.7%	17.9%	2.1%	4.0%	80.8%	0.6%	0.3%	0.1%
Salford	4.1%	3.6%	5.0%	5.3%	1.8%	14.3%	4.6%	2.9%	1.1%	2.0%	1.7%	70.9%	2.0%	3.8%
Stockport	2.9%	0.4%	0.4%	0.6%	4.2%	0.3%	4.9%	0.5%	0.8%	0.6%	0.5%	1.1%	71.2%	0.3%
Wigan	0.4%	1.9%	0.7%	0.2%	0.1%	14.4%	0.2%	0.1%	0.1%	0.1%	0.1%	1.3%	0.2%	82.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: the thesis author's own analysis

From table 6.6 above, we can identify a strong connection between several areas. For example, between Ashton-under-Lyne and Manchester, with 22.1% of in-migrants moving to Ashton-under-Lyne from Manchester; between Bolton North and Bolton South migration activity exceeded 16%; and 16% of out-migrants leaving Ashton-under-Lyne to move to Hyde. Further strong links can be seen between Rochdale and Middleton, with 17.9% of out-migrants leaving Rochdale; and Oldham East and Oldham West, with 24.1% of out-migrants leaving Oldham West; or Manchester and Stockport, with 20.2% of out-migrants leaving Manchester for Stockport.

It can be seen that Greater Manchester has good transport infrastructure comprising a comprehensive motorway network, an extensive city-wide rail network with over 200 tram and train stations, and the Metrolink tram system. These transportation networks provide good inter-suburban links and connect Manchester with the central of Bolton, Bury, Oldham and Rochdale. Also the UK's largest light rail system, Metrolink, covering 97 stops and over 57 miles of track, connects the central part of Manchester to many areas such as Altrincham, Ashton-under-Lyne, Bury, East Didsbury, Eccles, Manchester Airport and Rochdale. Meanwhile, the transport system connects Manchester with Ashton-under-Lyne, Bolton, Stockport and Wigan. These transport links have made the journey to work much more convenient for commuters; for example, the journey from the city centre to Stockport is 15 minutes, 36 minutes to Wigan, 21 minutes to Bolton, and 18 minutes to Rochdale. Hence, it is now cheaper and easier for commuters to live outside Manchester city centre.

It is important to identify the connections between HMAs as this may help us deal with the affordability problems due to the shortages of housing supply. A well-designed transport system could create a connection between advantaged and

disadvantaged areas and may not only help increase demand for housing in the disadvantaged ones but also ease pressure on the housing supply side in the advantaged. From the analysis above, we know that Stockport, Salford, Ashton-under-Leigh, Bury and Oldham (West) had fairly strong connections with Manchester, but the other HMAs seemed not to be strongly connected, such as Wigan and Leigh. To deal with the shortages of housing supply, it is necessary to attract more households to move to these HMAs, especially those areas with lower price. In order to change the migration patterns, the transport network and housing conditions both need to be improved.

In short, from the migration patterns above, it is possible to identify the locations or areas with high numbers of in-migrants, out-migrants and migration flows as well as the connections between HMAs. Such information may be useful when used together with house price or search patterns to help us understand better how the market system works locally.

6.3.2 Short, medium and long moves

Having looked at the links between HMAs, the chapter now explores the migration patterns within the HMAs based on short, medium and long distance. The study produced a number of visual maps based on distance to explore the migration patterns in relation to Output Areas. Migration lines were drawn from the centres of destination areas to the centres of original areas. Each line on the maps represents a migration flow from original area to destination area. All flows are shown on the maps based on distance to help us visually explore migration patterns within the HMAs. Moreover, this includes the calculation of movement proportions based on

distance to investigate the patterns of short and long distance moves between the HMAs.

6.3.2.1 Patterns of short, medium and long moves

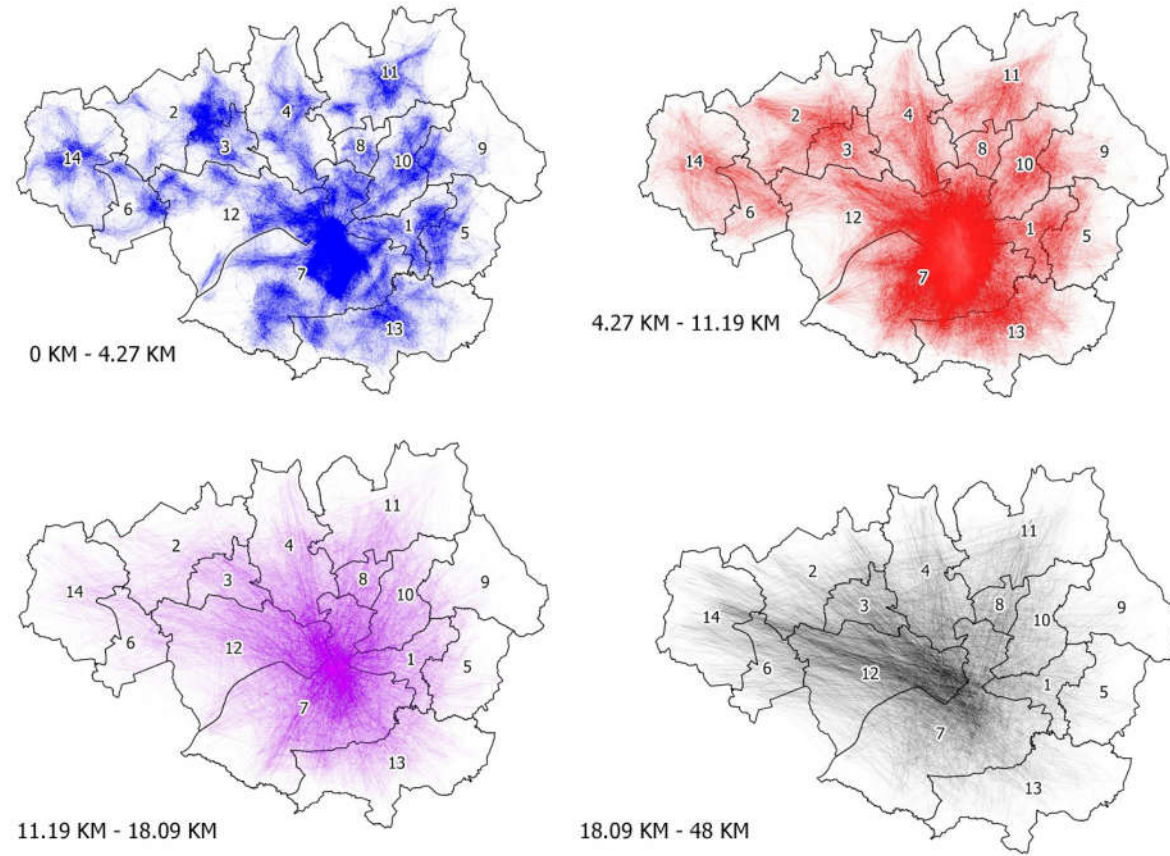
To provide a better view of the migration patterns within the existing HMAs, Figure 6.7 shows all migration flows based on distance: 0 Km – 4.27 Km, 4.27 – 11.19 Km, 11.19 – 18.09 Km and 18.09 – 48 Km. These distance bands are determined based on the statistical distribution. Through the moves from 0 Km to 4.27 Km, we can explore the migration patterns within local HMAs in Greater Manchester. The migration patterns that emerged in the 14 HMAs showed high density of flows from Rochdale, Bury, Bolton, to Wigan, Trafford, Stockport, Tameside, Oldham, Salford and Manchester. Manchester is an interesting case as it has a high density area in the middle. From the moves of s 4.27 – 11.19 Km, we can see that the size of area covered by the patterns becomes larger compared to the 0-4.27 Km moves. It is noted that the centre of Manchester appeared to be the biggest migration hub. Meanwhile, there are some smaller hubs of migration activity in other HMAs. For distances of 11.19 – 18.09 KM and 18.09 – 48 KM, the maps illustrate the flows based on these longer moves. Again, Manchester centre is the hub and attracted most of the movers. Regarding distances of above 48 Km, it seems that higher percentages of movers came from Wigan, Bolton (North, South) to the centre of Manchester.

These migration patterns from the map highlight a very intensive pattern of mobility activity at the heart of Manchester and many major patterns across Greater Manchester (from below 11.19Km). In terms of distances below 11.19 Km, the central area can be linked with high intensity of activity. In terms of long distance moves, this central area becomes the destination for migration flows from other areas.

This central area is similar to the central HMA identified in Greater Manchester SHMA (2008, 11) by Deloitte MCS Ltd and GVA Grimley (2008). As can be seen in the last two maps relating to long distance moves, in the central area of Greater Manchester, which includes parts of Manchester, Salford and Trafford, the regional business centres with the healthiest rates of economic growth, job opportunities drive migration flows from other areas.

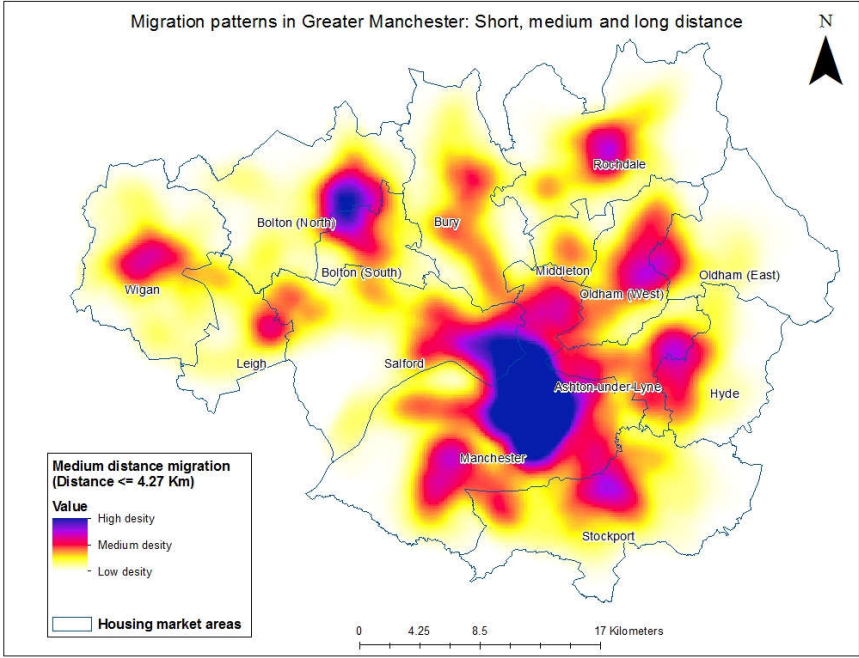
To have a better illustration, Figures 6.8, 6.9, 6.10 and 6.11 show patterns of migration flow density created using the 'line density' feature in ArcGIS. These patterns were based on the four distance ranges above. Clearly, people moved short distances within the boundaries of specific locations or areas in the housing market areas, for example, the hot spots in the city centre as well as smaller towns in other housing market areas such as Bolton (North), Rochdale, Wigan, Manchester South, Stockport, Oldham (West), Hyde and Ashton-under-Lyne or Leigh. Regarding medium distance, Manchester city seems to be the central location that people moved into or out of depending on preferred distance. Regarding long distance migration, people tended to move between the central area in Manchester and the western areas (Wigan, Leigh, Salford, Bolton North, Bolton South).

Figure 6.7 Migration patterns based on distance



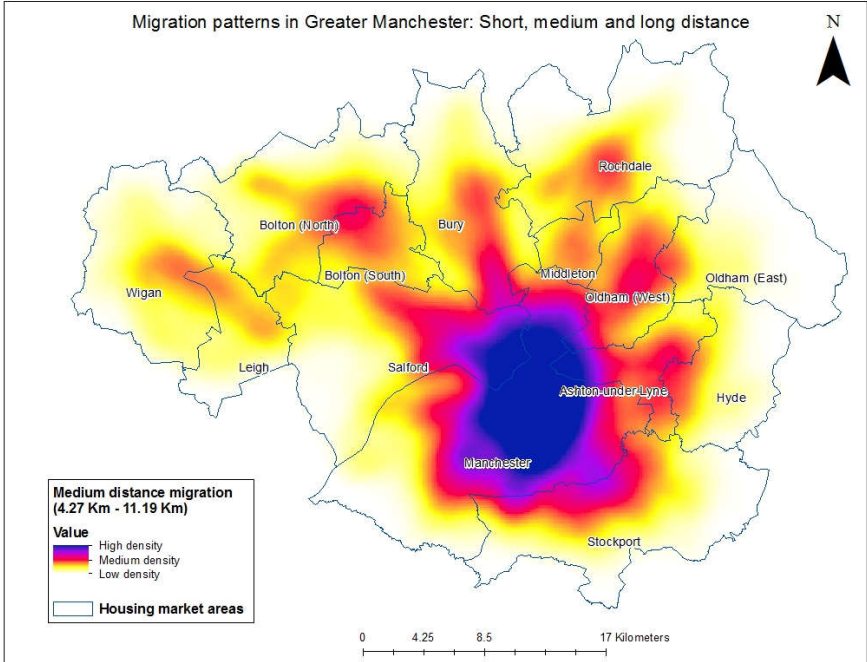
Source: the thesis author's own analysis

Figure 6.8: Flow density based on short distance below 4.27 Km



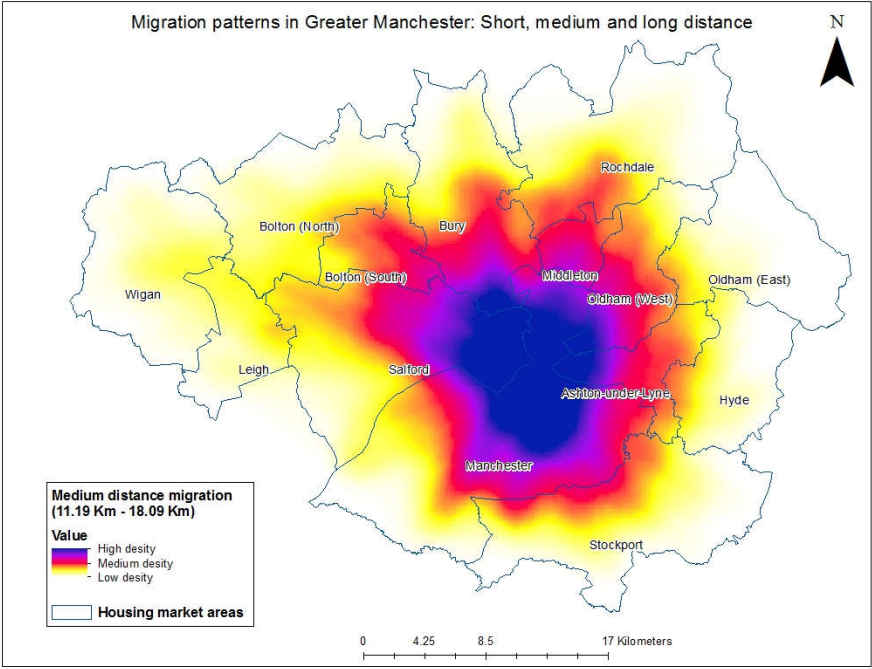
Source: the thesis author’s own analysis

Figure 6.9: Flow density based on medium distance 4.27 Km – 11.19 Km



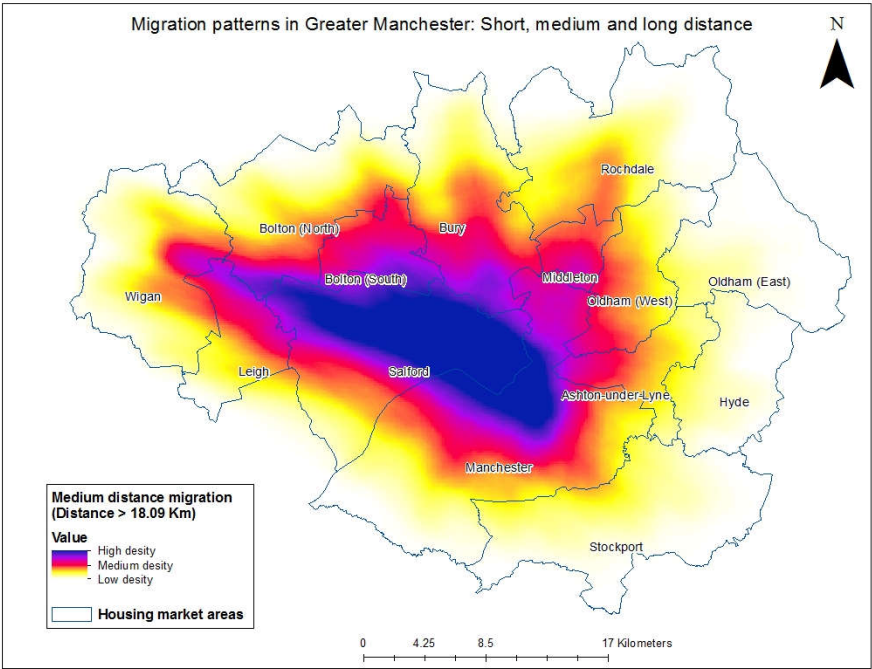
Source: the thesis author’s own analysis

Figure 6.10: Flow density based on medium distance 11.19 Km – 18.09 Km



Source: the thesis author’s own analysis

Figure 6.11: Flow density based on long distance above 18.09 Km



Source: the thesis author’s own analysis

It is worth noting that as Greater Manchester is a large metropolitan with a number of town centres outside the heart of the city, the housing market may comprise a system of submarkets. The maps also show a number of major migration patterns across the existing housing market areas. These local housing market areas seemed to be coincident or contain the surrounding town centre markets mentioned in the Greater Manchester Strategic Housing Market Assessment report (AGMA, 2008, 295), for example, Stockport, Oldham, Rochdale, etc. It is argued that workers may choose to live in lower priced houses far from the city centre because they can afford the cost of commuting to work in the city. Improvement of the transportation system has lowered commuting time and increased nonmetropolitan populations but will increase the number of nonmetropolitan commuters to the city centre.

From the first two maps, which show moves of 0 – 4.27 Km and 4.27 – 11.19 Km, we may also be able to review the existing HMAs based on the migration patterns from the data in 2011. It is worth noting that the HMAs here were taken from the NHPAU study for 2010 and migration data for 2001. These HMAs were identified based on high self-containment levels (typically 70 percent). This means that within a housing market area, there was a relatively high proportion of household moves. If there is a high proportion of migration flow outside the boundary of an HMA, this could mean that the HMA are no longer self-contained. When comparing the boundaries of these HMAs with the migration patterns from the maps above, some migration patterns crossed the boundaries of two adjacent HMAs. This can be seen more clearly through the case of Ashton-under-Lyne, where the movement pattern extended across several areas in Manchester. This situation can also be seen in the case of Leigh, where the migration pattern included some areas in Salford. Similar cases were seen in the

mobility patterns in Oldham (East) and Oldham (West). These observations may imply that boundaries of HMAs can change, especially over a long time period of 10 years as in this case.

6.3.2.2 Proportions of short, medium and long moves

To make a more detailed analysis, the study calculated the proportion of short, medium and long moves compared to the total number of migrants for each HMA. Tables 6.12, 6.13, 6.14 and 6.15 provide information about migration patterns based on short distances of 0 Km to 4.27 Km, medium distances of 4.27 – 11.19 Km and 19 – 18.09 Km and long distances of 18.09 – 48 Km. The left hand column shows the movers' areas of origin before migrating, while the other rows show the destinations to which movers moved. For example, in table 6.12, taking the place of origin as Ashton-under-Lyne and the destination as Hyde, the table shows that the percentage of movers was 6.7%. This means that 6.7% people moved the short distance to Hyde in the total number of out-migrants to all areas from Ashton-under-Lyne.

Table 6.12 Proportions of short distance moves for each HMA (below 4.268 Km)

Origins	Destinations														
	Ashton-under-Lyne	Bolton (North)	Bolton (South)	Bury	Hyde	Leigh	Manchester	Middleton	Oldham (East)	Oldham (West)	Rochdale	Salford	Stockport	Wigan	All areas
Ashton-under-Lyne	47.4%	0.0%	0.0%	0.0%	6.7%	0.0%	11.2%	0.0%	0.3%	2.2%	0.0%	0.1%	0.2%	0.0%	68.1%
Bolton (North)	0.0%	52.3%	7.9%	0.2%	0.0%	0.6%	0.0%	0.0%	0.0%	5.6%	0.0%	0.4%	0.0%	0.2%	67.2%
Bolton (South)	0.0%	9.0%	58.8%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	1.9%	0.0%	0.0%	73.0%
Bury	0.0%	0.3%	0.9%	59.8%	0.0%	0.0%	2.7%	0.1%	0.0%	0.0%	0.4%	1.4%	0.0%	0.0%	65.6%
Hyde	8.2%	0.0%	0.0%	0.0%	58.9%	0.0%	0.2%	0.0%	0.4%	0.0%	0.0%	0.0%	0.9%	0.0%	68.6%
Leigh	0.0%	1.0%	0.0%	0.0%	0.0%	56.9%	0.0%	0.0%	0.0%	0.0%	0.0%	7.8%	0.0%	4.9%	70.6%
Manchester	2.4%	0.0%	0.0%	0.8%	0.0%	0.0%	63.7%	0.2%	0.9%	1.2%	0.0%	1.5%	1.3%	0.0%	72.0%
Middleton	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	1.8%	55.4%	0.0%	3.2%	8.7%	0.0%	0.0%	0.0%	69.3%
Oldham (East)	0.7%	0.0%	0.0%	0.0%	0.8%	0.0%	3.7%	0.0%	42.9%	12.0%	0.0%	0.0%	0.0%	0.0%	60.2%
Oldham (West)	1.8%	4.1%	1.2%	0.0%	0.0%	0.0%	5.6%	0.8%	3.9%	54.4%	0.7%	0.0%	0.0%	0.0%	72.4%
Rochdale	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.0%	1.9%	0.0%	0.7%	65.7%	0.0%	0.0%	0.0%	68.7%
Salford	0.1%	0.2%	0.8%	0.6%	0.0%	1.8%	4.5%	0.0%	0.0%	0.0%	0.0%	59.0%	0.0%	0.0%	67.0%
Stockport	0.1%	0.0%	0.0%	0.0%	0.6%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	58.7%	0.0%	64.4%
Wigan	0.0%	0.2%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	70.2%	73.5%

Source: the thesis author's own analysis

Table 6.13 Proportions of medium distance moves for each HMA (4.268 Km - 11.18Km)

Origins	Destinations														
	Ashton-under-Lyne	Bolton (North)	Bolton (South)	Bury	Hyde	Leigh	Manchester	Middleton	Oldham (East)	Oldham (West)	Rochdale	Salford	Stockport	Wigan	All areas
Ashton-under-Lyne	3.7%	0.0%	0.0%	0.3%	5.5%	0.0%	9.5%	0.2%	0.9%	0.9%	0.0%	2.6%	1.7%	0.0%	25.2%
Bolton (North)	0.0%	10.1%	8.5%	1.5%	0.0%	1.0%	0.0%	0.0%	0.0%	0.6%	0.0%	1.3%	0.0%	1.2%	24.2%
Bolton (South)	0.0%	11.4%	3.0%	2.1%	0.0%	0.6%	0.3%	0.0%	0.0%	1.2%	0.1%	2.7%	0.0%	0.0%	21.3%
Bury	0.2%	1.2%	1.9%	12.6%	0.0%	0.0%	2.5%	0.5%	0.0%	0.5%	1.9%	2.9%	0.0%	0.0%	24.2%
Hyde	8.2%	0.0%	0.0%	0.0%	6.0%	0.0%	2.5%	0.0%	2.3%	1.2%	0.0%	0.0%	2.1%	0.0%	22.4%
Leigh	0.0%	1.4%	1.1%	0.0%	0.0%	5.1%	0.1%	0.0%	0.0%	0.0%	0.0%	5.0%	0.0%	8.0%	20.7%
Manchester	1.5%	0.0%	0.0%	0.7%	0.3%	0.0%	13.7%	0.3%	0.1%	0.7%	0.2%	2.5%	3.0%	0.0%	23.0%
Middleton	1.5%	0.0%	0.1%	2.3%	0.1%	0.0%	4.1%	0.0%	1.2%	3.8%	8.3%	2.1%	0.0%	0.0%	23.5%
Oldham (East)	1.6%	0.0%	0.0%	0.0%	2.7%	0.0%	0.9%	0.8%	12.4%	11.3%	1.7%	0.0%	0.0%	0.0%	31.4%
Oldham (West)	0.9%	0.3%	0.9%	0.5%	0.9%	0.0%	3.9%	1.1%	4.2%	4.8%	2.6%	1.0%	0.0%	0.0%	21.1%
Rochdale	0.1%	0.0%	0.0%	2.0%	0.0%	0.0%	0.8%	2.2%	0.7%	1.7%	14.9%	0.2%	0.0%	0.0%	22.4%
Salford	1.1%	0.6%	1.1%	1.0%	0.0%	1.4%	6.7%	0.3%	0.0%	0.4%	0.1%	11.1%	0.0%	0.5%	24.4%
Stockport	0.9%	0.0%	0.0%	0.0%	1.2%	0.0%	11.4%	0.0%	0.0%	0.0%	0.0%	0.2%	12.3%	0.0%	26.1%
Wigan	0.0%	1.0%	0.1%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.0%	11.7%	18.6%

Source: the thesis author's own analysis

Table 6.14 Proportions of medium distance moves for each HMA (11.18 Km - 18.09Km)

Origins	Destinations														
	Ashton-under-Lyne	Bolton (North)	Bolton (South)	Bury	Hyde	Leigh	Manchester	Middleton	Oldham (East)	Oldham (West)	Rochdale	Salford	Stockport	Wigan	All areas
Ashton-under-Lyne	0.0%	0.0%	0.1%	0.5%	0.1%	0.0%	1.3%	0.1%	0.3%	0.0%	0.5%	1.2%	1.0%	0.0%	5.1%
Bolton (North)	0.0%	0.3%	0.2%	0.6%	0.0%	0.2%	0.4%	0.1%	0.0%	0.0%	0.1%	1.5%	0.0%	0.4%	3.8%
Bolton (South)	0.1%	0.4%	0.0%	0.2%	0.0%	0.2%	1.3%	0.1%	0.0%	0.1%	0.2%	0.5%	0.0%	0.5%	3.5%
Bury	0.5%	0.6%	0.1%	0.4%	0.1%	0.1%	2.7%	0.0%	0.3%	0.6%	0.6%	1.0%	0.1%	0.0%	7.1%
Hyde	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	2.8%	0.1%	0.2%	0.2%	0.3%	0.8%	1.1%	0.0%	5.8%
Leigh	0.0%	0.6%	0.4%	0.3%	0.0%	0.0%	1.0%	0.0%	0.0%	0.2%	0.0%	1.1%	0.0%	1.5%	4.9%

Manchester	0.2%	0.0%	0.2%	0.4%	0.2%	0.0%	0.8%	0.1%	0.1%	0.2%	0.3%	0.5%	0.6%	0.0%	3.7%
Middleton	0.4%	0.1%	0.3%	0.6%	0.2%	0.0%	2.2%	0.0%	0.3%	0.0%	0.8%	0.7%	0.2%	0.0%	5.7%
Oldham (East)	0.4%	0.0%	0.0%	0.4%	0.2%	0.0%	2.3%	0.0%	0.0%	0.7%	0.4%	0.7%	0.3%	0.0%	5.4%
Oldham (West)	0.1%	0.0%	0.1%	0.8%	0.1%	0.1%	1.3%	0.0%	0.3%	0.0%	0.7%	0.8%	0.5%	0.0%	4.8%
Rochdale	0.5%	0.1%	0.2%	0.7%	0.3%	0.0%	1.3%	0.3%	0.2%	0.5%	0.3%	0.8%	0.0%	0.0%	5.2%
Salford	0.4%	0.7%	0.2%	0.5%	0.2%	0.3%	1.9%	0.1%	0.1%	0.3%	0.4%	0.8%	0.8%	0.3%	6.9%
Stockport	0.9%	0.0%	0.0%	0.0%	0.4%	0.0%	3.5%	0.1%	0.1%	0.4%	0.0%	1.3%	0.2%	0.0%	6.9%
Wigan	0.0%	0.6%	0.4%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	1.0%	0.0%	0.0%	2.6%

Source: the thesis author's own analysis

Table 6.15 Proportions of long distance moves for each HMA (above 18.09Km)

Origins	Destinations														
	Ashton-under-Lyne	Bolton (North)	Bolton (South)	Bury	Hyde	Leigh	Manchester	Middleton	Oldham (East)	Oldham (West)	Rochdale	Salford	Stockport	Wigan	All areas
Ashton-under-Lyne	0.0%	0.2%	0.1%	0.2%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%	0.4%	1.5%
Bolton (North)	0.4%	0.0%	0.0%	0.0%	0.1%	0.1%	2.9%	0.0%	0.1%	0.1%	0.2%	0.4%	0.4%	0.0%	4.8%
Bolton (South)	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.8%	0.0%	0.1%	0.2%	0.2%	0.0%	0.4%	0.1%	2.1%
Bury	0.2%	0.1%	0.0%	0.0%	0.2%	0.1%	1.4%	0.0%	0.2%	0.1%	0.0%	0.1%	0.4%	0.2%	3.1%
Hyde	0.0%	0.2%	0.3%	0.5%	0.0%	0.1%	0.6%	0.0%	0.0%	0.0%	0.3%	1.0%	0.1%	0.1%	3.1%
Leigh	0.3%	0.0%	0.0%	0.2%	0.1%	0.0%	1.9%	0.1%	0.1%	0.3%	0.2%	0.5%	0.3%	0.0%	3.8%
Manchester	0.0%	0.3%	0.1%	0.2%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	1.3%
Middleton	0.0%	0.2%	0.1%	0.0%	0.0%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.1%	1.4%
Oldham (East)	0.0%	0.4%	0.3%	0.1%	0.0%	0.1%	1.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.5%	0.1%	3.1%
Oldham (West)	0.0%	0.2%	0.2%	0.0%	0.0%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.1%	1.7%
Rochdale	0.1%	0.3%	0.2%	0.0%	0.1%	0.1%	1.6%	0.0%	0.0%	0.0%	0.0%	0.7%	0.5%	0.1%	3.6%
Salford	0.2%	0.1%	0.0%	0.0%	0.2%	0.0%	0.2%	0.0%	0.1%	0.1%	0.2%	0.0%	0.3%	0.4%	1.8%
Stockport	0.0%	0.3%	0.2%	0.3%	0.1%	0.2%	0.2%	0.1%	0.0%	0.1%	0.3%	0.5%	0.0%	0.2%	2.6%
Wigan	0.3%	0.1%	0.0%	0.2%	0.1%	0.0%	2.7%	0.1%	0.0%	0.2%	0.1%	1.4%	0.3%	0.0%	5.4%

Source: the thesis author's own analysis

According to these four tables, at 73.5% the proportions of short distance moves were significant in Wigan compared to 21.2 % for medium distance moves (18.6% for distance above 4.268 Km and below 11.18Km and 2.6% for distance 11.18 – 18.09Km) and 5.4% for long distance moves. This means that the majority of households in Wigan made short distance local moves within the HMA boundary. This was followed by Bolton South with 73% of short moves in relation to the total number of migrants. Meanwhile, at 64.4% Stockport had the least percentage of short moves. Regarding longer distance moves, Oldham West witnessed the highest percentage at 31.4%, with distance ranging from 4.268 Km to 11.18 Km, while Wigan had the lowest at 18.6%. Strong connections linking HMAs can be seen between Bolton North and Bolton South, with 8.5% of movers to Bolton South coming from Bolton North, and between Manchester and Salford / Stockport, with 2.5 % migrants from Manchester moving to Salford and 3% to Stockport. Regarding distances of 11.18 Km - 18.09 Km, the moves declined in number, with the highest level of 7.1% recorded by Bury, and the lowest level of 2.6% by Wigan. Further strong connections were seen between Manchester and Bury, Hyde and Stockport, with 2.7%, 2.8% and 3.5% respectively of migrants coming from Manchester originally. Meanwhile, regarding long distance moves (above 18.09 Km), Wigan saw the highest level at 5.4%, whilst Manchester and Middleton saw the lowest levels at 1.3% and 1.4% respectively. A number of areas saw their highest numbers of out-migrants moving to Manchester, including Bolton North (2.9%), Wigan (2.7%), Leigh (1.9%), Rochdale (1.6%), Bury (1.4%) and Oldham East (1%).

In terms of reasons for moving home, Clark and Maas (2013) indicated that households make the decision to migrate if they feel they can enjoy better

neighbourhoods, lifestyles and job perspectives. In the current world, moving for work is not necessarily the main motivation for households to migrate. Households pay more attention to amenities in destination areas (Glaeser et al., 2001). As a result, employment, residence, neighbourhood, family and lifestyle all play an important role in the mobility process and vary across the mobility distance (Shields & Wooden, 2003). This indicates that to attract immigration, policy makers should pay attention to improving neighbourhoods in addition to creating jobs (Clark and Maas, 2013).

Short distance moves tend to be motivated by both non-economic and economic reasons, such as occupational opportunities, family needs, community, and lifestyle (Clark and Maas 2013). Households may need to move to larger or smaller housing due to changes in family structure, or choose to move to better quality housing when their income increases. They also make decisions to move to locations near their workplace, but this is not really a significant influential factor in the case of short moves. But for long distance moves, it may be a different story. Many studies have claimed that job opportunities and differences across labour markets influence motivation to make a long distance move (Greenwood, 1975; Shields & Shields, 1989; Bartel, 1979; Bartel and Borjas, 1981). However, the primary motivations in location choice are not jobs, but various factors associated with the characteristics of dwelling units, neighbourhoods, residential and social environment as well as lifestyle (Clark and Maas 2013).

Generally, the analysis above provided us with key findings regarding, firstly, patterns of short, medium, long distance mobility and, secondly, their proportions. Regarding short distance moves, mobility activity was focused on several local areas in major and smaller towns of HMAs such as Bolton North, South Manchester,

Wigan, Rochdale, Oldham West, Stockport, Ashton-under-Lyne. However, such activity was more significant in the city centre and its surrounding neighbourhoods (including parts of Salford). Regarding medium distance moves, when distance increased, the city centre became a central location, with people moving to or from here and other surrounding areas. Regarding long distance moves, migration activity tended to create connections between the central business area (city centre and its surrounding neighbourhoods including parts of Salford) and west-side areas such as Salford, Bolton (North, South), Wigan, Leigh. Through the visual maps above, several hotspots with high levels of migration density were identified. These hotspots were located in the central business district, major towns and smaller towns in the Greater Manchester system.

Regarding proportions of moves, the majority of moves were of short distance within the individual HMAs (from 60.2% - 73.5%), while smaller proportions of moves were long distance from one HMA to another HMA (from 1.3% - 5.5%). Wigan and Bolton South had the highest percentages of short moves, whilst Wigan again had the highest number of long distance moves. Stockport had the lowest percentage of short moves, while Manchester and Middleton had the lowest levels of long distance moves. Further, the analysis of migration flows provided information about the strength of connections between HMAs.

The analysis of migration flows above could only show changes in residential locations, and provided little information about housing demand. From migration patterns, it is not possible to identify household demand for different housing types, prices or locations. On the other hand, while the house price transactions data from Land Registry can provide information about market outcomes such as house sale

values and volumes, it is difficult to identify where housing demand came from and how it changed. Nevertheless, these shifts in housing demand play an important role in creating different submarkets. Therefore, analyses of migration and house price, when combined, may provide new insight on the housing market in terms of the interactions between submarkets within HMAs. The following section will explore the links between submarkets based on migration flows and house price.

6.4 Dynamics of submarkets

The study adopts a framework assuming that local HMAs are composed of an arrangement of housing submarkets (Jones et al., 2005; Jones et al., 2012) and are subject to disequilibrium between supply and demand. Adjustment to imbalance then comes into play through a variety of mechanisms including migration (Bramley et al., 2008) and is seen as a way to ease the pressure on the housing market (Cameron and Muellbauer, 1998). The adjustment among submarkets via migration flows also shows the connections between submarkets. By exploring the links between submarkets, we may be able to identify shifts in demand from submarket to submarket and identify those submarkets which have close connections.

In the housing market literature, researchers have paid attention to the analysis of advantaged and disadvantaged neighbourhoods (Rae et al., 2016), neighbourhood changes (Hincks, 2015) and the tendency of households move in and out them (Clark and Mass, 2016). However, little effort has been paid to the connections between neighbourhoods in general, which caused Clark and Mass (2016) to raise a number of questions. First, are poor neighbourhoods disconnected from other neighbourhoods in the local housing market? Do households move from wealthy areas to poor areas and

vice versa and how extensive are those links? By looking at the links between submarkets within a system of HMAs, this study intends to answer these questions.

The section will firstly examine the proportions of moves between submarkets based on house price differentials. After that, it explores the connections between low-end price and high-end price areas with wider areas. To make it clearer, a number of maps are presented to explore the outflows and inflows regarding the lowest priced submarkets and highest priced submarkets. The study also looks at one high-end and one low-end neighbourhood, City Centre and Rumworth respectively, to explore the proportions of moves in detail.

6.4.1 Proportions of moves between submarkets

According to filtering theory, when households' income increases they may change their aspirations for housing. An increase in income may lead households to raise their requirements for housing to a higher level. They may upgrade their current house, or may want to move to a house that is of a higher standard. This is called upward movement. In contrast, when households' income declines, they may want to live in lower price accommodation and this can be regarded as a downward move. To examine this phenomenon, we can analyse the mobility flows of households between the areas defined by house price difference. In particular, we can explore household movements between areas with different price levels in order to explore the dynamics of the local markets.

This section uses the submarkets defined by price differentials mentioned in the previous chapter, specifically, submarket 1 represents significantly low price level, submarket 2 low price, submarket 3 medium price, submarket 4 high price, and

submarket 5 represents significantly high price. Based on the available migration flow data, the percentages of migration flows from original submarkets to destination submarkets are presented to provide us with information about the dynamics of the submarkets at the local level. The details are provided in Table 6.16 below.

Table 6.16: Proportion of moves from submarkets to submarkets in the total number of moves for the whole market system

Origins	Destinations					
	Submarket 1 Significantly low price	Submarket 2 Low price	Submarket 3 Medium price	Submarket 4 High price	Submarket 5 Significantly high price	Total
Submarket 1 Significantly low price	0.78%	0.99%	1.24%	0.14%	0.12%	3.27%
Submarket 2 Low price	0.58%	8.84%	8.22%	1.89%	0.94%	20.48%
Submarket 3 Medium price	0.46%	5.93%	30.73%	7.35%	3.61%	48.09%
Submarket 4 High price	0.07%	1.27%	8.07%	8.15%	2.55%	20.11%
Submarket 5 Significantly high price	0.04%	0.60%	2.44%	1.43%	3.55%	8.06%
Total	1.94%	17.63%	50.70%	18.96%	10.78%	100%

Source: the thesis author's own analysis

From the table above, it can be noted that the highest proportion of inward migration flow was seen in submarket 3, with a total of 50.70%, followed by submarket 4, submarket 2, submarket 5, and finally submarket 1. On the other hand, the highest level of total migration, 48.09%, was also seen in submarket 3, followed by submarket 2, submarket 4, submarket 5 and submarket 1. Most people moved within their current type of submarket with similar characteristics, for example from

submarket 2 to submarket 2 or submarket 3 to submarket 3, except for submarket 1, where 0.78% moved within the submarket compared to 0.99% moving to submarket 2. People move to the same level of neighbourhood and this implies people move because of reasons other than increase in income. According to the table, filtering occurs not only in upward and downward moves, but also within similar submarkets. Indeed, the percentage of moves within similar submarkets was even higher than those of moves up and down. From the observations, the likelihood of moving up and within similar submarkets is much higher than moving down, except in the cases of submarkets 4 and 5.

Those who moved within similar submarkets may have done so mainly for family life cycle and other non-economic reasons, for example, moving to places near friends, family, relatives, or due to family breakup, marriage, or young people moving near their parents' houses. Regarding upward and downward moves, the choice of neighbourhoods is mainly dependent on household income. Households with high financial ability tend to search in areas with high quality houses, for example, 8.84% out of 20.48% households moved from submarket 2 to the higher priced submarket 3. In contrast, those with low income tend to search in areas with lower quality or smaller housing units, for example, 0.58% out of 20.48% households moved from submarket 2 to the lower priced submarket 1. However, despite the importance of income, there are other factors affecting the choice of where to live, for example, religion, communities, friends, family and supply restrictions (Clark and Fossett, 2008; Meen, 2012; Whitehead, 2012). Moreover, factors relating to education, employment and training tend to motivate households to move out of poor areas such as submarket 1 and this movement may lead to an increase in the level of deprivation in such areas (Cheshire et al., 2003; Dorling and Rees, 2003).

The information above in relation to the proportions of moves up, down and within similar submarkets may be useful in reviewing the supply side of the market. To achieve better planning of new housing stock provision, it is necessary to know what type of dwelling units are needed and where to build them. From the table above, the percentage of households moving to the significantly high price submarket totals 10.78% compared to the 50.70% moving to the medium price submarket and 17.63% moving to the low price submarket. Therefore, this implies a need to supply a high proportion of medium price housing units, followed by supply of low price housing units, and then high price housing units. However, in reality, high numbers of new built dwelling units are significantly highly priced and as a result they are out of reach for many medium income households. To deal with this situation, the cost of building new houses needs to be reduced through careful consideration of where to allocate land, the size of the houses, and other factors. According to the 2011 Census data, in the city of Manchester the average household size had decreased, with an increase in households of single people aged under 65. This reflects a decline in demand for family-sized houses. If the average household size continues to fall over the next decade, building smaller dwelling units with lower price would meet the corresponding growth in demand for such properties.

To explore the dynamics of the submarkets on the maps, we need to look at the patterns of migration flows in relation to the areas with significantly low price and significantly high price levels, both in-migration and out-migration in the following section. We will examine the dynamics of submarket 1 and 5 which have significantly low and significantly high price levels respectively. The maps will provide us with the picture of connections between low-end price neighbourhoods and high-end price neighbourhoods. According to filtering theory, households may

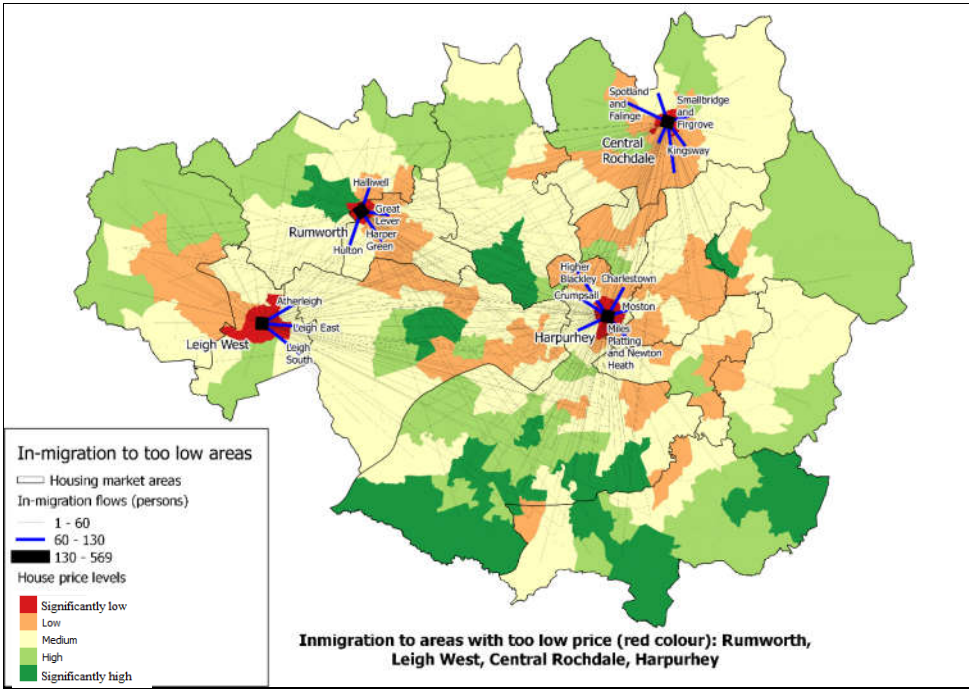
move upward to houses with higher prices, or downward to houses with lower prices, or move to houses with similar prices. If an area has a high number of in-migrants coming from the other areas, it is possible to check whether this area seems to be the most attractive area for upward moves or downward moves or moves to areas with similar price levels and to identify which areas are more attractive among those areas with similar price levels. It is also possible to identify the higher price areas which were more attractive to movers from lower price areas and vice versa.

6.4.2 Connections of low-end price submarkets

6.4.2.1 Are low-end price submarkets isolated?

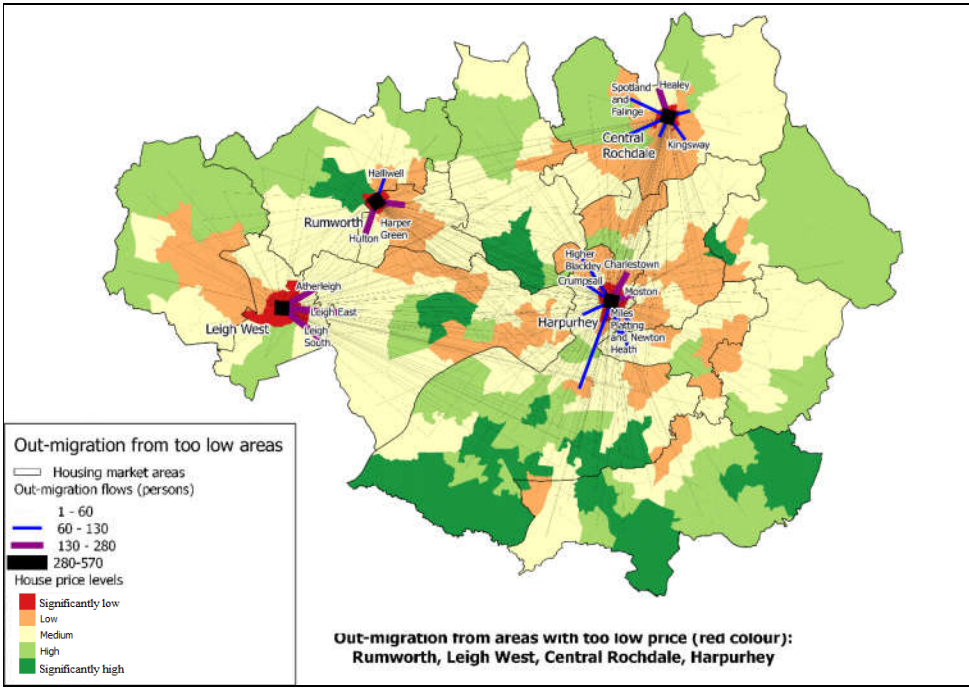
Figures 6.17 and 6.18 present the migration flows to and from the areas with significantly low price levels. It is interesting that the significantly low price area of Rumworth, in Bolton (South), attracted a high proportion of movers compared to the other areas with significantly low prices. On the other hand, this area also saw a high rate of out-migration, and most of the movers migrated to neighbouring areas with higher prices. A similar situation is seen in the too-low-price area of Harpurhey, in Manchester, where people moved out to the surrounding areas. Meanwhile, the areas of Central Rochdale in Rochdale and Leigh West in Leigh had lower proportions of movers, in terms both of in-migration and out-migration.

Figure 6.17: In-migration to the red colour areas at the level of significantly low price



Source: the thesis author’s own analysis

Figure 6.18: Out-migration from the red colour areas at the level of significantly low price

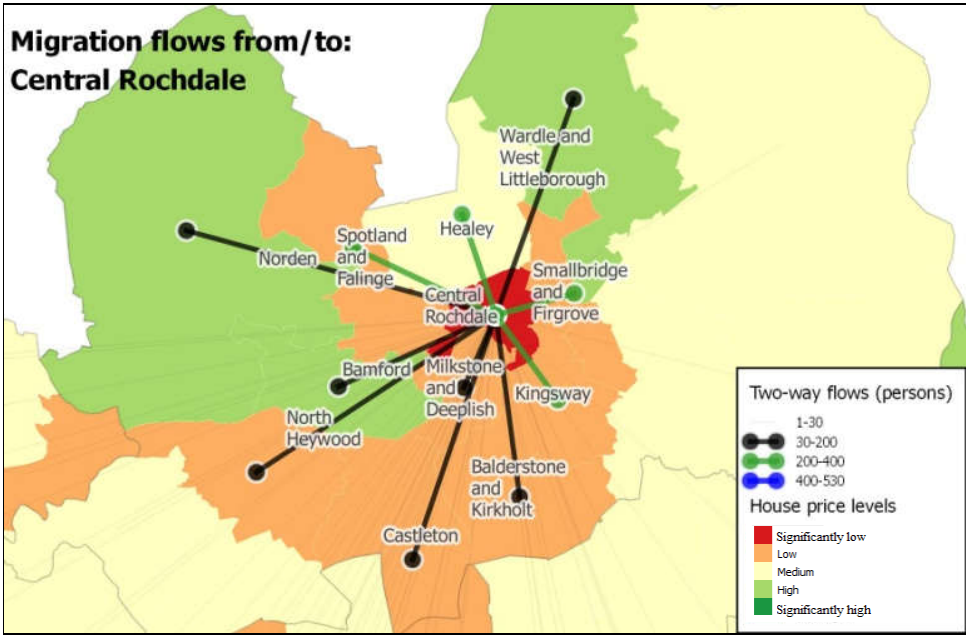


Source: the thesis author’s own analysis

The areas with the lowest price levels may often be associated with issues of neighbourhood deterioration. In such areas, households form strong intentions to leave their homes as a reaction to the bad impact from their neighbourhoods. As a result, the attractiveness of these areas to potential buyers may be reduced. For example, most of the movers in Leigh West and Central Rochdale left these areas. The areas with the lowest prices may often be options for those households with low incomes or beginners starting out on the property ladder. These areas also are the targets of investors, who purchase to rent out or to repair and sell at a higher price.

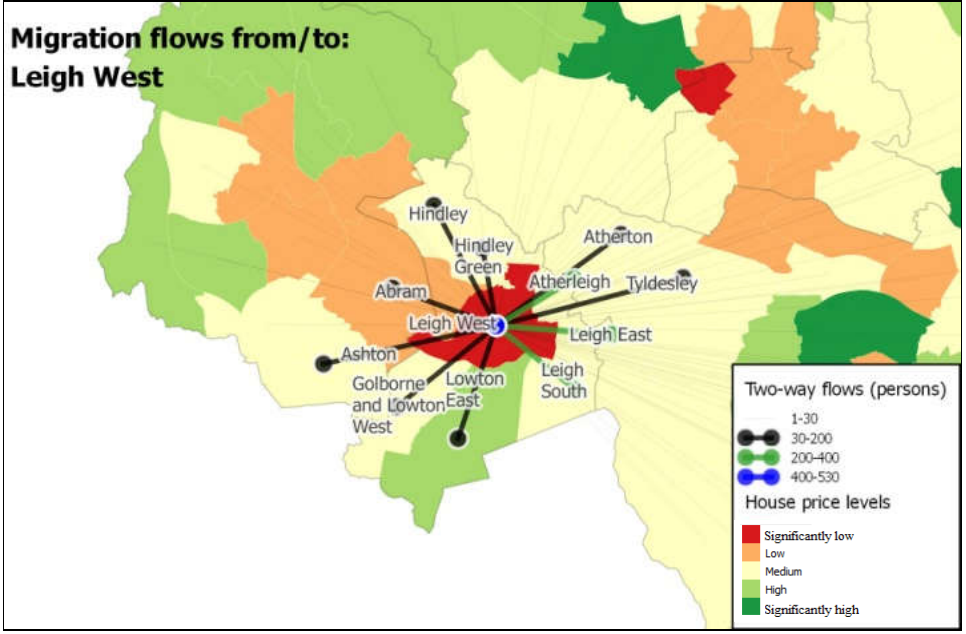
Figures 6.19 and 6.20 illustrate the reciprocal migration flows between two low-end price submarkets, namely Central Rochdale and Leigh West, and other submarkets. These maps show a stronger connection between these low-end price submarkets and their neighbouring submarkets. Regarding Central Rochdale, a high number of migrants (200-400 persons) moved from and to areas with higher price levels: Spotland and Falinge, Healey, Kingsway, Smallbridge, and Firgrove. It also had connections with the high price submarkets of Norden, Barmford, Wardle and West Littleborough (30-200 persons). In terms of Leigh West, it had a connection with the high price area of Lowton East and stronger connections with the medium price areas of Atherleigh, Leigh East, Leigh South.

Figure 6.19: Reciprocal migration flows between Central Rochdale and other submarkets



Source: the thesis author’s own analysis

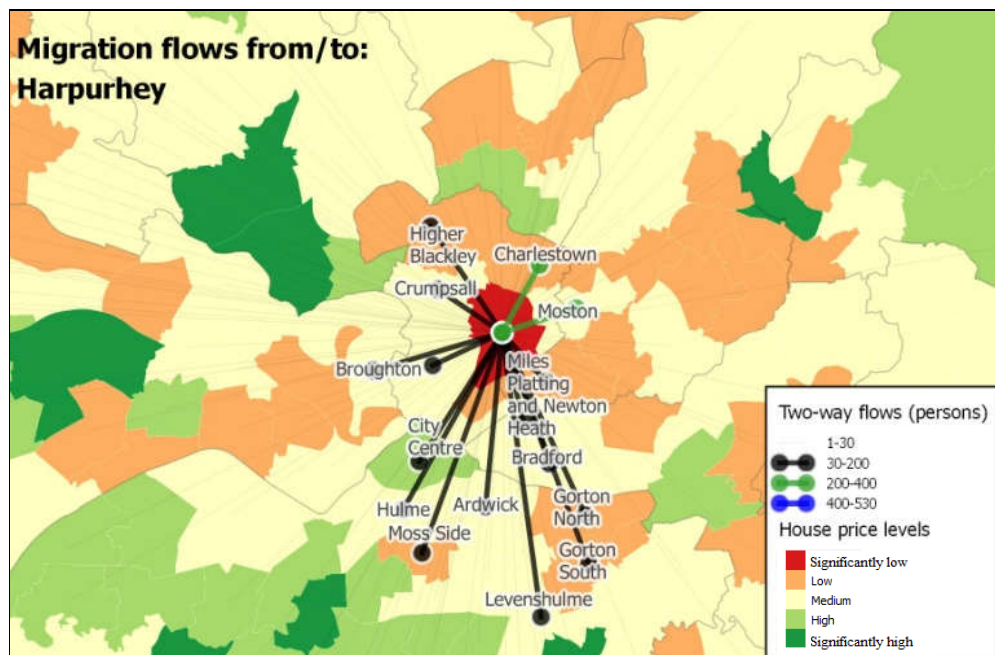
Figure 6.20: Reciprocal migration flows between Leigh West and other submarkets



Source: the thesis author’s own analysis

In the case of Harpurhey, Greater Manchester SHMA (2008, 295-296) described that it had a fairly low percentage of adults with university degrees, high unemployment rate, and experienced high levels of deprivation. This submarket was likely to contain dwellings of poorer quality and low price on the periphery, suitable for low income households. However, as illustrated in Figure 6.21, the area did have a connection with the high price City Centre area and stronger links with Charlestown and Moston (with low and medium price levels respectively). To improve the connections with other areas, it is necessary to improve infrastructure, transport systems, the quality and range of homes, remove individual barriers, and encourage private sector investment to support regeneration. With its location close to the City Centre as an advantage, such improvement practice is likely to attract new households with different demographic profiles to move to this area.

Figure 6.21: Reciprocal migration flows between Harpurhey and other submarkets



Source: the thesis author's own analysis

The study shows that most neighbourhoods are not isolated in the market system. The maps above help to answer the question whether the lowest price submarkets or poorest neighbourhoods are isolated. From the analysis, while they seem not to be isolated, connections are less intensive compared to those of other submarkets. Nevertheless, they had strong links to several particular neighbourhoods. This observation supports the finding by Clark and Mass (2016) that submarkets are linked and not disconnected with wider areas. The lowest price submarkets have only slightly lower levels of connection than the other submarkets. To examining the proportion of moves for a particular low-end price area, the following section takes Rumworth as an example to explore its connection with other areas.

6.4.2.2 Rumworth

Rumworth is located in Bolton, Greater Manchester. According to the 2011 census, it had a population of 16,250, with a high percentage of dependent children and ethnic groups. Rumworth has the lowest average price in Bolton at around £77,951.

According to Bolton's Housing Needs and Market Assessment of 2011, Rumworth suffers from deprivation based on a high percentage of low income households and low rate of employment. Terraced properties make up around half of all the housing stock in Rumworth (Bolton Council, 2011).

Table 6.22 shows the migration figures for Rumworth, in particular the proportions of moves up, down and within similar submarkets, and the distances involved.

Rumworth comes under submarket 1, the lowest price level. Regarding in-migration, Rumworth saw the highest number of moves within submarket 1 at 40.06% and a fairly small number of moves down from submarket 4 and 5 at 3.55% and 2.27% respectively. On the other hand, there was a considerable percentage of moves down

from submarket 2 at 30.6%, while 23.96% were moves down from submarket 3.

According to mobility distance, the longest distance that households moved was the 16.10 Km from submarket 5.

Table 6.22 Migration proportions for Rumworth

Migration from/to Rumworth	Total moves (person)	Percentage (%)	Distance (Km)
In-migrates from			
Submarket 1	530	40.06	0.00
Submarket 2	399	30.16	12.11
Submarket 3	317	23.96	10.46
Submarket 4	47	3.55	14.13
Submarket 5	30	2.27	16.10
Grand Total	1323	100.00	10.56
Out-migrates to			
Submarket 1	530	36.05	0.00
Submarket 2	429	29.18	6.60
Submarket 3	423	28.78	8.96
Submarket 4	42	2.86	10.60
Submarket 5	46	3.13	6.00
Grand Total	1470	100.00	6.43

Source: the thesis author's own analysis

Regarding out-migration from Rumworth, the highest proportion moved to similar submarket 1 at 36.05%, followed by submarket 2 and submarket 3 at 29.18% and 28.78% respectively. The lowest proportions moved to submarket 4 and submarket 5 at 2.86% and 3.13% respectively. The longest distance moved was to submarket 4 at 10.6 Km. In general, the average distance of moves up was lower than that of moves down from other submarkets (6.43 Km compared to 10.56Km). This means that people in poor areas did not on the whole migrate long distances to other areas.

To examine out-migration in more detail, Table 6.23 below illustrates the migration flows from Rumworth to other areas. A high number of households (36.05%) moved within the boundary of Rumworth. The destination areas that received a high number

of households leaving Rumworth included Hulton at 15.92%, and Great Lever at 12.93%, followed by Halliwell (6.67%) and Harper Green (3.81%). Regarding migration distance, most households moved with short distances to surrounding areas, except for movers to Cheetham and Ancoats and Clayton (16.08 Km and 18.95 Km respectively). Above 60% of movement was to submarkets with higher prices.

Table 6.23 Migration flows from Rumworth to other areas

Origin: Rumworth		Destination		
Sum of Movers (person)	Percentage (%)	Name	Submarket	Distance Km
530	36.05	Rumworth	1	0.00
234	15.92	Hulton	3	2.66
190	12.93	Great Lever	2	1.74
98	6.67	Halliwell	2	1.63
56	3.81	Harper Green	2	2.28
55	3.74	Crompton	3	3.09
45	3.06	Heaton and Lostock	5	2.53
41	2.79	Farnworth	2	3.76
36	2.45	Tonge with the Haulgh	2	3.15
20	1.36	Brightmet	3	4.47
19	1.29	Westhoughton North and Chew Moor	3	4.93
18	1.22	Bradshaw	4	6.20
18	1.22	Kearsley	3	6.21
16	1.09	Astley Bridge	3	4.73
15	1.02	Smithills	3	4.35
13	0.88	Little Lever and Darcy Lever	3	4.64
12	0.82	Westhoughton South	3	6.45
8	0.54	Cheetham	3	16.08
5	0.34	Ancoats and Clayton	3	18.95
5	0.34	Church	4	8.26

Source: the thesis author's own analysis

Regarding moves from other areas to Rumworth, as shown in Table 6.24 below, while the highest number of moves was within Runworth (40.6%), there were high numbers of moves from Great Lever and Hulton, 9.75% and 8.09% respectively. These two areas had higher price levels. According to migration distance, it is generally accepted that households prefer to move to nearby areas, and this notion is

true for Rumworth. Around 86% of moves were local and involved distances below 5 Km. Only a very small percentage of moves were long distance, for example, moves from Leigh South (1.13%, distance 10.05 Km), Longsight (0.98%, distance 20.88Km) and Whalley Range (0.6%, distance 18.46Km).

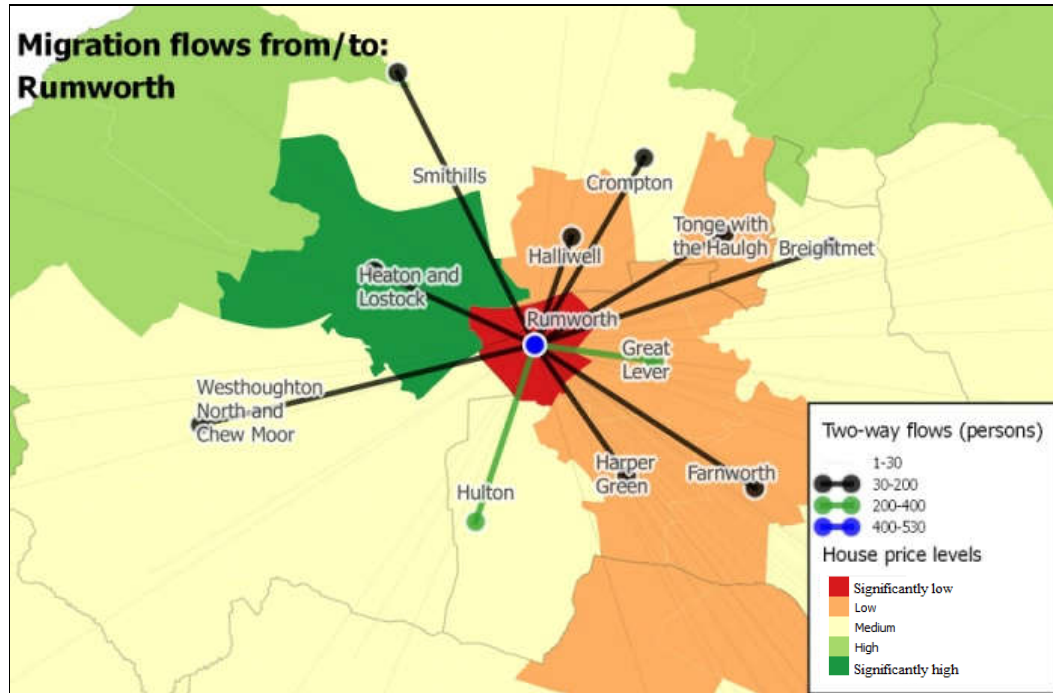
Table 6.24 Migration flows to Rumworth from other areas

Origins		Destination: Rumworth		
Name	Submarket	Sum of Movers (person)	Percentage (%)	Average distance Km
Rumworth	1	530	40.06	
Great Lever	2	129	9.75	1.74
Hulton	3	107	8.09	2.66
Halliwell	2	73	5.52	1.63
Harper Green	2	67	5.06	2.28
Crompton	3	60	4.54	3.09
Tonge with the Haulgh	2	56	4.23	3.15
Farnworth	2	40	3.02	3.76
Heaton and Lostock	5	28	2.12	2.53
Smithills	3	20	1.51	4.35
Little Lever and Darcy Lever	3	16	1.21	4.64
Westhoughton North and Chew Moor	3	16	1.21	4.93
Leigh South	3	15	1.13	10.05
Brightmet	3	14	1.06	4.47
Astley Bridge	3	13	0.98	4.73
Longsight	3	13	0.98	20.88
Horwich North East	4	11	0.83	5.88
Horwich and Blackrod	4	8	0.60	8.15
Little Hulton	2	8	0.60	4.54
Whalley Range	4	8	0.60	18.46

Source: the thesis author's own analysis

Figure 6.25 provides us with a view of reciprocal migration flows for Rumworth. It had strong connections with Great Lever and Hulton, which had higher price levels. A smaller proportion of movements were to and from Heaton and Lostock, both with significantly high price levels. From the map, it is clear that while Rumworth is not isolated, it is less connected to better surrounding areas.

Figure 6.25: Migration into the significantly low price area of Rumworth



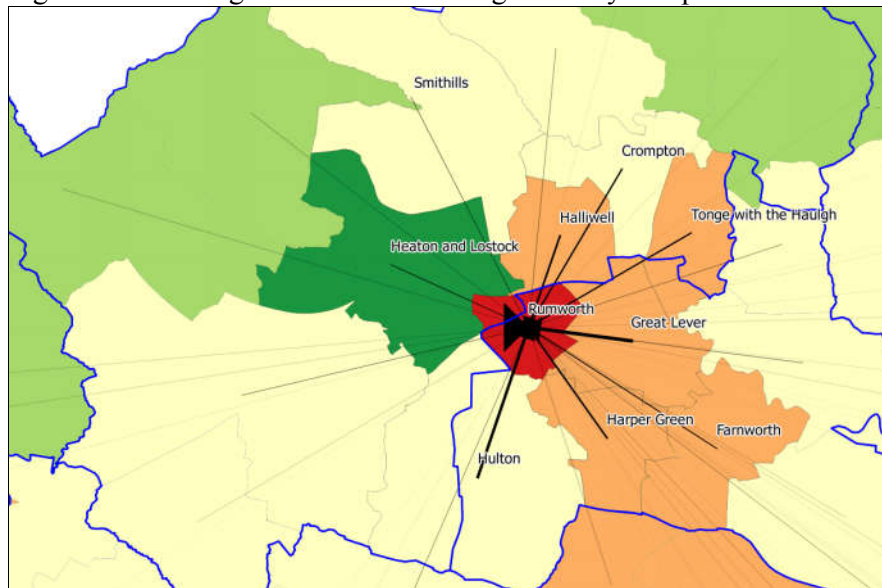
Source: the thesis author's own analysis

Figures 6.26 and 6.27 provides us with a closer view of out-migration and in-migration flows to/from Rumworth. Higher amounts of in-migration to this area came from Hulton and Great Lever, Harper Green in Bolton (South), Halliwell, Crompton, and Tonge with the Haulgh in Bolton (North). On the other hand, this area had higher numbers of out-migrants to surrounding areas with a wide range of different price levels, for example, Hulton, Great Lever, Harper Green, Farnworth, Halliwell, and the significantly high price area of Heaton & Lostock. It is important to consider these migration flows as they help planners to review the supply in these destination areas.

Andersson and Brama (2004) indicated that low income households tend to be mobile and are more likely to choose to live in poor rather than average areas, which leads to increased neighbourhood deprivation. A considerable number of out-migrants left

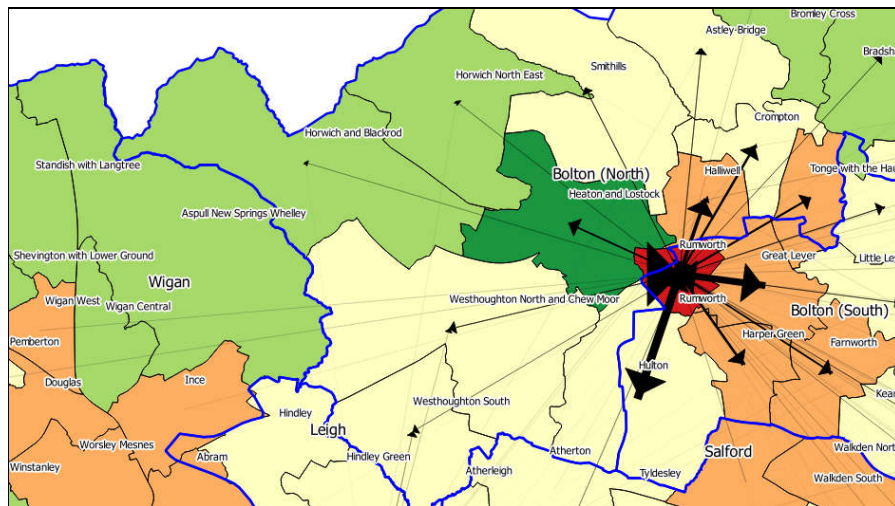
Rumworth for GreatLever and Halliwell, which were, like Rumworth, among the most deprived areas in Bolton (Bolton's Housing Needs and Market Assessment, 2011). Such movement between the most deprived areas may lead to an increase in the levels of deprivation in these areas (Bolton Council, 2011).

Figure 6.26: In-migration flows to the significantly low price area of Rumworth



Source: the thesis author's own analysis

Figure 6.27: Out-migration flows leaving Rumworth for other areas



Source: the thesis author's own analysis

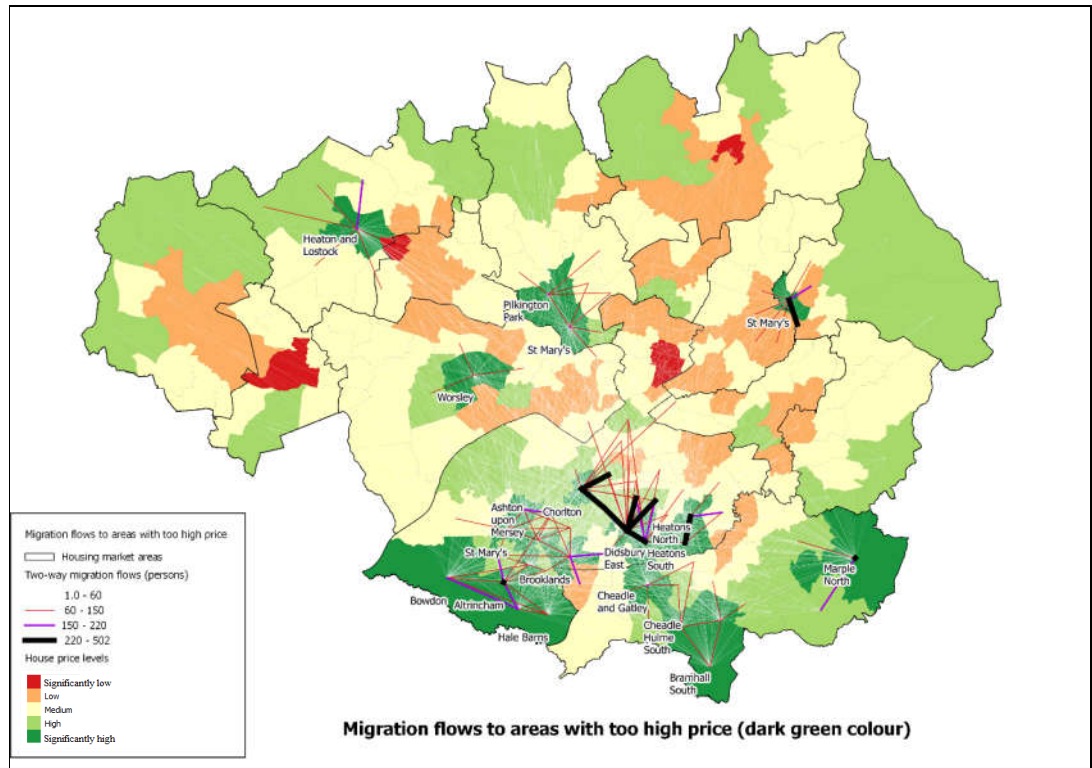
The statistical analysis above showed us the high level migration activities between Rumworth and other areas in submarkets 1, 2, and 3. It is evident that this poor neighbourhood still had connections with other better neighbourhoods and therefore it was not isolated in the housing market. This supports the claim by Bailey and Livingston (2007) that poor areas are not isolated within the housing market system as they had more than half of the in-migration and out-migration from/to better areas. On the other hand, the reasons causing households to move in and out of the poor areas could be related to household earnings and socio-economic status (Bolt et al., 2008). In particular, households with higher earnings and higher education, employment and training opportunities tend to move out of disadvantaged areas (Schaake et al., 2009; Dorling and Rees, 2003).

6.4.3 Connections of high-end price submarkets

6.4.3.1 How are high-end price submarkets connected?

In this study, high-end price submarkets are considered as those with high or significantly high price levels. To illustrate the connections of these submarkets, this section takes into account only those areas with significantly high price levels.

Figure 6.28: Two-way migration flows for significantly high price (dark green coloured) areas



Source: the thesis author's own analysis

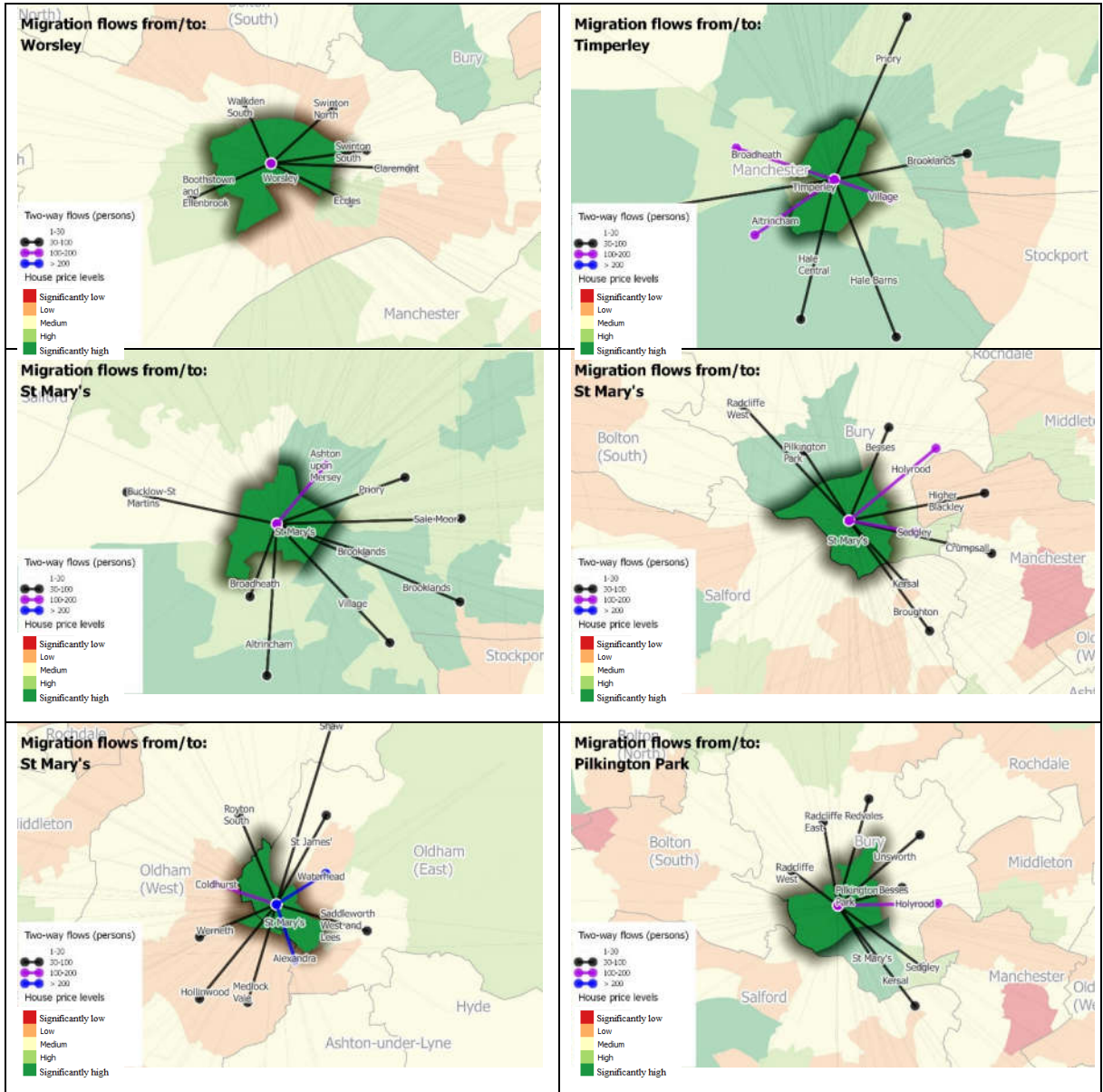
Figure 6.28 shows us the movement flows from and to the areas with significantly high price levels. South Manchester and Stockport appeared to have high percentages of two-way migration. There were stronger connections between high-end submarkets based on high and significantly high price, for example, Didsbury East, Didsbury West, Heaton North, Heaton South, Chorlton, Marple North, Brooklands, Aston upon Mersey, St Mary's in Manchester, Bowdon, and Altrincham. However, strong connections were also found between significantly high price areas and low or medium price areas such as Heaton and Lostock in Bolton North or St Mary's in Oldham East.

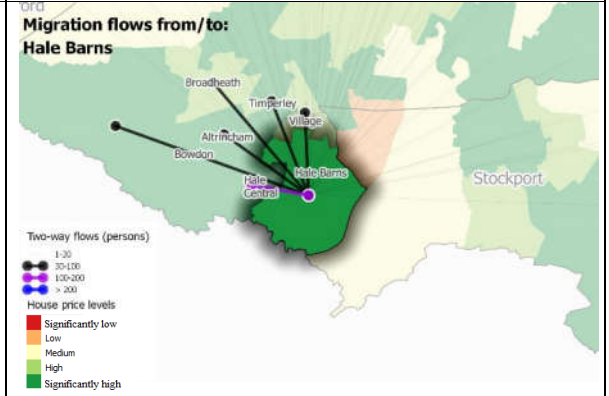
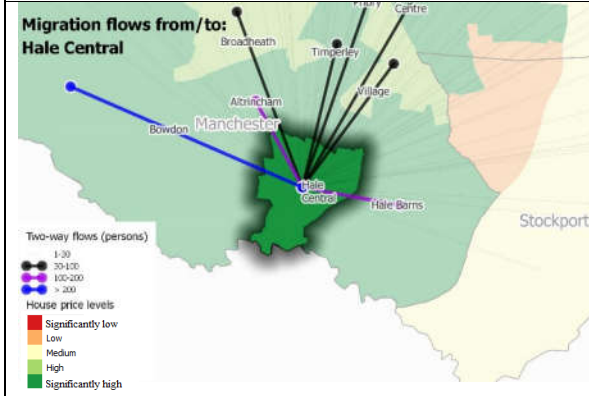
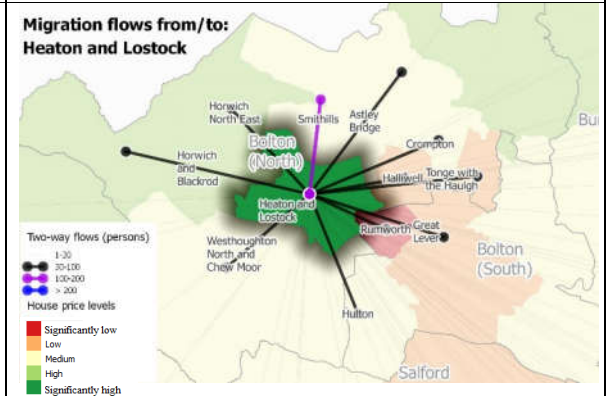
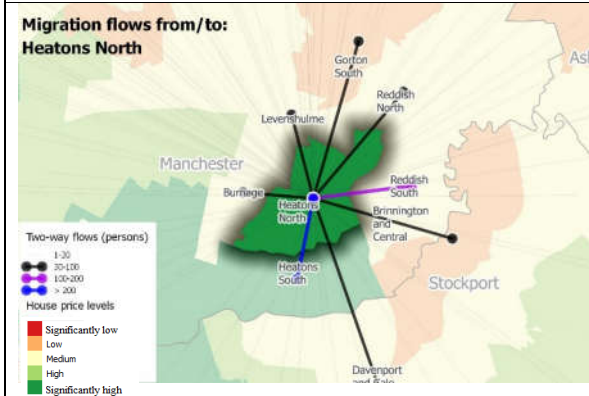
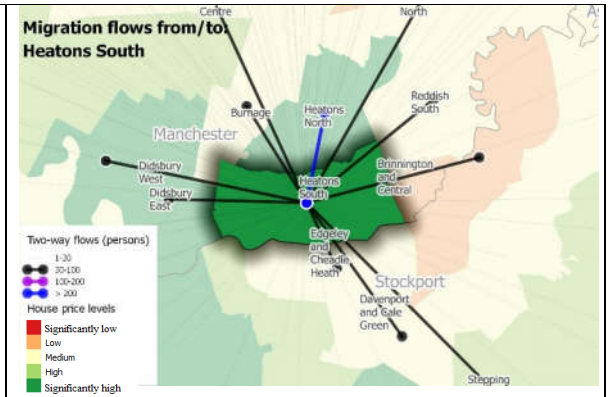
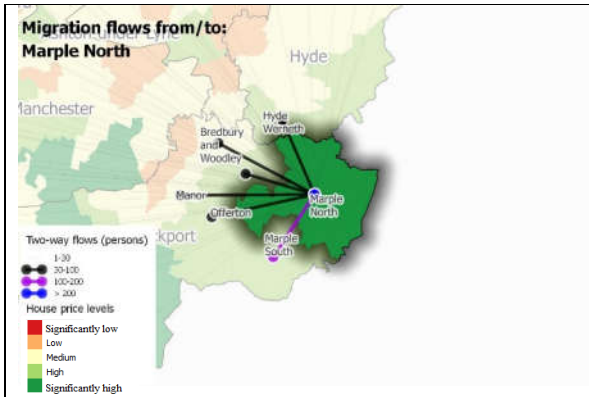
It should be noted that households currently living in better submarkets enjoy good neighbourhoods with high quality facilities and services connecting with their higher social and economic profiles. Therefore, it is more likely that households will move to more advantaged submarkets, or at least similar submarkets, to avoid issues that affect life in the less advantaged submarkets. As observed from the maps, there were high proportions of moves from submarket 5 into similar submarkets, and smaller percentages of downward moves to lower price submarkets. In particular, there were high levels of migration activity within submarket 5 in Manchester. Elsewhere, in Bolton and Bury, apart from the high number of moves within similar submarkets, some moves downward occurred to submarkets 3 and 4. Meanwhile, there were very low percentages of moves to submarkets 2 and 1, except for Bolton (North) where there were moves downward to submarkets 1 and 2. The study demonstrates that there are links between poor areas and wealthy areas, especially when people move up from poor areas to rich areas. Moves from rich areas to poor areas are less common and depend on the areas themselves. Movement from high-end price areas is more common than movement from low-end price areas. From the observations, it can be noted that households with higher income and education levels have greater opportunities, and they tend to have a great choice of areas to migrate, as mentioned in the works of Bailey and Livingston (2007) and Clark et al., (2014).

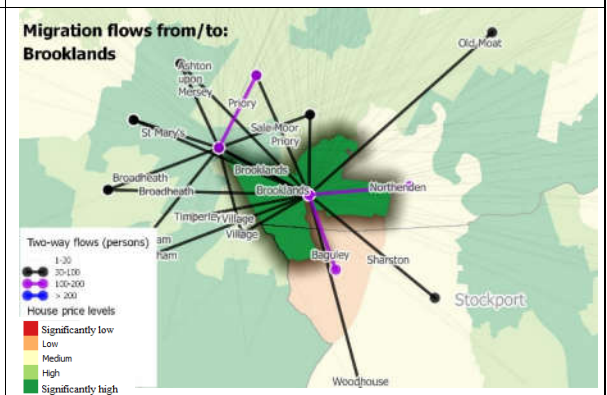
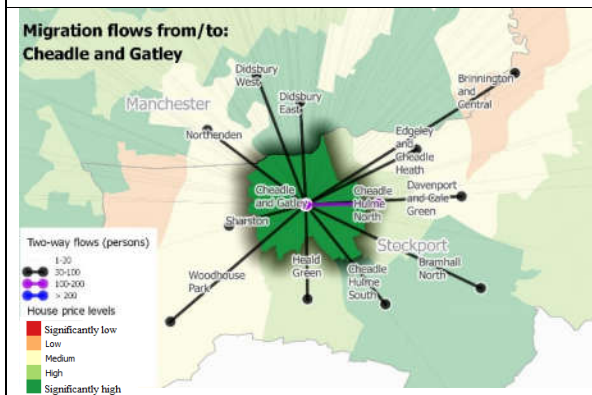
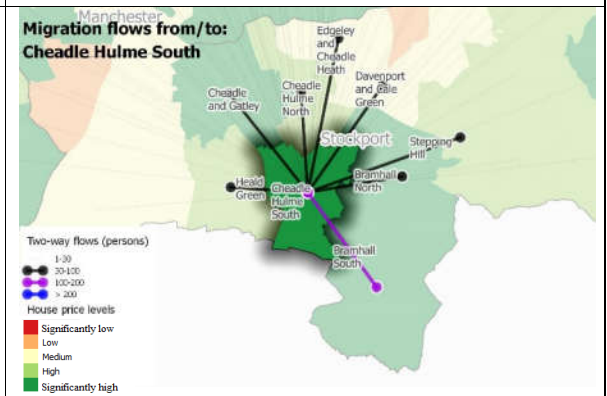
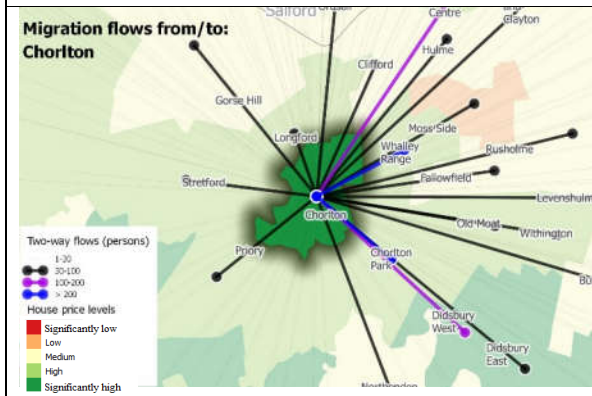
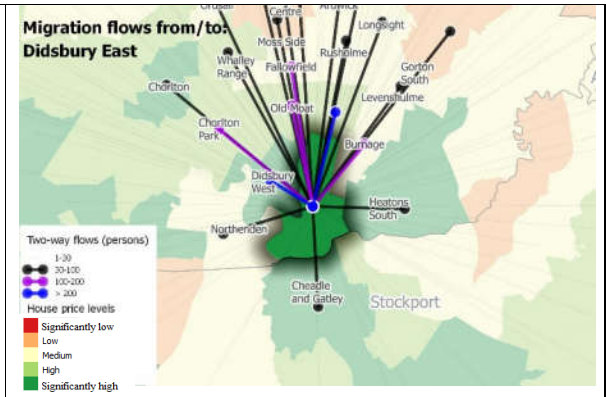
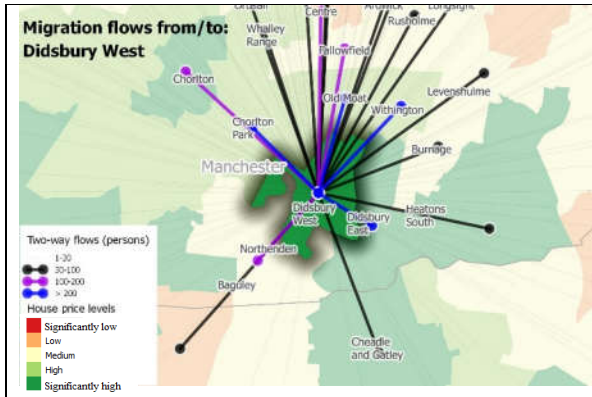
Figure 6.29 below shows two-way migration flows for significantly high price submarkets, shown in dark green. The maps illustrate the connections between each of these high-end price areas and other areas through a mechanism of migration flows. A majority of migrants moved to the surrounding neighbourhoods based on short distance. These connections were made through the different price types of submarket from significantly low to significantly high. Some areas had particularly strong links,

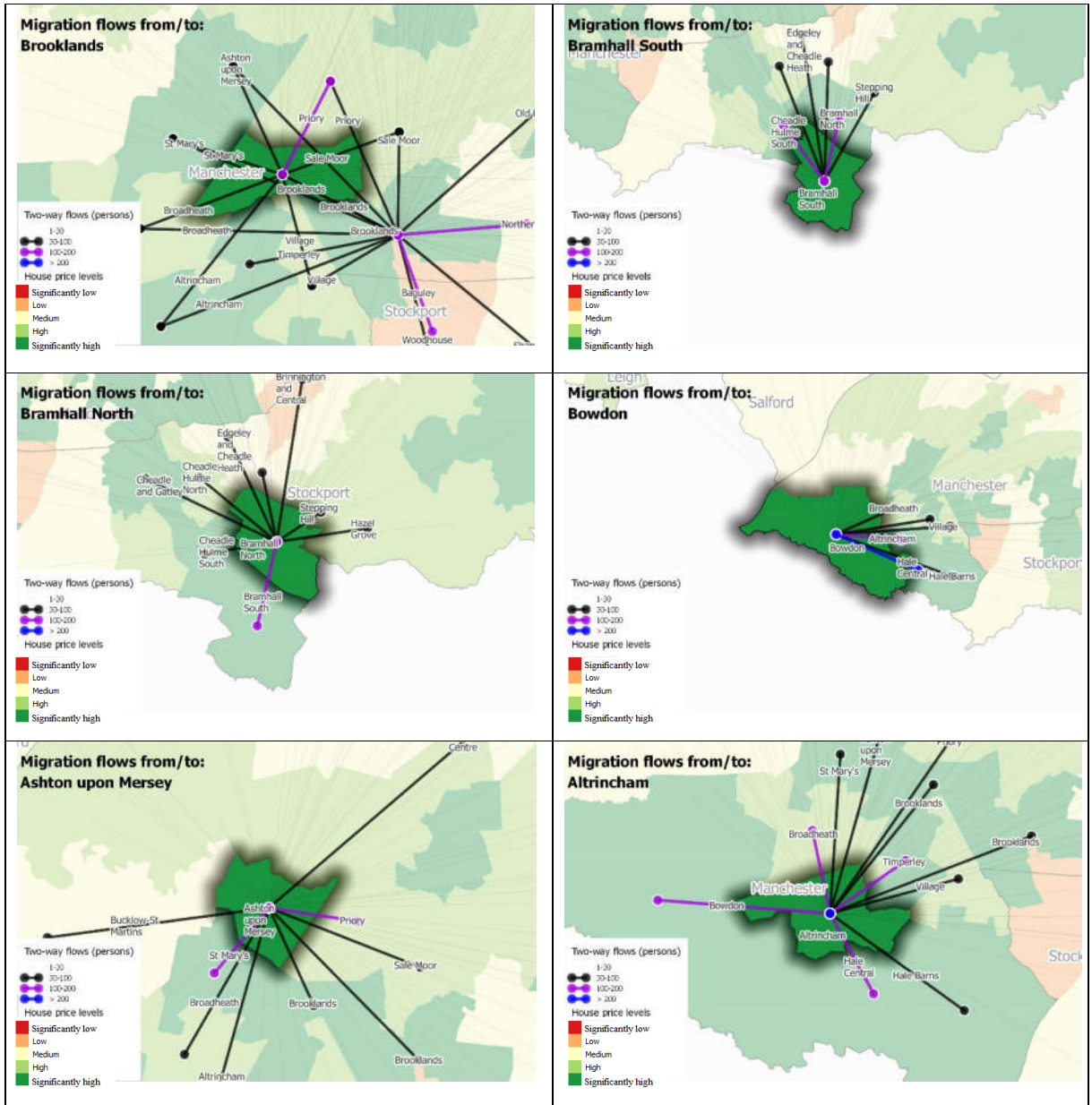
for example, St Mary's with Waterhead or Alexandra in Oldham East; Heaton South and North in Manchester, Hale Central and Bowdon in Manchester, Didsbury West with Chorlton Park or Didsbury East, Withington, Old Moat in Manchester; Didsbury East with Didsbury West or Old Moat; Chorlton with Whalley Range or Chorlton Park; within Altrincham itself. There were some strong connections between significantly high price areas and low price areas, for example, in St Mary's (significantly high price) and Coldhurst (low price) in Oldham East or Brooklands in Manchester with Baguley in Stockport.

Figure 6.29: Two-way migration flows for significantly high price submarkets
(shown in dark colour)









Source: the thesis author's own analysis

This is useful information in terms of helping market providers to allocate land to build new houses. Building new houses in unattractive areas will not necessarily influence the high-end submarket unless migration patterns change. Meanwhile, in high demand areas, housing supply may not respond in a timely way to demand, and this causes high demand pressure. This leads to high rates of house price increase and has resulted in high numbers of smaller flatted developments as the construction time is shorter and prices are more affordable.

To examine the proportions of moves in relation to a particular high-end price submarket, the study takes Manchester City Centre as an example. This provides us with more information about where in-flows came from and where the majority of out-migrants moved to.

6.4.3.2 City Centre

The city centre acts as the transport interchange for Greater Manchester and is the commercial heart of the metropolitan area, with primary business in retail and services. The city centre, together with parts of Salford and Trafford, has become the Regional Centre of Greater Manchester. Based on the relationship between politics and economics, the city centre and parts of Salford and Trafford have become metropolitan-level centres.

From the migration table 6.30 below, we can identify the proportions of moves up, down and within similar submarkets. City Centre comes under submarket 4 and had a fairly small number of moves down to submarkets 1 and 2 (0.07% and 0.93% respectively), but a very high number of moves down to submarket 3, accounting for

44.32% of total moves. On the other hand, the percentage of moves up to submarket 5 was 6.2% higher than the total number to submarkets 2 and 1. According to mobility distance, upwards moves to submarket 5 were of the shortest distance at 9.59 Km, while moves down to submarket 1 were of the longest distance at 17.16 Km.

Table 6.30 Migration activity in City Centre

Migration from/to City Centre	Total moves (person)	Percentage (%)	Distance (Km)
In-migrates from			
Submarket 1	23	0.54	14.70
Submarket 2	345	8.15	11.05
Submarket 3	1945	45.97	11.56
Submarket 4	1628	38.48	14.12
Submarket 5	290	6.85	11.02
Grand Total	4231	100.00	12.08
Out-migrates to			
Submarket 1	2	0.07	17.16
Submarket 2	25	0.93	11.37
Submarket 3	1186	44.32	10.86
Submarket 4	1297	48.47	13.67
Submarket 5	166	6.20	9.59
Grand Total	2676	100.00	11.36

Source: the thesis author's own analysis

Regarding in-migration, the highest level of in-migration to City Centre was from submarket 3 at 45.97%, followed by similar areas in submarket 4, and then submarket 2, at 38.48% and 8.15% respectively. The lowest numbers were from submarket 1 and submarket 5, at 0.54% and 6.85% respectively. The longest distance was from submarket 1 at 14.70 Km and the lowest was from submarket 5.

From the statistical analysis above, we have identified the proportions of moves up and down and moves within similar submarkets. It is clear that there were more moves up to better areas and within similar areas than moves down. Movement flows

down to submarket 3 were as high as those within similar areas. There were weak connections between City Centre and poor neighbourhoods, in particular, a very low level of migration activities between them. To examine migration activity from particular areas to City Centre, Table 6.31 is presented.

Table 6.31 Migration activity from other wards to City Centre

Origins		Destination: City Centre		
Name	Submarket	Movers (person)	Percentage (%)	Distance Km
City Centre	4	1187	28.05	0
Ardwick	3	361	8.53	2.138
Hulme	3	341	8.06	1.3423
Ordsall	3	181	4.28	2.3887
Ancoats and Clayton	3	174	4.11	2.9756
Rusholme	3	152	3.59	3.4982
Moss Side	2	142	3.36	2.4354
Fallowfield	3	111	2.62	3.6672
Cheetham	3	105	2.48	2.581
Old Moat	4	92	2.17	4.6557
Levenshulme	3	89	2.10	5.2575
Withington	4	76	1.80	5.049
Longsight	3	64	1.51	3.7335
Bradford	3	54	1.28	3.4698
Didsbury West	5	43	1.02	6.5489
Irwell Riverside	2	37	0.87	3.2418
Didsbury East	5	35	0.83	7.2702
Chorlton Park	4	33	0.78	5.418
Whalley Range	4	30	0.71	3.4798
Chorlton	3	25	0.59	4.9491
Heatons South	5	23	0.54	8.0006
Cheadle Hulme South	5	18	0.43	12.6121
Heatons North	5	18	0.43	6.7968
Pilkington Park	5	18	0.43	8.8042
Harpurhey	1	16	0.38	4.0782
Cheadle and Gatley	5	15	0.35	9.823
Clifford	3	15	0.35	2.4275
Heaton and Lostock	5	14	0.33	19.6433
Langworthy	2	14	0.33	3.4191
Marple North	5	14	0.33	15.7064

Source: the thesis author's own analysis

City Centre appeared to have the highest percentage of households moving within its borders at 28%. Ardwick and Hulme followed with a percentage of around 8%. Next were Ordsall and Ancoats and Clayton with around 4% (Ordsall is part of Salford, while Ancoats and Clayton is part of Ashton-under-Lyne). These four areas are close to Manchester city centre and all had lower price levels. According to migration distance, it is generally accepted that households prefer to move to nearby areas. However, in this case, there were some areas with low numbers of movers despite their close proximity, such as Cheetham (2.48%), Withington (1.8%), Chorlton Park (0.78%), Heaton North (0.43%), Harpurhey (0.38%), Clifford (2.4%), Langworthy (0.33%).

In terms of those areas attracting migrants from City Centre, as shown in Table 6.32, 44.36% of its population moved within its boundary. The area with the highest number of migrates from City Centre was Ardwick, with 13.12%, followed by Ancoats and Clayton, Bradford and Fallowfield, with 9.98%, 5.53% and 5.19% respectively. This information shows us the competition among areas to attract migrants from City Centre. Migration distance is not the only factor affecting households' choices as households consider various factors when choosing an area in which to live. This information also shows us the most attractive areas to migrants, for example, some areas at long distances having high in-migration from City Centre, such as Bromley Cross and Smithills.

Table 6.32 Migration flows to other wards from City Centre

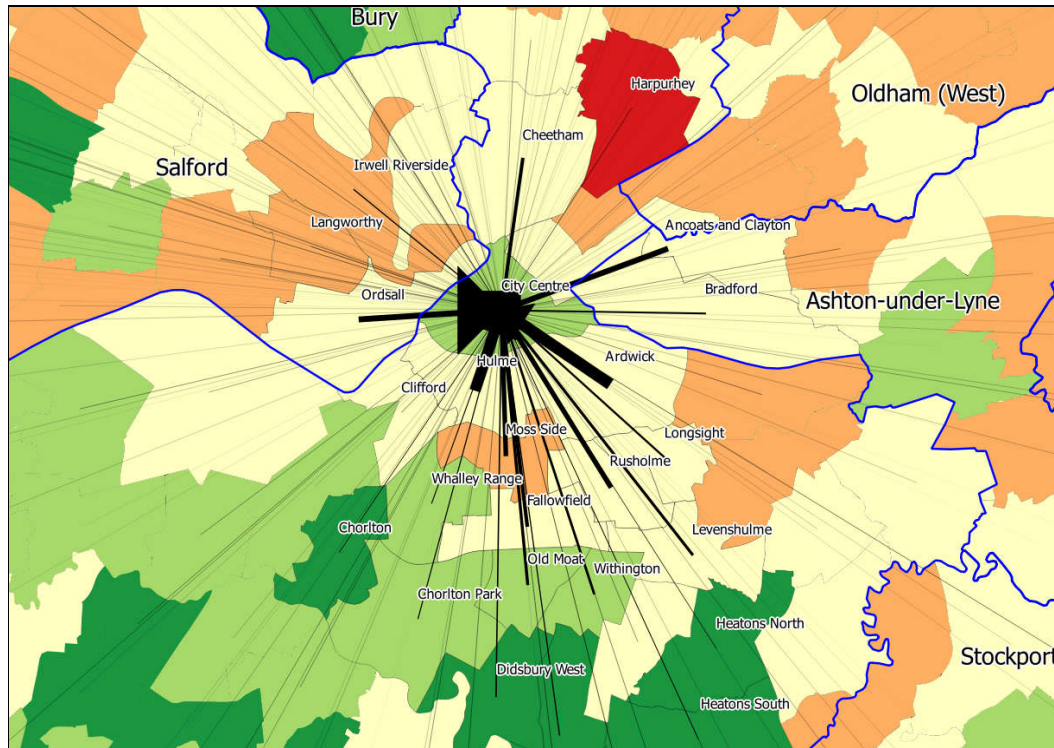
Origin: City Centre		Destination		
Movers (person)	Percentage (%)	Name	Submarket	Distance Km
1187	44.36	City Centre	4	0
351	13.12	Ardwick	3	2.138

267	9.98	Ancoats and Clayton	3	2.9756
148	5.53	Bradford	3	3.4698
139	5.19	Fallowfield	3	3.6672
115	4.30	Cheetham	3	2.581
80	2.99	Chorlton	3	4.9491
79	2.95	Chorlton Park	4	5.418
77	2.88	Didsbury West	5	6.5489
59	2.20	Didsbury East	5	7.2702
29	1.08	Burnage	3	6.0747
16	0.60	Bromley Cross	4	20.2837
13	0.49	Crumpsall	3	4.6042
10	0.37	Gorton North	2	4.6568
10	0.37	Holyrood	3	7.5731
10	0.37	Sedgley	4	5.4079
10	0.37	St Mary's	5	6.4991
8	0.30	Brooklands	5	8.7913
8	0.30	Smithills	3	21.1445
7	0.26	Pilkington Park	5	8.8042
5	0.19	Heaton and Lostock	5	19.6433
4	0.15	Charlestown	2	6.1357
4	0.15	Kearsley	3	10.9968
4	0.15	Westhoughton North and Chew Moor	3	20.672
3	0.11	Baguley	2	10.0964
3	0.11	Farnworth	2	13.4122
3	0.11	Horwich North East	4	23.0431
3	0.11	Radcliffe West	3	10.8305
3	0.11	Ramsbottom	3	19.724
2	0.07	Besses	3	8.422

Source: the thesis author's own analysis

Figure 6.33 shows us the migration flows from other areas to City Centre. Those areas near City Centre had high numbers of migrants and lower level prices. Those areas with high or significantly high prices had low numbers of migrants to City Centre, for example, Didsbury West, Chorlton Park, Chorlton, etc. In particular, the flow from Harpurhey reflects movement to City Centre from a significantly low price area. Generally, moves to city centre were mainly local and involve young migrants who want to improve their job opportunities.

Figure 6.33: The picture of migration to City Centre from other areas

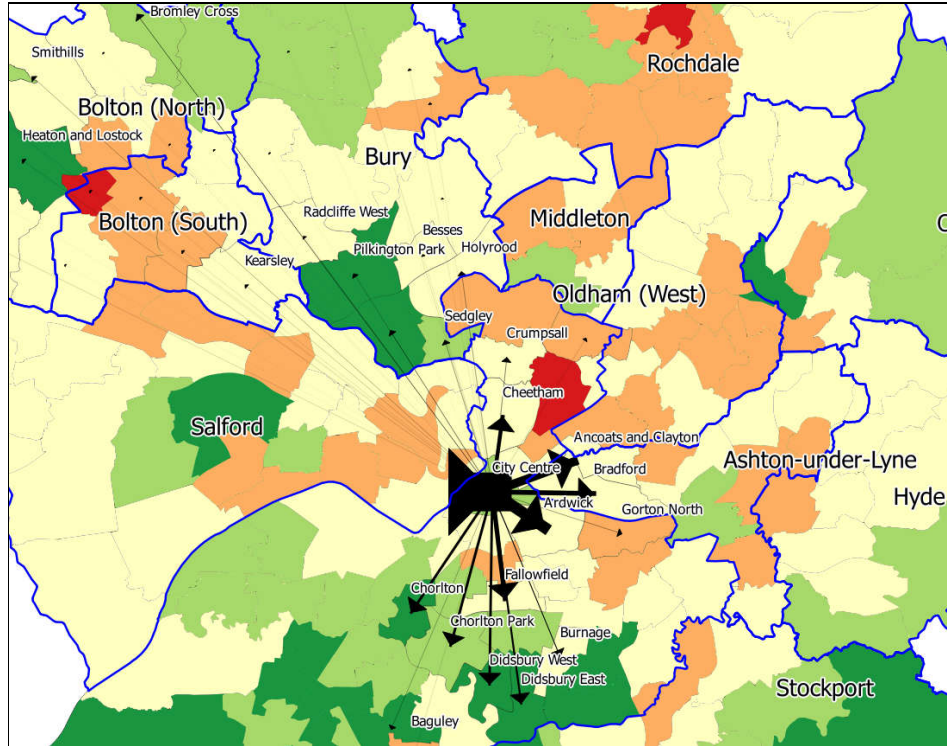


Source: the thesis author's own analysis

Figure 6.34 below shows us the picture of migration leaving City Centre for other areas. Manchester city centre has become an attractive destination for young people who wish to live in the city centre and do not wish to commute. However, movers who preferred to commute within and beyond the city centre chose to move to other areas. There was high migration to lower price areas near the city such as Cheetham, Bradford, Ardwick or Ancoats and Clayton. Especially, areas with high and significantly high prices to the south also attracted movers from the city, such as Didsbury East, Didsbury West, Chorlton Park, Chorlton. Smaller numbers of movers also moved to areas in Bolton (North, South) from City Centre. Based on the analysis above, there are weaker connections between City Centre and the lowest price areas

(red colour) compared to connections with other areas at similar distance from the city.

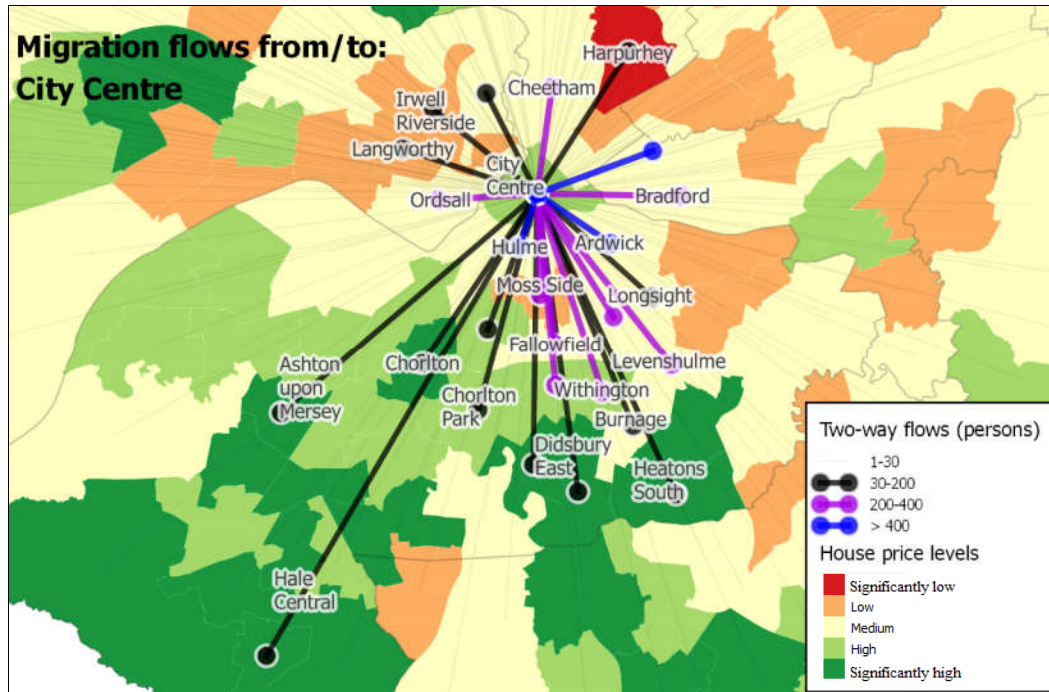
Figure 6.34: The picture of migration leaving City Centre for other areas



Source: the thesis author's own analysis

On the other hand, Figure 6.35 shows us several strong links between City Centre and other areas such as Hulme, Ancoats and Clayton, Ardwick, Cheetham, Fallowfield, Longsight, Moss Side, Withington, Bradford. These areas did not necessarily have an excess of potential demand but had a surplus of supply. This could be a reason why these areas had a high number of in-migrants compared to other areas.

Figure 6.35: Two-way migration flows for City Centre



Source: the thesis author's own analysis

From the observations, there are three migration patterns: outmigration to Bolton (North, South) and Bury; outmigration to South Manchester; and out-migration to lower price areas surrounding City Centre. Regarding the first pattern, households (only small percentage) can take advantage of the low cost and time of commuting and affordable prices of higher quality housing units to enjoy a better lifestyle. The second pattern represents those who have enough resources to afford a better life in the most desirable neighbourhoods in the south. The third pattern represents those who do not have enough resources to afford a better lifestyle in the most desirable areas, but have enough resources to live near the city centre and avoid commuting time and cost by choosing to live in the surrounding areas.

6.5 Conclusion

Researchers have long been considering the role of migration patterns in the housing market. Such consideration is especially necessary for policy makers in estimating housing demand in order to provide sufficient resources to meet future housing needs. To estimate housing demand effectively, it is important to explore the connections of local housing market areas, and submarkets via mobility flows. The study has advocated a systems approach with a GIS-based method to look at the proportions and patterns of short, medium and long moves between local HMAs and the interactions between submarkets. A series of maps was developed based on Census 2011 data and 2010 and 2011 house price data from the Land Registry. The key findings are as follows.

6.5.1 Connections between HMAs

The analysis of the interactions between HMAs identified those HMAs that were most attractive and least attractive to migrants in terms of the high numbers of in-migrants, out-migrants and migration flows. It also provided more information about the particular locations or areas within each HMA with high levels of migration density. Further, it examined the connections between HMAs and discussed the influential factors on trade-off between migration and commuting.

6.5.2 Short, medium and long moves

Regarding the patterns of moves, short distance moves were found dominantly in major and smaller towns of the Greater Manchester system including Bolton North, South Manchester, Wigan, Rochdale, Oldham West, Stockport, Ashton-under-Lyne. These patterns were more significant in the city centre and its surrounding

neighbourhoods (including parts of Salford). When distance increased, households took the city centre as a central location and considered commuting as an important factor in moving home. Meanwhile, long distance patterns reflected a stronger link between the central business area (city centre and its surrounding neighbourhoods including parts of Salford) and west-side areas such as Salford, Bolton (North, South), Wigan, Leigh. The analysis also identified several hotspots with high levels of migration density, including the central business district, major towns and smaller towns.

Regarding the proportions of moves, short distance was the dominant pattern, accounting for 60.2% - 73.5% in the total number of migrants for each HMA. A smaller number of movers made long distance moves from one HMA to another HMA, accounting for 1.3% - 5.5%. The highest percentages of short moves were found in Wigan and Bolton. Wigan also had the highest number of long distance moves. Stockport had the lowest proportion of short moves, while the lowest percentages of long distance moves were found in Manchester and Middleton. The analysis also helped us identify strong connections between several HMAs, for example, Manchester and Stockport or Salford, Bolton North and Bolton South.

6.5.3 Dynamics of the market system

Within the HMAs, the filtering process between submarkets was examined based on migration flows and house price differentials across the HMAs. The process of market filtering was considered not only through movements up and down but also through movement within similar submarkets. The percentage of moves within similar submarkets was higher than those of moves up or down. The proportions of moves up and within the similar submarkets were higher than those of moves down,

except in the cases of submarkets with high and significantly high price. The proportion of households moving to high-end submarkets accounted for 10.78% of moves compared to 50.70% for medium price submarkets and 17.63% for moves to low-end submarkets. Hence, most people moved within similar submarkets with low price or medium prices.

6.5.3.1 Connections of low-end price submarkets

Most low-end price neighbourhoods, while not disconnected from the market system as a whole, are less intensively connected compared to other submarkets. Connections were however found between low-end price and high-end price submarkets, for example, Central Rochdale with Norden or Leigh West with Lowton East, Harpurhey with City Centre or Rumworth with Heaton and Lostock.

By taking Rumworth as an example, the proportions of moves were explored in detail. The highest percentage of moves was within similar low-end price submarkets, accounting for 40.06 % and 36.06% in terms of in-migration and out-migration respectively. The proportions of moves up to high and significantly high price submarkets were 2.86% and 3.13% respectively. On the other hand, Rumworth received 3.55% and 2.27% respectively of its in-migrants from areas with high and significantly high price. Moves up to low and medium price submarkets accounted for 29.18% and 28.78% respectively. The analysis of migration distance showed that people in this area generally did not migrate long distances to other areas, for example, the longest distance was 10.6 Km to high price submarkets.

6.5.3.2 Connections of high-end price submarkets

These connections were made through the different types of submarkets, from significantly low to significantly high price levels. Intensive links were found between high-end price submarkets in terms of moves to high and significantly high price and even medium price areas, for example, St Mary's with Waterhead or Alexandra in Oldham East; Heaton South and North in Manchester, Hale Central and Bowdon in Manchester, Didsbury West with Chorlton Park or Didsbury East, Withington, Old Moat in Manchester; Didsbury East with Didsbury West or Old Moat; Chorlton with Whalley Range or Chorlton Park; within Altrincham itself. Some strong connections were identified between significantly high price areas and low price areas, for example, St Mary's (significantly high price) with Coldhurst (low price) in Oldham East; or Brooklands in Manchester with Baguley in Stockport.

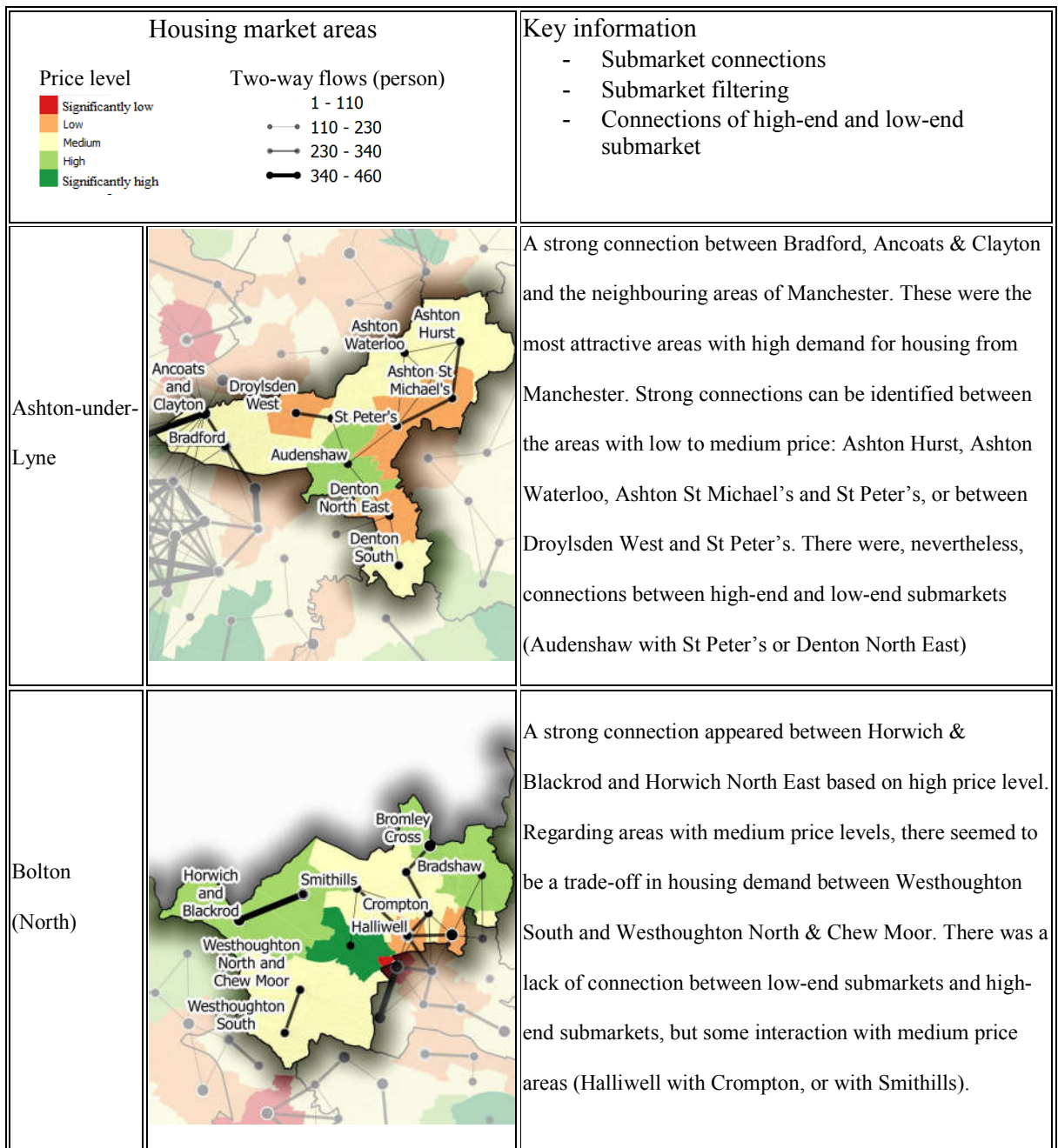
The study took City Centre as an example to explore the proportion of moves. A high proportion of moves downward to medium price submarkets (44.32%) were identified, for example, Ardwick with 13.12%, followed by Ancoats and Clayton, Bradford and Fallowfield with 9.98%, 5.53% and 5.19%. However, connections were also identified with low and significantly low submarkets (0.07% and 0.93% respectively), for example, Gorton North (0.37%), Charlestown (0.15%), Baguley (0.11%), Farnworth (0.11%). On the other hand, moving up to significantly high price submarkets and high price submarkets accounted for 6.2% and 48.47% respectively, for example, City Centre itself (44.36%), Chorlton Park (2.95%), Didsbury West (2.88%), Didsbury East (2.20%), Bromley Cross (0.6%). It is clear that moves up to better areas and within similar areas were more frequent than moves down. Among those who moved to City Centre, the highest number (45.97%) of in-migrants came


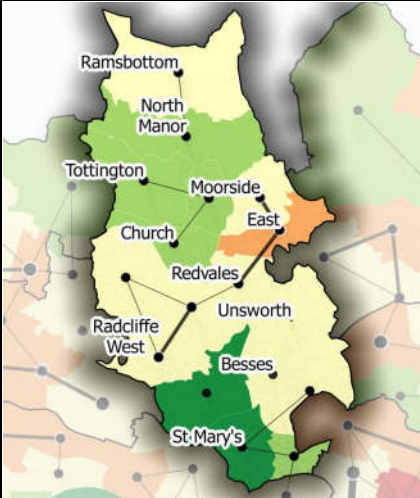

from medium price areas, followed by those from high price and low price areas at 38.48% and 8.15% respectively. In-migrants from significantly low price areas made up the lowest proportion (0.54%), whilst in-migrants from the significantly high price areas accounted for 6.85%. Strong links were identified between City Centre and other areas such as Hulme, Ancoats and Clayton, Ardwick, Cheetham, Fallowfield, Longsight, Moss Side, Withington, Bradford.


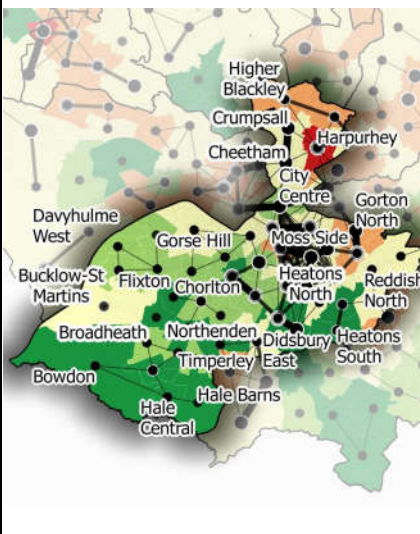
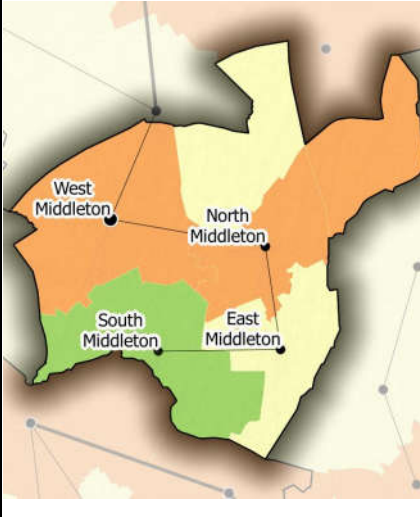
6.5.4 A summary table for each HMA


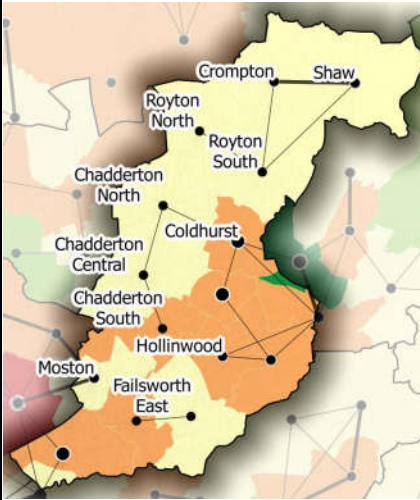

Figure 6.36 below summarises the connections between submarkets based on price differentials for each HMA. The table identifies important information on the origins of demand and strong links existing between certain submarkets. If an area is strongly connected with a number of other areas, building new houses in that area could draw demand from those other areas. This information may be useful for market planners and providers in making their decisions on allocating land resources for new house construction in response to high demand. On the other hand, it may highlight how to change migration patterns by improving the commuting system between areas and the public transport infrastructure.

Figure 6.36: In-migration patterns in each housing market area based on five house price levels



<p>Bolton (South)</p>		<p>Low prices had attracted a high number of in-migrants to Rumworth, Hulton, Great Lever, Farnworth or Harper Green. Despite having the lowest price level, Rumworth had a high percentage of demand. Several areas with medium price levels seemed to be isolated: Brightmet, Little Lever and Darcy Lever. In general, this HMA witnessed a high number of households moving within its boundary. Connection was however found between low-end submarkets and medium price areas (strong connection between Runworth with Hulton & Great Lever)</p>
<p>Bury</p>		<p>This HMA seemed to have more self-contained submarkets. Some areas had stronger connection with others, such as: Radcliffe North and Radcliffe West and Radcliffe East, Moorside and East or East and Redvales. In general, most of the areas seemed to have a lack of connection, especially those areas with high and significantly high price level, or Unsworth, which had a lack of migration activity.</p>
<p>Hyde</p>		<p>The HMA showed a high level of self-containment. Households were likely to move between similar submarkets. Stronger connection was found between the areas with medium prices. There was a link between low price area and medium price area and between high price area and medium price areas. There was a stronger link between Hyde Godley and Hyde Werneth.</p>

<p><u>Leigh</u></p>		<p>Leigh West prices were at the significantly low level, and attracted high percentages of movers from Leigh South, Leigh East and the adjacent HMA, Salford. A strong connection was found between Hindley and Hindley Green (both medium price levels) and between Golborne & Lowton West (medium price) and Lowton East (high price). There was strong connection between the low-end price submarket (Leigh West) and its neighbouring submarkets (medium price), but a lack of links to high-end submarkets.</p>
<p><u>Manchester</u></p>		<p>A high proportion of migration activities were focused on the areas close to City Centre, such as Moss Side, with lower price levels. The significantly high price areas of Chorlton and Didsbury in the south experienced high demand for housing. A strong connection was found between Bowdon, Altrincham, Hale Central, Broadheath, between Crumpsall and Cheetham, and between the areas surrounding Moss Side and City Centre. Harpurhey (significantly low price) was found to have connections with the wider area.</p>
<p><u>Middleton</u></p>		<p>This HMA had a lack of housing demand. Among the areas, West Middleton was the most attractive with low price. There was connection between South Middleton (high price) and East Middleton (medium price) or West Middleton (low price) and North Middleton (low price). It seemed that there was no connection between high-end and low-end price submarkets.</p>

<p>Oldham (East)</p>		<p>A strong connection was found between the high-end price submarket of St Mary's (significantly high price) and the low-end price submarket of Alexandra (low price). There was housing demand in Waterhead (low price) originating from St James'. A connection was also found between Saddleworth North (high price), Saddleworth South (high price).</p>
<p>Oldham (West)</p>		<p>Most of the areas within this HMA showed high levels of self-containment, except for Moston, with high demand from Manchester. Strong links were found between Crompton and Shaw; Royton South and Royton North, or between the areas with low price surrounding Coldhurst.</p>
<p>Rochdale</p>		<p>A strong connection was found between Wardle & West Littleborough (high price) with its neighbours (medium price) or between West Heywood (medium price) with its neighbours (low price). The lowest price area, Central Rochdale, had connections to surrounding areas such as Healey, Kingsway. The high-end price submarket of Wardle & West Littleborough (high price) interacted with its neighbouring low-end submarket. Milnrow and Newhey seemed to be isolated.</p>

<p>Salford</p>		<p>Areas neighbouring Manchester such as Ordsall, Broughton or Kersal seemed to attract migration with their affordable prices. Strong connection was found between Cadishead and Irlam, Astley Mosley Common and Tyldesley, and between Little Hulton and Walkden North (its neighbour). The high-end price submarkets of Worsley and Eccles had lower levels of connection compared to the others.</p>
<p>Stockport</p>		<p>The migration activity was focused on the areas with medium price and lower price: Woodhouse Park, Bredbury & Woodley, Manor and Baguley. A strong connection was found between Baguley and Woodhouse Park. The high-end price areas seemed to lack connection with other lower price areas.</p>
<p>Wigan</p>		<p>Most of the migration activities in this HMA happened within its boundary. Stronger connection was found between Bryn and Ashton, Douglas and Pemberton. Wigan West, with low price levels, also interacted with its neighbouring high price area. Shevington with Lower Ground seemed to have no connection with wider neighbourhoods.</p>

Source: the thesis author's own analysis

The analysis of migration patterns helps us explore the connection between HMAs and sub-markets to understand the market system dynamics. However, migration patterns do not provide information about the effects of household preferences and aspirations on their housing choices, especially in the process of housing search. Therefore, in order to gain a better understanding of the market system, the study conducted analysis of the household search process, which is discussed in the next chapter. Analysis of housing search can help us identify submarkets based on search preferences, and explore latent demand and market search pressure, market constraints and frictions, as well as the notion of ‘satisficing’.

7.1 Introduction

The chapter aims to highlight the importance of housing search analysis in studies of the housing market. To achieve this, the study intends to fulfil the following aims. Firstly, it is important to explore search patterns to understand the relationship between housing search and submarkets based on demand side. A series of search maps were created to present the geography of household search patterns across Greater Manchester based on the Rightmove dataset in 2013. Secondly, this study investigates the difference between the search patterns and the patterns of property availability to examine the issue of latent demand relative to supply. Thirdly, this study explores issues in relation to supply constraints, unrealistic searches as well as suboptimal and optimal choices. This section also uses visual method to show search patterns as segmented by price band and number of bedrooms and the patterns of available dwellings, house price and migration.

It is generally accepted that the analysis of migration patterns plays an important role in assessing the housing market, especially submarkets and HMAs. Moreover, the combination of house price and migration patterns can provide us with better information about housing demand in local HMAs. However, outcomes based on migration and house price patterns cannot provide us with information on household preferences or aspirations during the housing search process. Analysis of housing search can help us understand latent demand, market search pressure, and market constraints and friction, and therefore can support planners and market providers in

their decision-making. Although studies have been investigating the housing search for a long time, there are still research gaps in this field.

Recently a new direction has emerged in the study of housing search and the connection between household search and submarkets. Particularly, a new study by Rae (2015a) has investigated search patterns and their relationship with submarkets generated by potential buyers across the London metropolitan area. Results from their study have advocated that submarkets can be segmented both sectorally and spatially, which supports the research from Watkins (2001) and Maclellan and Tu (1996). In addition to examining submarkets based on search preferences, they paid attention to the issue of latent demand in exploring differences between spatial demand and dwelling supply based on search patterns and listed properties. This enabled the researcher to identify latent demand patterns together with high and low demand areas in London areas. Generally, this new study area promises to provide new insights on how the market system works, and therefore needs to attract more research attention.

To build in this emerging direction, this study follows the work of Rae (2015a) to investigate whether the results remain valuable in another, smaller urban area, such as Greater Manchester. This section firstly attempts to investigate search patterns across the Greater Manchester market system. These search patterns are explored in association with the following household search criteria: house price band and number of bedrooms. Through these search patterns, the study seeks to examine the links between household search patterns and housing submarkets segmented by potential buyers, based on the hypothesis that submarkets may be better segmented spatially and sectorally (Maclellan and Tu, 1996; Watkins, 2001; Rae, 2015a).

Secondly, this section explores the issue of latent demand and market search pressure based on differences between level of search intensity and number of listed properties, as well as the notion that potential buyers make suboptimal choices under market restrictions. The results of this investigation could help us identify which areas have low and high housing demand relative to housing availability.

Following this introduction, the chapter describes the method and datasets used in the analysis. Next, the analysis of housing search is presented in relation to submarkets based on search preferences at the local level. Then, the chapter investigates the issue of latent demand by exploring search patterns and property availability. This is followed by discussion of issues relating to supply constraints and suboptimal and optimal choices. Finally, the conclusion is presented.

7.2 Search statistics

This section uses datasets from Rightmove.com, the leading online real estate website in the UK. On the Rightmove website, households can search for properties based on a wide range of criteria, such as areas, postcodes, search radius, property types, price, and bedroom numbers, as shown in Figure 7.1. Users can also use the Draw a search feature to draw the area in which they seek to find their home on a Google map as shown in Figure 7.2. Also, the users can filter their search results based on preferences such as price, number of bedrooms, or property types. As such a high number of users search for homes on the website, Rightmove provides a useful dataset for researchers investigating the subject of housing search.

This study uses two datasets from Rightmove. These datasets are similar to those employed by Rae (2015a), except that the current study uses data on Greater

Manchester. The first of these is a set of 25613 search polygons collected from March 2013 across Greater Manchester. This dataset provides information about search price, bedroom numbers, search radius and postcodes, and is used to explore the geography of housing searches across Greater Manchester based on price and bedroom number. The study also used the dataset of properties advertised on the Rightmove website. Data on available properties for sale across Greater Manchester were collected in March 2013. These two datasets, search patterns and available housing opportunities, derived from the most used property search channel, can be seen as a proxy to represent housing demand and supply in the housing market.

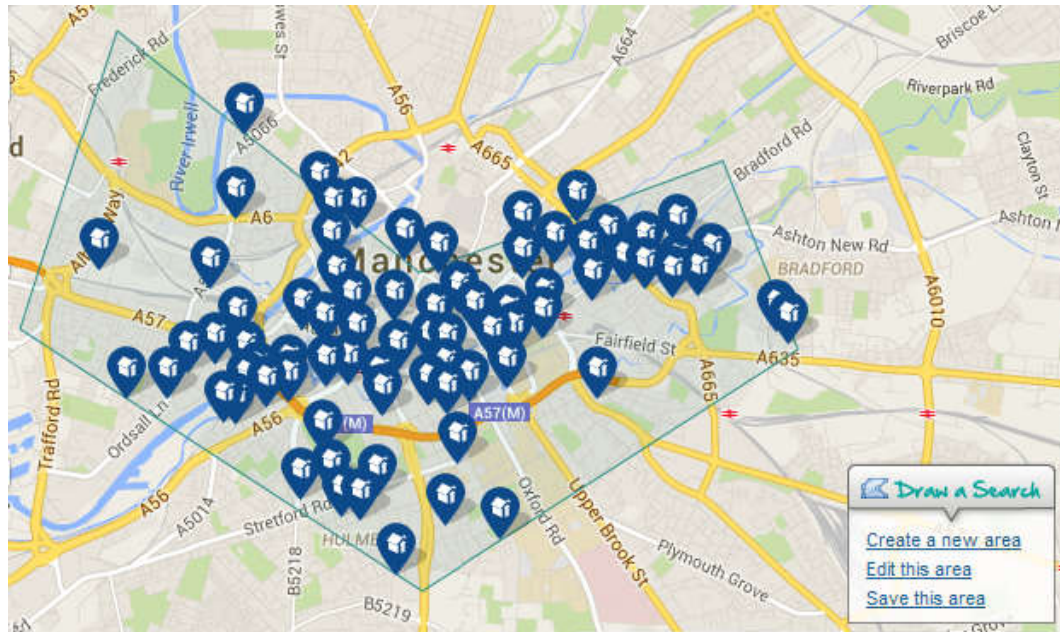
In short, search data include two sets: search polygon and the lists of available properties. To clarify, search polygon is used to explore search patterns in section 7.3, 7.5 and 7.6.4 below. Both search polygon and the lists of available properties are used to explore the issue of latent demand in section 7.4 below.

Figure 7.1: Search polygon on Rightmove property website

The screenshot shows the search interface on the Rightmove website. At the top, there is a navigation bar with the Rightmove logo and links for 'For Sale', 'To Rent', 'House Prices', 'New Homes', 'Commercial', 'Agents', 'Blog', 'Home Ideas', 'Overseas', and 'Students'. On the right side of the navigation bar, there are links for 'Sign in or Create Account', 'My Rightmove', and a 'Like' button with a count of 175k. Below the navigation bar, the search title is 'PROPERTY FOR SALE IN MANCHESTER, GREATER MANCHESTER'. The search filters are organized into two columns. The left column includes: 'Location' (Manchester, Greater Manchester), 'Search radius' (This area only), 'Price range (£)' (No min, No max), and 'No. of bedrooms' (No min, No max). The right column includes: 'Property type' (Any), 'Added to site' (Anytime), and a checkbox for 'Include Under Offer, Sold STC...' with a help icon. A blue 'Find properties' button is located at the bottom right of the filter section.

Source: Rightmove website

Figure 7.2: Searching for properties via the Draw-a-search feature



Source: Rightmove website

Table 7.3 below shows the statistics for search polygons across Great Manchester. It can be noted that apart from those who did not specify bedroom criteria, most people were looking for two and three bedroom houses, 17% and 26% respectively. In contrast, there was a low number of searches for one bedroom and more than 4 bedrooms, 1.6% and 0.4% respectively. Meanwhile, the average maximum price range was from £84272 to £ 675000. For two and three bedroom houses, the average maximum price was between £167000 and £221000. Turning to the median search area, people searched for distances of between 5.71 SQKm and 45.27 SQKm to find houses with from 1 to 5 bedrooms or bedrooms not specified.

Table 7.3: Statistics for search polygons in Greater Manchester

Bedroom	Polygon Count	%Total	Av Max Price (£)	Av Min Price (£)	Median Area (SQKm)
Not specified	12711	49.6%	84272	22109	5.71
1	409	1.6%	130465	55831	7.28
2	4350	17.0%	166463	44794	12.05
3	6670	26.0%	220919	96808	13.35
4	1365	5.3%	278172	125571	21.10
5	103	0.4%	435097	398058	45.27
7	1	0.0%	500000	0	346513
12	4	0.0%	675000	300000	346513

Source: the thesis author's own analysis

7.3 Submarket based on search preferences

This section uses the search data to provide a picture of search patterns across Greater Manchester, and explore connections between these patterns and submarkets and local HMAs. The patterns were based on house price bands and bedroom numbers. Similar work has been carried out by Rae (2015a) to explore search patterns and their relationship with local HMAs in London. This study is a follow-up to Rae (2015a), but is based on Greater Manchester. As Greater Manchester is a smaller region compared to London, the search patterns and their connections with submarkets are supposed to be different.

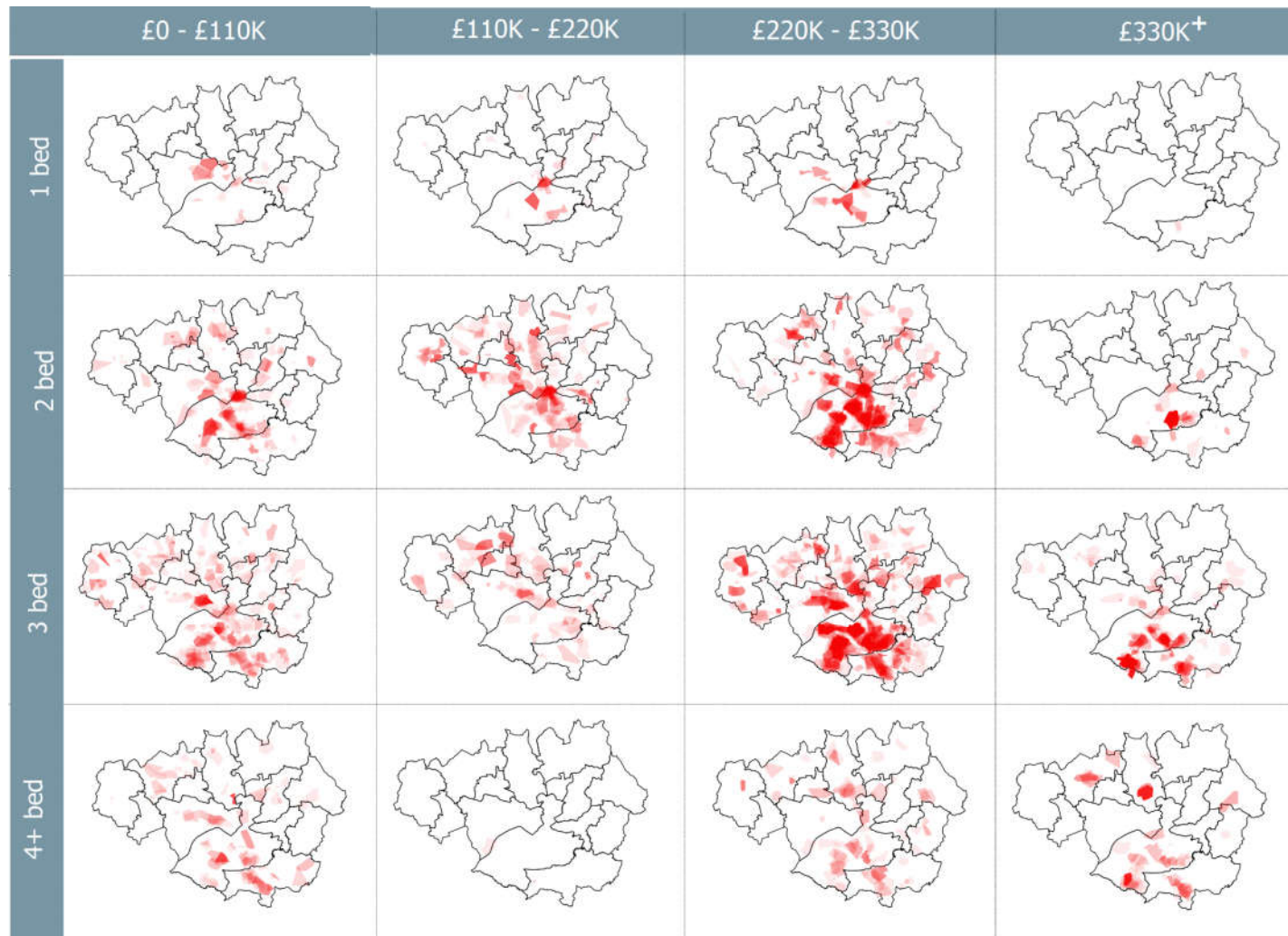
In order to illustrate the search patterns in the Greater Manchester market system, a series of search maps are presented in Figure 7.4 based on bedroom numbers and price bands. The price bands were chosen based on the standard deviation, the mean and the range which measures how the data is clustered around the mean. It is useful in the way that identifies the price range of normal distribution around the mean and the price range that are greatly above or below the average (Berry & Bernard, 1990). There is a rule of thumb that approximately 68%, 95% and 99% of the data is

within one, two and three standard deviations (higher or lower) from the mean respectively (Berry & Bernard, 1990).

With the normal distribution, thesis considers the score cuts for defining the price bands around the average value: the above average within one standard deviation, the high value greater than one standard deviation, the below average within one standard deviation and the low value less than one standard deviation. Based on the data, the average search price was calculated as around £220K while standard deviation was around £110K. Therefore, the price bands are: below £110K, £110K - £220K, £220K – £330K, and above £330K.

These maps were drawn using a search radius of below 10 sqKm, which is in correspondence with the median search radius for houses with less than 6 bedrooms. Generally, these maps showed different patterns in each of the maps. These results indicate that search-based submarkets existed sectorally and spatially in Greater Manchester. This finding confirms the result from Rae (2015a).

Figure 7.4: Search patterns in Greater Manchester based on bedroom number and price in 2013

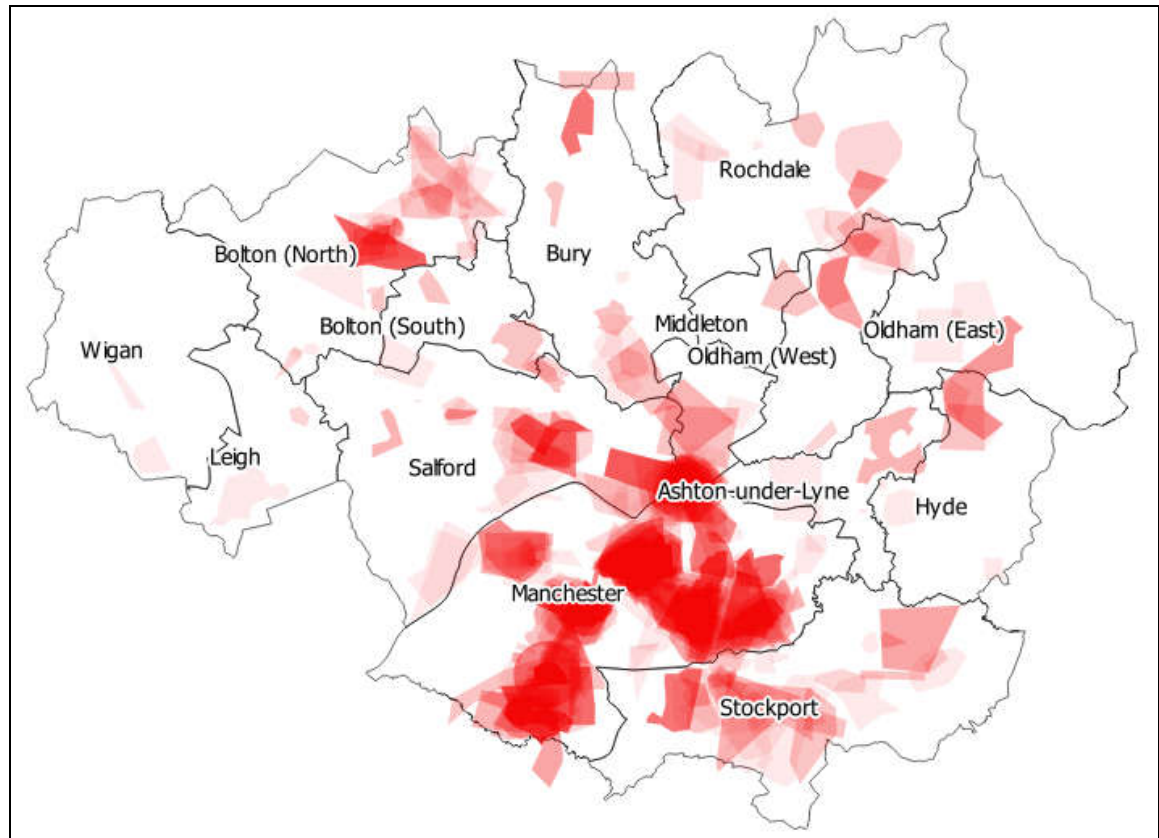


Source: the thesis author's own analysis

Figure 7.4 shows that more searches were conducted for two and three bedroom houses with prices below £220K and especially in the price range £220K - £330K. It is interesting that in the high level price range, £330K upwards, with the exception of 1 bedroom searches, search numbers were focused on the south of Greater Manchester, which is a wealthy area and is seen traditionally as the most in-demand area in which to live. Searches for one bedroom homes were concentrated in the centre of Manchester and the areas surrounding the city centre, while searching for four bedrooms or more was more fragmented. The maps also show that the centre and the south had high levels of search intensity. The results from the analysis highlight the high demand for specific house price bands, on the one hand, and help us explore household demand for particular locations, on the other hand.

The NHPAU study by Jones et al. (2012) suggested that the housing market can be divided into three layers: HMA Framework, local HMAs and submarkets. In order to explore the submarkets within local HMAs, the study presents search maps and the local HMAs derived from the NHPAU study as shown in Figure 7.5 and 7.6 below. In particular, these two maps show the submarkets based on search preferences with two and three bedrooms and the price band £220K - £330K. Generally, these maps show that the submarkets generated by search seem to fit into the local HMAs from the NHPAU study. The results here also support the finding by Rae (2015a) that submarkets based on search preferences were formed within the local HMAs from the NHPAU study (for London case). Therefore, the observation has supported that search patterns play an important role in identifying submarkets and local HMAs.

Figure 7.5: Search patterns for local HMAs in Greater Manchester derived from the NHPAU study by Jones et al. (2012), based on 2 bedrooms and priced band £220K – £330K



2 bed £220K – £330K

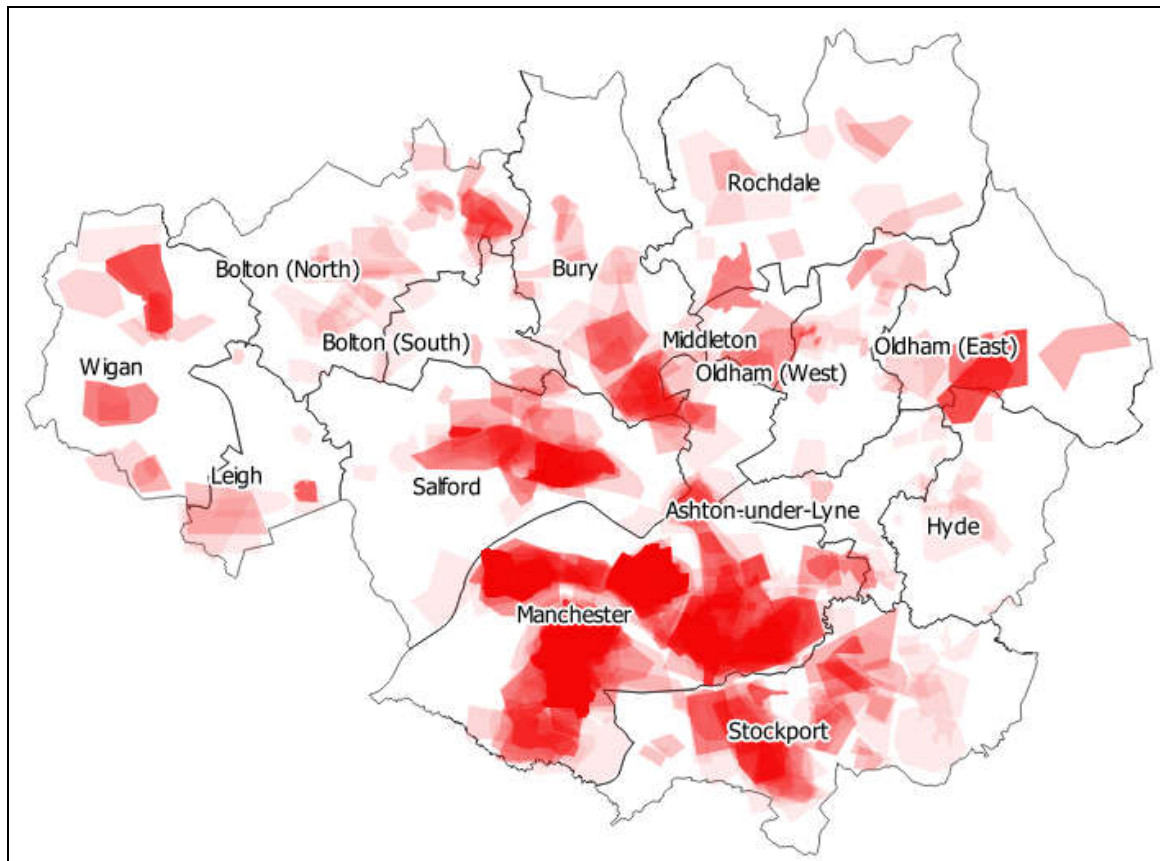
Source: the thesis author's own analysis

In Figure 7.5, we can see that the submarkets based on search preferences emerged in the NHPAU local HMA areas in Salford, Bolton (North), Stockport and, more intensively, in Manchester. It can be noted that a number of submarkets overlapped two adjacent local HMAs, such as Hyde and Oldham (East) or Salford and Manchester.

In Figure 7.6, it is worth noting that submarkets emerged clearly and fit well in the local HMAs in Manchester and Stockport. Also, other submarkets based on search preferences

appeared, for example, in Wigan and Leigh. In general, these results from search patterns can help us understand latent demand within the local HMAs, and also provide evidence that submarkets based on search preferences can be identified by location and sector, using criteria such as price and number of bedrooms.

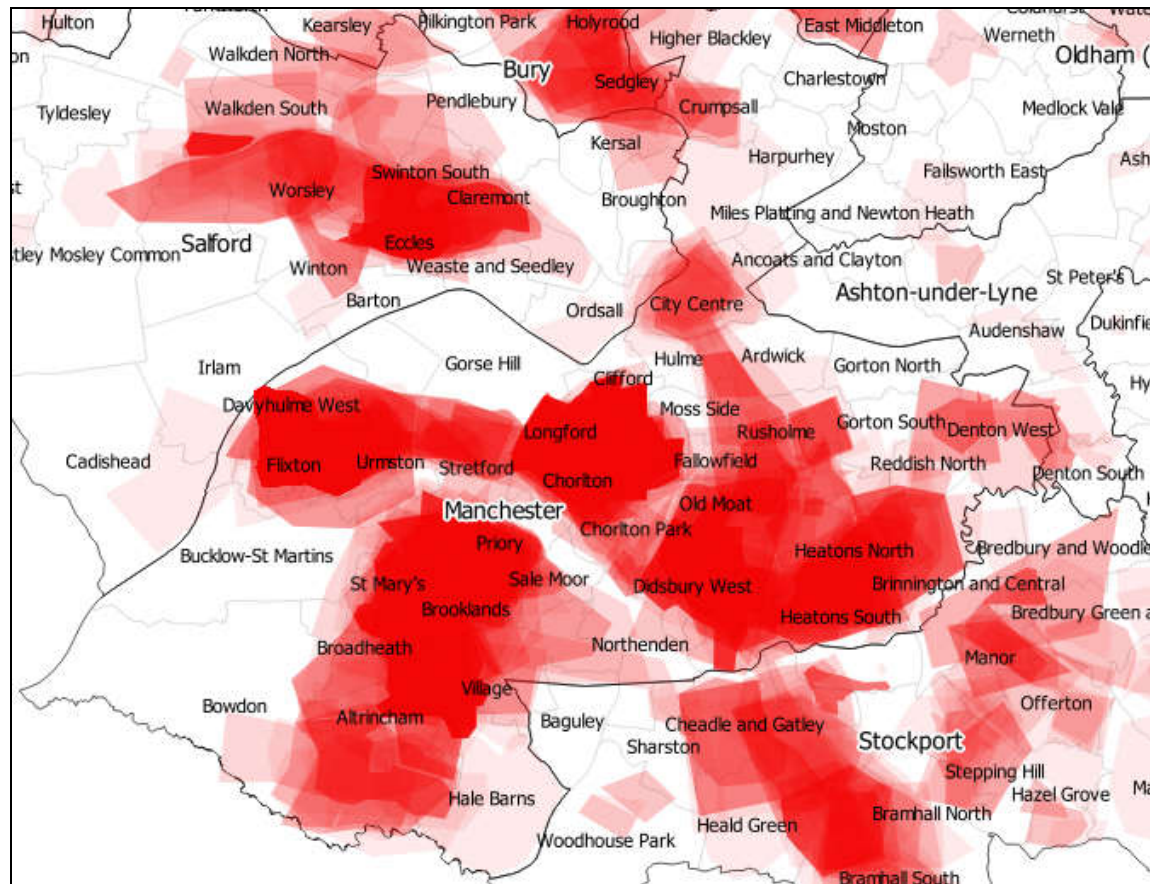
Figure 7.6: Search patterns in relation to local HMAs in Greater Manchester derived from the NHPAU study by Jones et al. (2012), based on 3 bedrooms and price band £220K – £330K



3 bed £220K – £330K

Source: the thesis author's own analysis

Figure 7.7: Search patterns in relation to local HMAs in Manchester derived from the NHPAU study by Jones et al. (2012), based on 2 bedrooms and price band £220K – £330K



2 bedrooms, priced £220K – £330K in Manchester

Source: the thesis author’s own analysis

Figure 7.7 provides us with a closer view of the search patterns in Manchester regarding 2 bedrooms and the price band from £220K to £330K. From the map, a number of submarkets appeared such as that in the south including Altrincham, Broadheath, Broaklands, Sale Moor, Priory and St Mary’s. In the west, the submarket includes Davyhulme West, Flixton, Urmston, Stretford, Longford, Chorlton, and Chorlton Park. The other submarkets were strongly connected, for example, there were strong links

between City Centre and surrounding areas including Rusholme, Old Moat, Didsbury West, Heaton South, and Heaton North. It is also worth noting that there was a submarket around Denton West in the east.

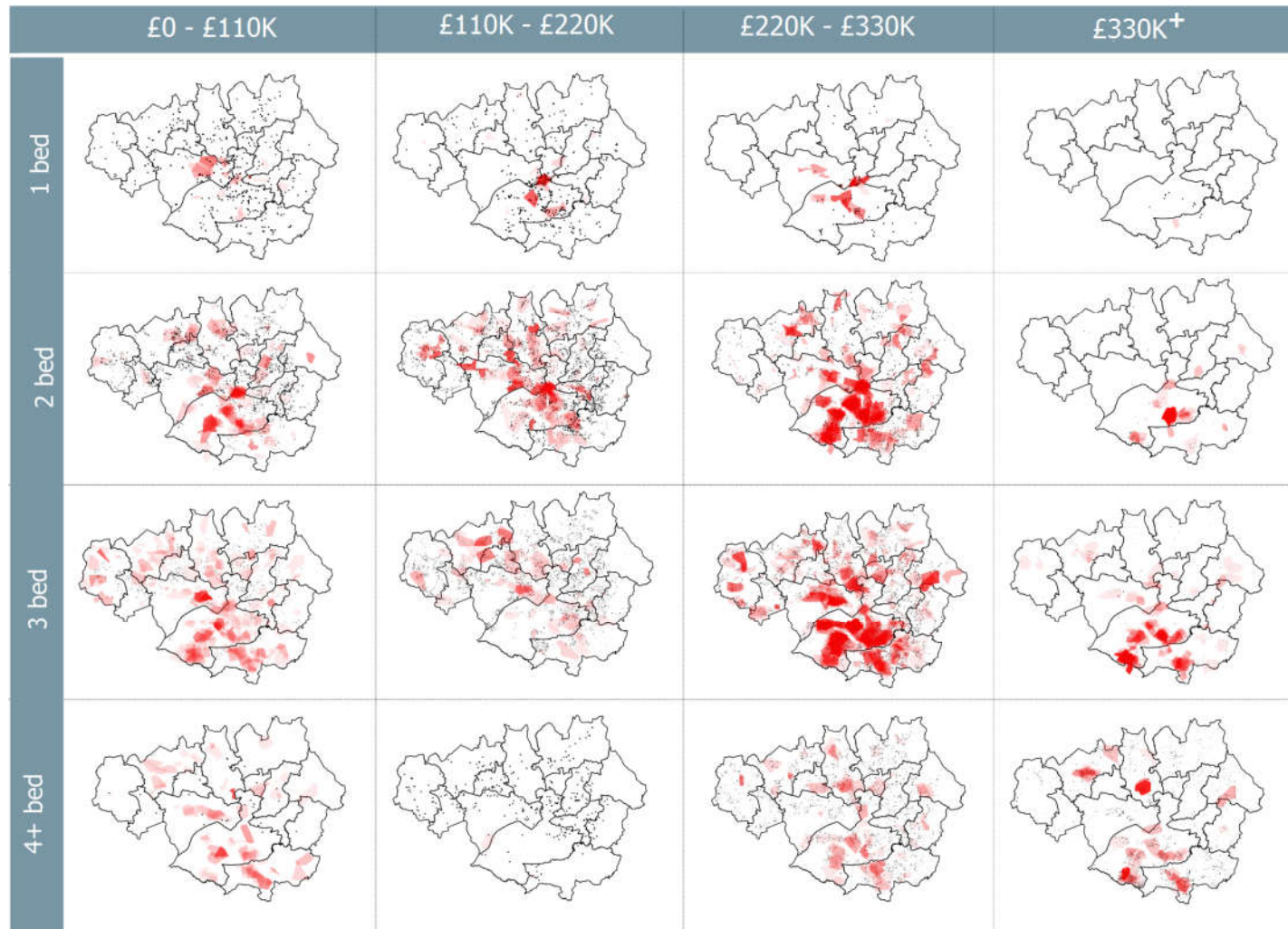
7.4 Latent demand from search patterns and property availability

It is possible to identify latent demand by investigating differences between demand and supply across urban areas. Latent demand can be seen as potential demand and can be identified based on search activities. To investigate the issue of latent demand, we can compare search patterns on the demand side with patterns of availability of dwellings on the supply side. Differences between the level of search intensity in a particular area and the number of listed dwellings in that area can provide a picture of latent demand as well as identifying high and low demand areas. This may also help us understand the issue of sub-optimal mobility that arises when households are unable to find their dream home because of excess demand relative to supply (Rae, 2015a).

This section is based on the examination by Rae (2015a) of the spatiality of latent demand and supply in London. However, the current study focuses on Greater Manchester to investigate the relationship between search and property availability. The relevant data is presented on QGIS maps, based on segmentation of house price band, bedrooms and the locations of available dwellings. The visual difference highlighted by these maps can help us identify mismatches between household preference and aspiration and housing supply stock. This information could assist market providers to review their housing supply on the basis of actual demand.

The study used the same search patterns generated by price and bedrooms as presented in the previous section, together with new maps of property availability, in particular, property locations based on listing price band and number of bedrooms. The same four price levels were also used: below £110K, £110K - £220K, £220 - £330K and £330K+, and four bedroom types: 1, 2, 3, and 4+ bedrooms. The series of maps is presented in Figure 7.8, with property locations shown as black points and search patterns as coloured areas, as in the previous section. Generally, the search patterns differed from the patterns for available properties, except for in some specific cases such as 2 or 3 bedrooms priced £220K - £330K and 4+ bedrooms priced above £330K.

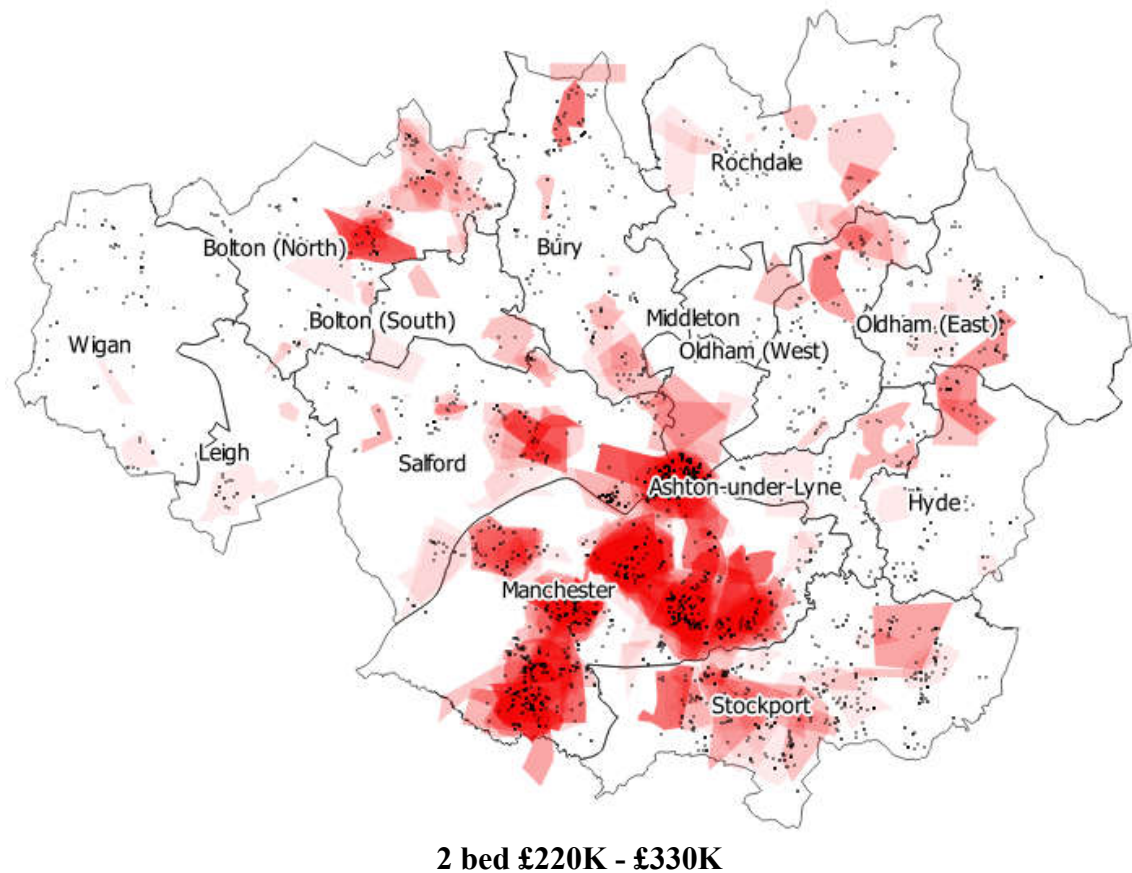
Figure 7.8: Search patterns and property availability in Greater Manchester based on bedroom number and price



Source: the thesis author's own analysis

There was a close match between search intensity and available properties where households searched for 2 or 3 bedrooms priced from £220K - £330K despite some specific locations having more searches but fewer property opportunities. In contrast, there was a mismatch between the few households that searched for 4+ bedrooms with the price £110K - £220K and the relatively high number of available properties in the areas. A similar situation can be seen on the maps showing 1 bedroom and prices below £110K or £110K - £220K. More available properties and fewer searches can be seen in the areas the price band £110K - £220K and 1 or 2 bedrooms. It is also interesting that more searches than property opportunities appeared on the maps for 2 or 3 bedrooms and prices above £330K. Overall, the visual differences between search patterns and property availability provide us with an understanding of latent demand relative to supply, and can help us identify the areas with high demand pressure.

Figure 7.9: Search patterns and property availability based on 2 bedrooms and price band £220K - £330K



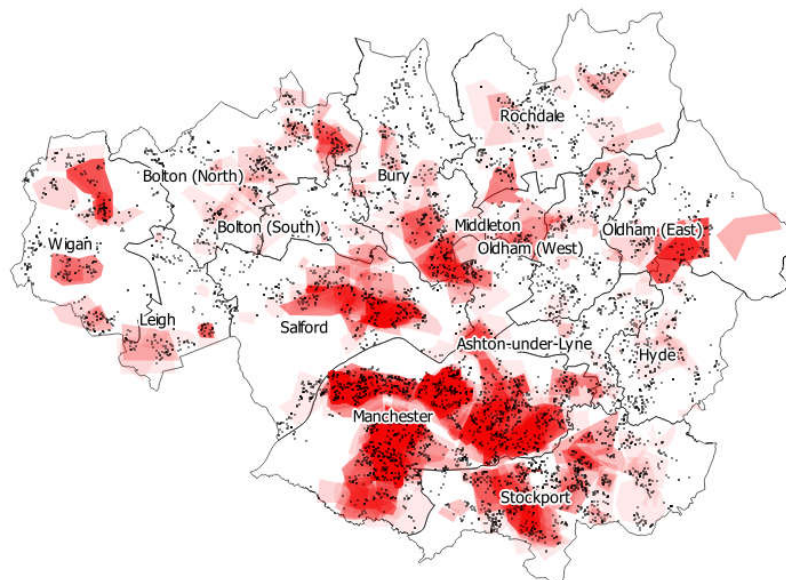
Source: the thesis author's own analysis

Figure 7.9 above shows the search patterns and available properties for the price band £220 - £330K and 2 bedrooms across the 14 housing market areas. It can be seen clearly that there was high search intensity in Manchester. On the other hand, areas with a lower level of intensive searching included Stockport, Salford, Bolton (North) and Oldham (West). In contrast, a lack of searches but more available properties was found in Hyde, Bury, Rochdale, Leigh or Wigan. This presents a mismatch between latent demand and

existing supply, which may play an important role in shaping property prices in these areas.

Figure 7.10 provides the search patterns and available properties for the price band £220 - £330K and 3 bedrooms across the 14 housing market areas. Similarly, a great number of searches and available properties can be found in Manchester. On the other hand, some areas experienced high but less intensive searching, such as Stockport, Oldham (East), Salford, Wigan, Bury or Bolton (North). However, it seems that there were not enough property opportunities to meet the potential demand in the area. Mismatches between searches and available properties occurred across the 14 housing market areas, with more housing choices but a lack of searches identified in areas such as Hyde, Oldham (West), Ashton-under-Lyne or Bury.

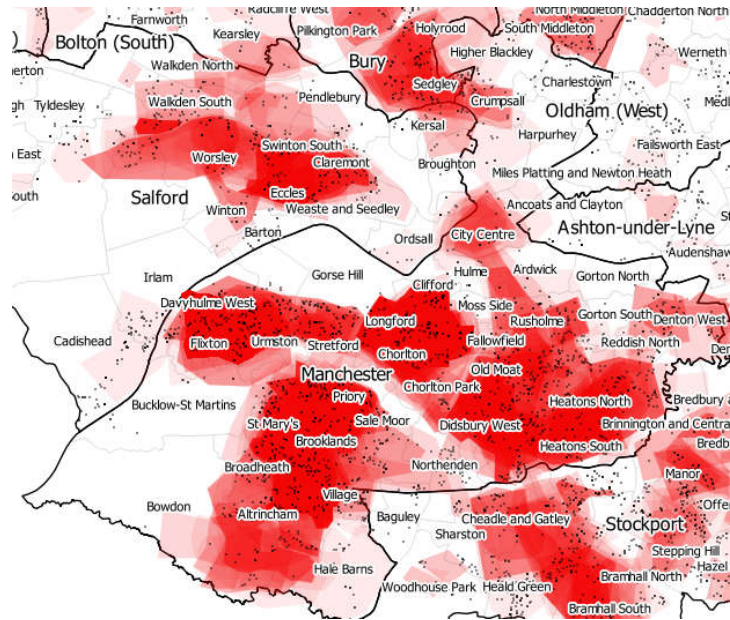
Figure 7.10: Search patterns and property availability - 3 bedrooms, price band £220K - 330K



3 bed £220K - £330K

Source: the thesis author's own analysis

Figure 7.11: Search patterns and property availability - 3 bedrooms, price band £220K - 330K



3 bed £220K - £330K

Source: the thesis author's own analysis

Figure 7.11 shows a larger scale map of the patterns of searches and available properties in the price band £220 - £330K and 3 bedrooms in Manchester. It can be seen that high search intensity was found in most areas of Manchester. This also corresponds with the large number of property opportunities. However, an issue of insufficient stock compared to latent demand can be seen in high search areas such as the city centre and its surrounding areas, such as Rusholme, Longford, Chorlton. In contrast, it seems that there was a mismatch in Northenden, which had more available properties than searches. Meanwhile, in the northern areas of Higher Blackley, Charlestown and Harpurhey there was both a lack of searches and property opportunities.

The analysis above complemented the earlier study by Rae (2015a) which highlighted the importance of search data in identifying submarkets. As mentioned by Rae (2015a), the use of search data with a visual method takes us one step closer to overcoming the challenge of how to segment submarkets effectively and accurately. This study has further demonstrated the usefulness of search data for exploring the relationship between current supply and latent demand.

The analysis above identified several areas that had an excess of latent demand but a lack of housing supply. This provides us with information about market restrictions and constraints. To explore this factor in more detail, the following sections look at the patterns of revealed demand and search preferences (or latent demand). Revealed demand focuses on information about the outcomes in real markets, for example, investigating housing choices based on paid house price or migration flows. By examining the difference between search preference and revealed patterns, it is possible to identify the potential problems in terms of supply and demand. For example, if an area has a greater number of searches compared to house transactions, the area may have excess demand due to the market imposing restrictions on housing supply, as exemplified by a lack of preferred houses. As a result of such market restrictions, households may make a suboptimal choice.

7.5 Market restriction and suboptimal choice

The previous sections highlighted the importance of search in identifying submarkets and latent demand. In this section it is important to discuss the issues of market restrictions and suboptimal choices through search and migration data. Migration data cannot show

us the desirable areas where households choose to live, but only show where most people move to. When compared with migration flows, search patterns provide us with information about these issues.

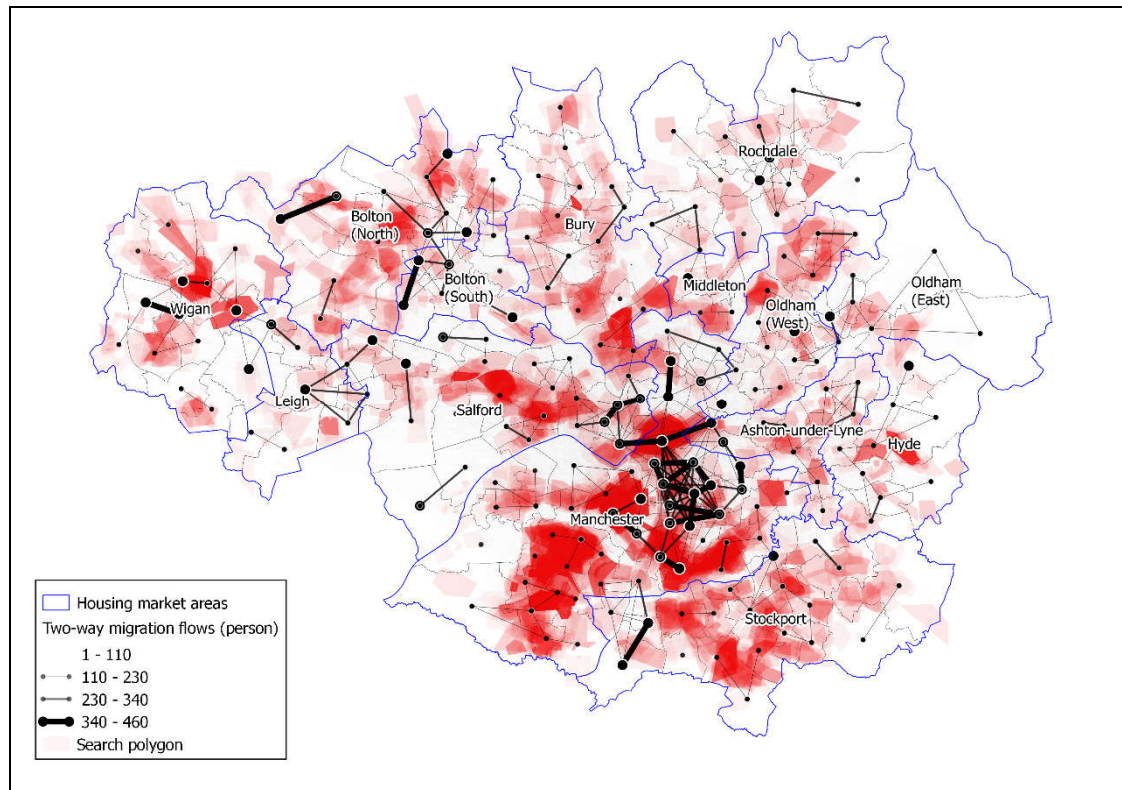
According to mainstream theory based on utility maximisation and perceived knowledge of the market, households make their housing decisions under certain conditions. These decisions have then to be adjusted to market restrictions. Research found that before they find their dream home households relocate several times during their lifetime in an attempt to make their housing situation better (Potepan, 1989; Montgomery, 1992; Littlewood and Munro, 1997). This is a process of adjustment to the market constraints. Alternatively, Simon (1978) and Simon (1982) and then Cyert and March (1992) suggested a notion of 'satisficing' which refers to the second best option or the best suitable option. The term means that instead of searching for the dream home that could be difficult or impossible to achieve due to imperfect information and supply constraints, households usually find an alternative that satisfies their preferences.

To explore the issues of market restrictions and suboptimal choice, the study produced several maps based on migration flows in 2011 and search polygons for 2013. To achieve this, the study assumes that migration patterns from 2011 remained unchanged in 2013. Through these maps, market restrictions and suboptimal choices were identified in the areas in which mismatches occurred between search and migration activities.

Both households' search preferences and housing supply can create separate market segments, and this could result in a mismatch between supply and demand segmentation. This is mainly due to an inelastic relation between supply and demand and the lack of

market information from households. Figure 7.12 shows information about the migration flows and search patterns. Some areas with high levels of search activity had limited migration flows, such as South Manchester, Stockport, Hyde, South Bury, Bolton (North) or Salford. This signals the existence of market restrictions as there seems to have been a lack of acceptable housing options. Further, the map shows that a number of areas had high in-migration numbers but a lack of searches, such as Bolton South and the areas surrounding Manchester city centre. This is also a signal of people making suboptimal choices because they have abandoned their original expectations and aspirations. It appears that while an area with a lack of searches may not be a desirable place to live, people move to that area because it is the best option among all the options available to them.

Figure 7.12: Two-way migration flows in 2011 and search patterns in 2013

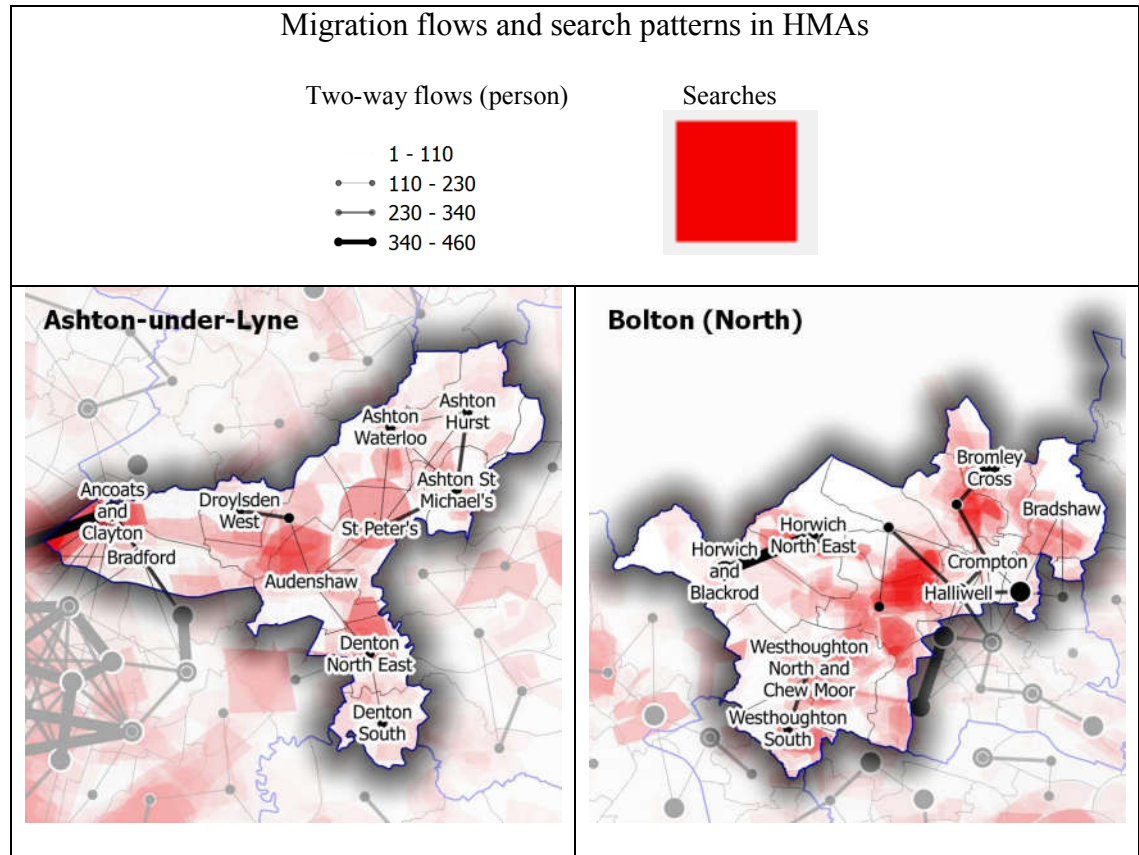


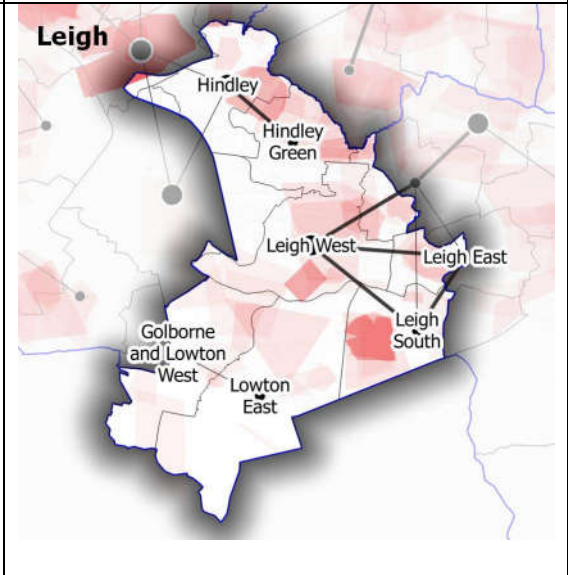
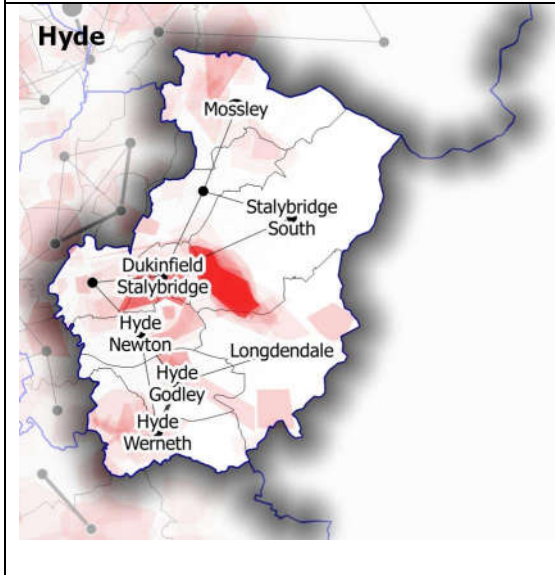
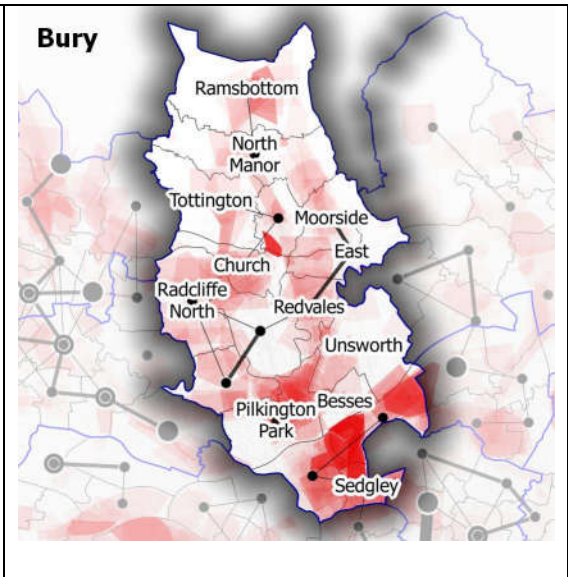
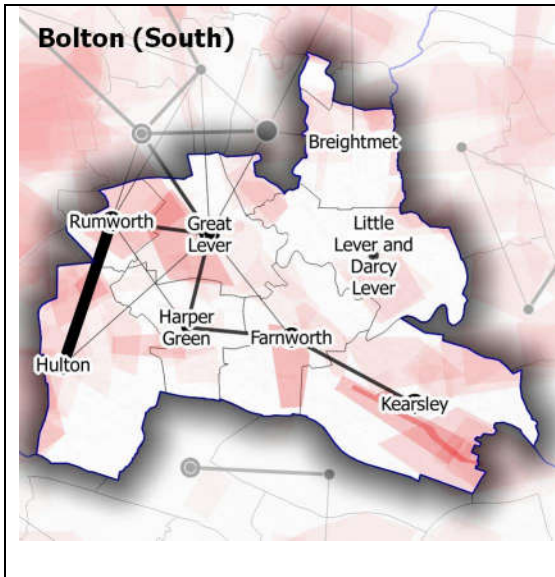
Source: the thesis author's own analysis

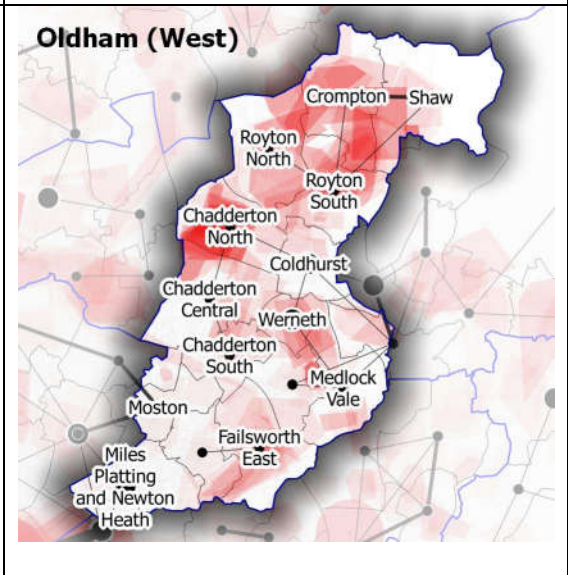
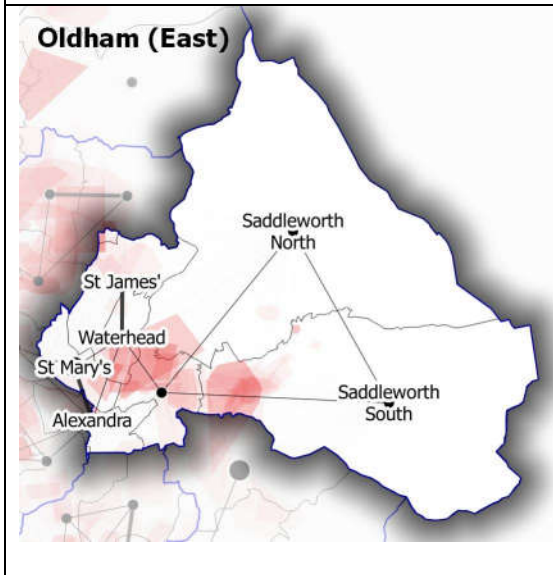
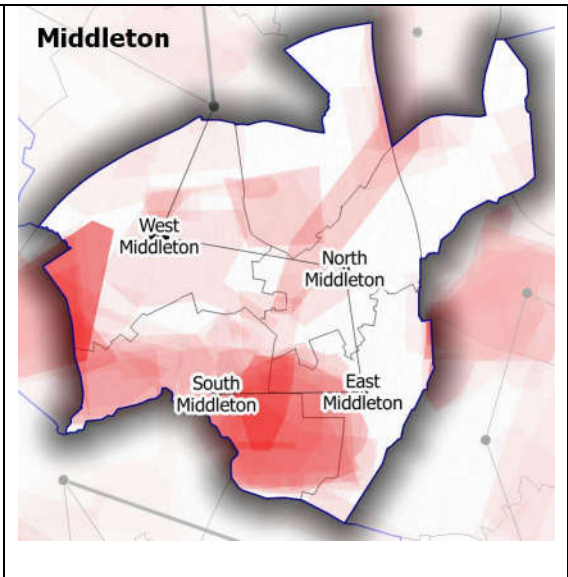
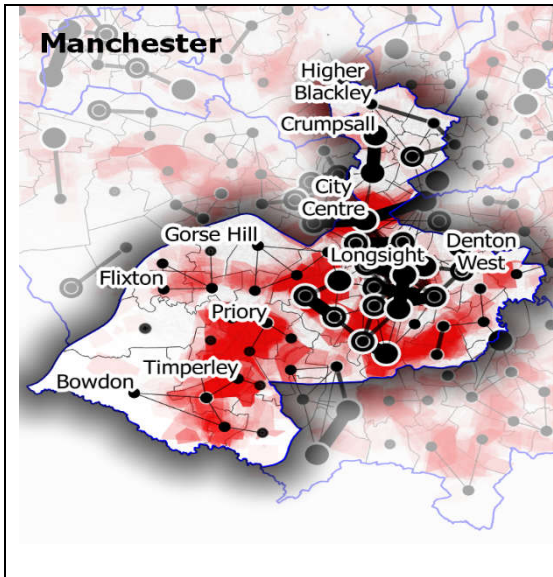
Figure 7.13 below provides the detail of search patterns in 2013 and migration patterns in 2011 for each of the 14 HMAs. From the figure, it is possible to identify the areas with a mismatch between migration and search activity. The areas with high searches but low in-migration were likely to suffer market restrictions, while those areas with high in-migration but low searches were likely to be suboptimal choices. In some areas there was a high number of searches compared to a lack of migration activity, for example several areas in Bolton North, Stockport, Bury, South Manchester (Timperley, Priory and the areas close to them), Salford (Worsley, Eccles). On the other hand, low search activity but high in-migration was found in areas including Ashton-under-Lyne (Bradford), Stockport (Baguley and Woodhouse Park), Wigan (Pemberton and Douglas), Bury

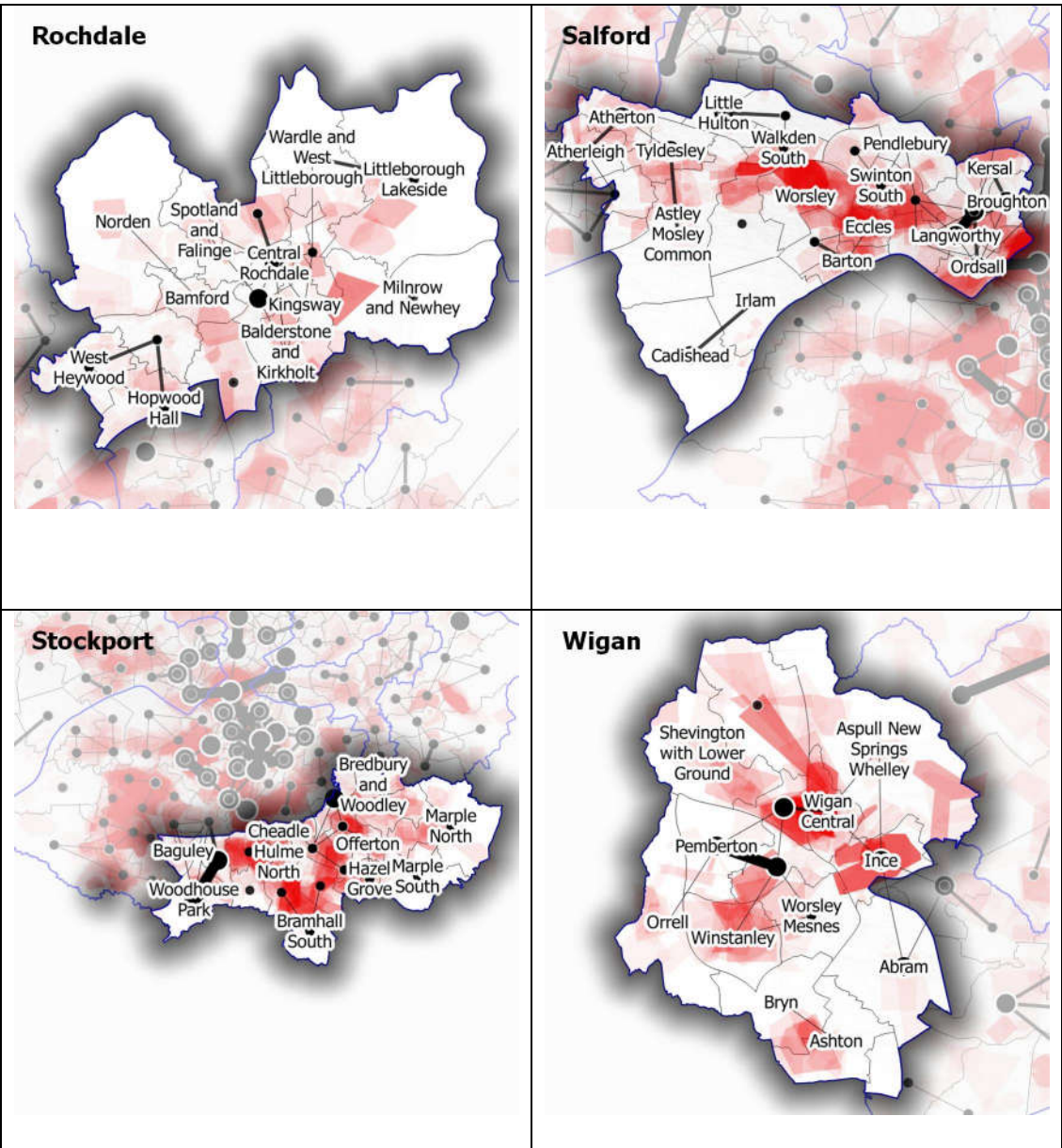
(Moorside, East), Leigh (Leigh West), Manchester (Longsight and the areas close to it, Crumpsall, Higher Blackley), Salford (Cadishead, Irlam, Little Hulton), Rochdale (Central Rochdale, Wardle and West Littleborough).

Figure 7.13: Migration flows in 2011 and search patterns in 2013 in HMAs









Source: the thesis author's own analysis

The analysis above helped us identify the areas where there was a mismatch between migration and search activity. This mismatch was a reflection of either market restrictions or suboptimal choices. The section below provides discussion about these in more detail.

7.5.1 Market restrictions

While house prices have increased at a high rate over the past 40 years, incomes have not kept pace with this rise, which has led to a problem of housing affordability in many areas of the country. Young people in particular are significantly struggling to afford their own homes. In dealing with this situation, increasing the housing supply is one of the most important actions. It is estimated that at least 250,000 new dwelling units need to be built per year in the UK to keep pace with an increasing population (The Migration Observation, 2016). However, the construction of new homes is limited by land and policy restrictions (The Migration Observation, 2016). As a result, it can take several years to increase the housing stock. Shortages of housing supply may occur across submarkets in a local market, which means that household preferences for housing are not met. Because of their lack of market information, households may not realise that these shortages of housing supply exist when they start searching for their desired home. Therefore, they do not know whether the areas in which they start searching will contain their desirable options. Their search patterns may be unrealistic and thus reflect the market constraints on housing supply for particular submarkets.

The maps above showed that in several areas there was an excess of latent demand but a lack of supply due to market restrictions, especially in the desirable areas in South Manchester. These market constraints on housing supply were caused by inefficiency within the planning system and land control restrictions. These factors have been investigated by Cheshire and Sheppard (2002), Barker (2004 and 2006), Evans and Hartwich (2005) or Cameron et al. (2006). In addition, Bramley (1998) highlighted the ineffectiveness of the planning system and examined ways in which planning constraints

and their effects on future supply could be measured. Another investigation indicated that the cost of the planning system in England had a real impact on the progress of supplying new homes (Cheshire and Sheppard, 2002; Ball et al., 2009). On the other hand, elsewhere, Harter-Dreiman, (2004), Green et al. (2005), Quigley and Raphael (2005) and Saiz (2010) has shown that land use regulation has a significant impact on the supply of housing. Moreover, Saks (2008) indicated that areas with few restrictions on building new housing projects saw a higher number of newbuilt dwelling units and smaller increases in house prices when facing a growth in housing demand. Furthermore, Glaeser et al. (2005) claimed that restrictions on land use tend to cause an increase in housing price due to the creation of shortages in supply.

In general, the issue of market restrictions can be identified when examining search and migration patterns in combination. Because potential buyers may lack market information, they may not realise that such market restrictions exist until they become involved in the search process. Their search patterns represent their optimal choice rather than the available options in the real market. However, during the process of search, they are likely to face market restrictions and may therefore change their search preference to take account of the real market situation. In a market with high latent demand but lacking their preferred options, it is necessary to explore how households make their decisions. Wong (2002) showed that when facing market constraints, for example, during the search process, a conflict between the household's actions and thoughts tends to come into play and this increases the difficulty of the decision-making process, which may cause households to choose the best available options or the least-worst options. These suboptimal choices are a sign of housing dissatisfaction because they still intend to find

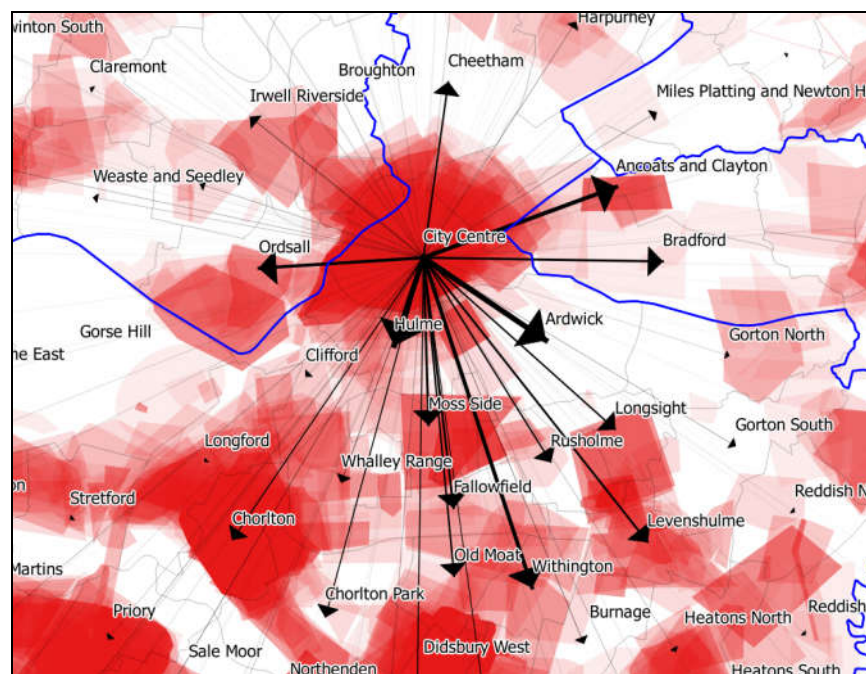
and move into their dream houses in future. The following section will provide more discussion on suboptimal choice.

7.5.2 Suboptimal choice

Search patterns reflect households' aspirations and preferences for housing, whilst migration patterns may provide us with the information about household's choices of housing locations and show where movements come from. From migration flows and search patterns, it is possible to identify mismatches between households' preferences and outcome patterns. The actual choices that did not reflect households' preferences can be described through the notion of 'satisficing'. This term derives from Simon's (1955) theory of bounded rationality. The word 'satisficing' means that households do not seek to maximise utility based on their predefined preferences. Instead, as households cannot obtain all the information required, they are unable to work through the decision making process properly. As a result, they are unlikely to achieve their dream homes and instead choose the best options available for them as suboptimal options. Dunning and Watkins (2012) examined the question of whether house buyers find their dream home. The study revealed that almost always home searchers had unrealistic expectations and were unable to find their dream houses to meet their original preferences. In particular, only a few searchers know the exact area, type or size of housing units they want to live in when they start searching for a home. One-fifth of home searchers adjust their aspirations before the first visit to a location. Moreover, another fifth adjust their preferences between their first visit and making an offer. Importantly, one-third of home searchers already feel that their new dwelling units do not meet their preferences before they start the actual purchase process.

Figure 7.14 shows the migration flows leaving the city centre for other areas in combination with search patterns. Some areas had low volumes of searches but high numbers of movers, including Ardwick, Cheetham, and Bradford. Clearly these areas were not seen as desirable areas but people moved there because the price was affordable and they were near the city centre. These outflows of migration from the city centre mainly involved people with low income and renters. These areas became the best suitable options based on their current financial ability. Because they have moved to areas that are not particularly desirable, their dissatisfaction may in the long run cause them to decide to move again.

Figure 7.14: Migration from the city centre to other areas and search patterns



Source: the thesis author's own analysis

The issues of optimal and suboptimal choice are important as they can affect the stability of a neighbourhood. Parkes and Kearns (2003) and Speare (1974) provided evidence that

households are likely to migrate to better neighbourhoods if their areas are experiencing the process of deterioration. On the other hand, the likelihood of moving home is low when households enjoy living in the current areas. When households find their optimal house, they are less likely to move except for unexpected reasons. However, if households decide to move to a suboptimal house because they cannot obtain their dream house, they are high likely to move out to find their dream house in future. This creates instability of submarkets, leading to outflows of migration which cause pressure on housing and public services as well as pressure on the labour market.

Suboptimal choice may be associated with households' financial ability. The majority of lower income households try to search in neighbourhoods with affordable house prices. However, in recent years, there have been shortages in the market of new-built affordable housing. A number of problems can be associated with this lack of supply, for example, planning restrictions, geographic restrictions, and mismatch between supply and demand preferences. Due to the shortages of affordable housing, disadvantaged households compete to buy low price housing units, which are often affected by issues relating to neighbourhood deprivation. While these low price neighbourhoods have attracted high levels of in-migration, which could be advantageous for the area, in the long run problems can emerge associated with residential dissatisfaction that may cause them to relocate again. To achieve stability in the housing market, it is necessary to pay attention to identifying and meeting the needs and wants of all kinds of households, not only those with high and medium incomes but also those with low income.

7.6 Conclusion

This chapter explored the role of housing search data to help us understand the structure and dynamics of the market. This was through the examination of submarkets based on search preferences, mismatch between supply and demand as well as the notion of satisficing. Despite its exploratory nature, this study offers some insights that can enhance understanding of the market system.

7.6.1 Submarket based on search preferences

Through presenting search patterns in Greater Manchester, submarkets based on search preferences were identified both sectorally and spatially across the HMAs in the market system. For example, high-end submarkets with prices over £330K were found only in several particular areas and mostly focused on the south of Manchester and Stockport. Submarkets associated with one bedroom accommodation were dominantly found in City Centre and its surrounding areas. Submarkets with two bedrooms and priced £220k - £330k were highly concentrated in Manchester and Stockport. The analysis showed that search patterns had a close relationship with submarkets and fit well into local HMAs from the NHPAU study. This implies that search information can be used to identify submarkets and local HMAs. This also has opened a new direction for researching submarkets and local HMAs based on housing search data as indicated in the study from Rae (2015a).

7.6.2 Latent demand

The study's analysis of search data provided us with a picture of latent demand, and, importantly, helped us identify mismatches between demand and supply. The analysis of search patterns and property availability identified where demand was high or low

relative to supply. The study found a close match between search intensity and available properties where households searched for 2 or 3 bedrooms in the price band £220K - £330K. In contrast, it identified a mismatch in areas where few households searched for 4+ bedrooms in the price band £110K - £220K or 1 bedroom priced below £220K relative to the high number of available properties in the areas. More available properties but fewer searches were found in the areas with prices of £110K - £220K and 1 or 2 bedrooms. On the other hand, more searches than property opportunities appeared in the submarkets with 2 or 3 bedrooms and prices above £330K. South Manchester saw a high number of searches but a lack of housing choices in terms of 2-3 bedrooms with price between £220K and £330K. Overall, the visual differences between search patterns and property availability help us identify those areas with high/low demand pressure.

7.6.3 Market restrictions and suboptimal choices

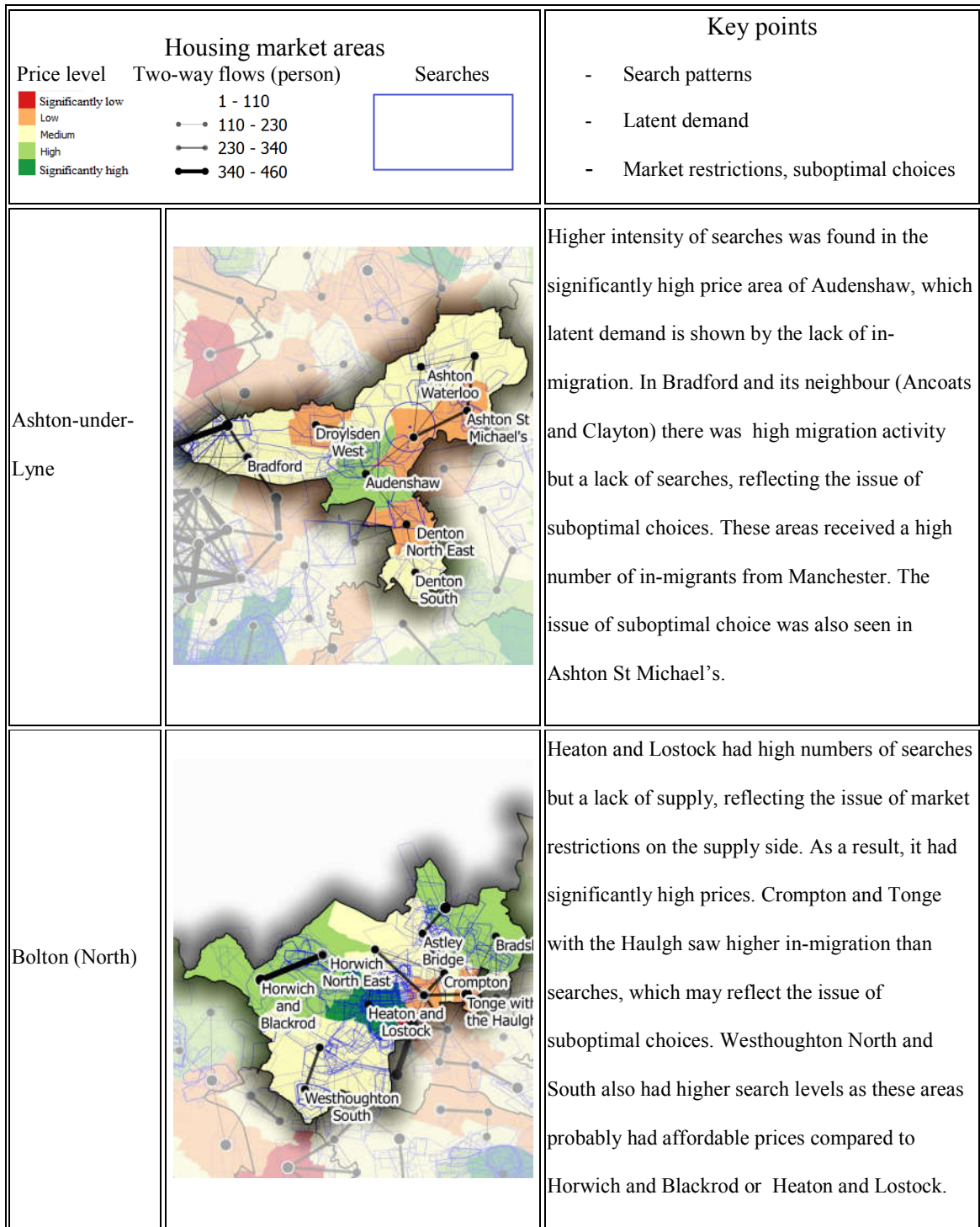
The study identified several areas suffering market restrictions and reflecting the issue of suboptimal choice. For example, high searches but low in-migration numbers were found in Bolton North, Stockport, Bury, South Manchester (Timperley, Priory and the areas close to them), Salford (Worsley, Eccles). On the other hand, a high number of areas witnessed high levels of in-migration but a lack of searches, for example, Ashton-under-Lyne (Bradford), Stockport (Baguley and Woodhouse Park), Wigan (Pemberton and Douglas), Bury (Moorside, East), Leigh (Leigh West), Manchester (Longsight and the areas close to it, Crumpsall, Higher Blackley), Salford (Cadishead, Irlam, Little Hulton), Rochdale (Central Rochdale, Wardle and West Littleborough).


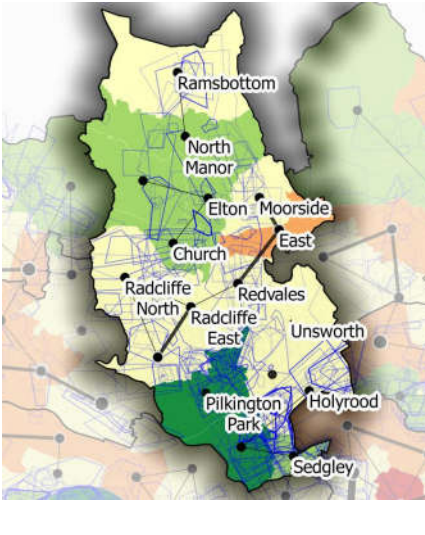

The study highlighted mismatches between submarkets segmented by supply and demand. Market constraints on housing supply were likely to be caused by the planning system and restrictions of land controls, which in turn made it more difficult to deal with the problem of housing affordability. The analysis showed that some submarkets were affected more badly than others by market restrictions. The study stressed the importance of providing sufficient housing supply for all submarkets, especially for low income groups, as each submarket plays a role in the structure and dynamics of the market system.

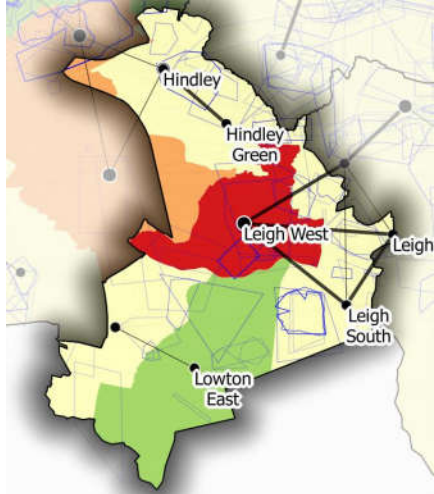
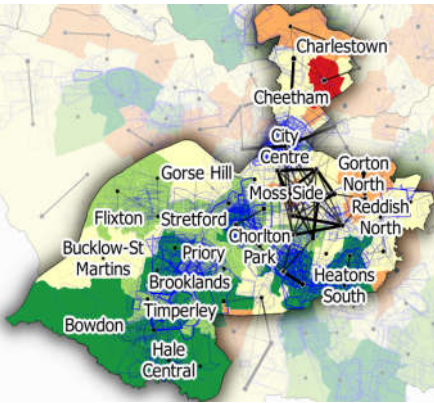
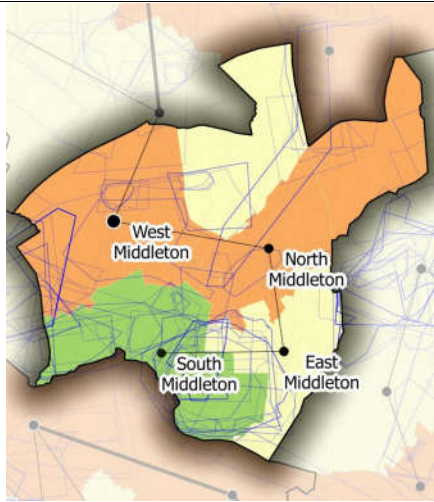
7.6.4 A summary table for each HMA


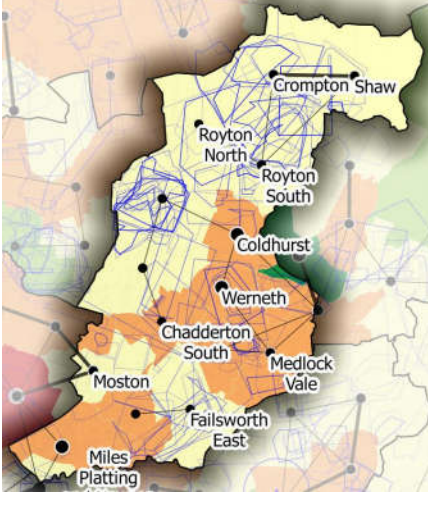

Figure 7.15 below summarises the information in terms of search patterns, latent demand and market restrictions in each housing market area. From these observations, it is possible to identify those areas with high potential demand relative to supply and those areas with a lack of demand compared to supply. This information may be important for market planners and analysts in making their decisions on either allocation of land for new housing projects or identifying housing problems to deal with them effectively.

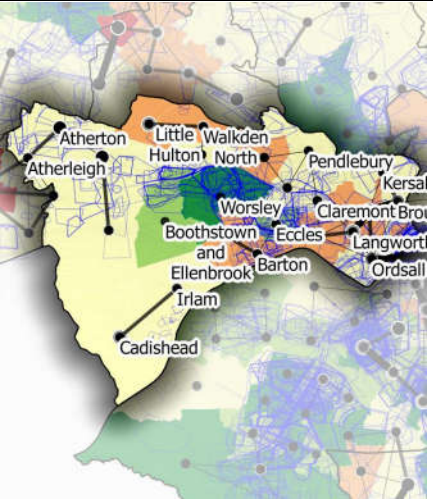
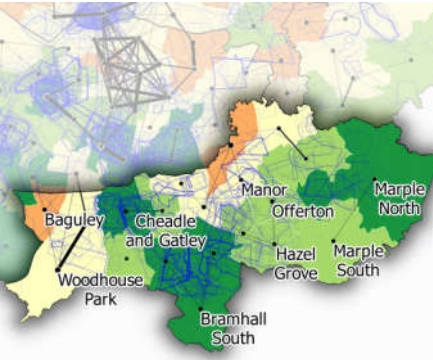
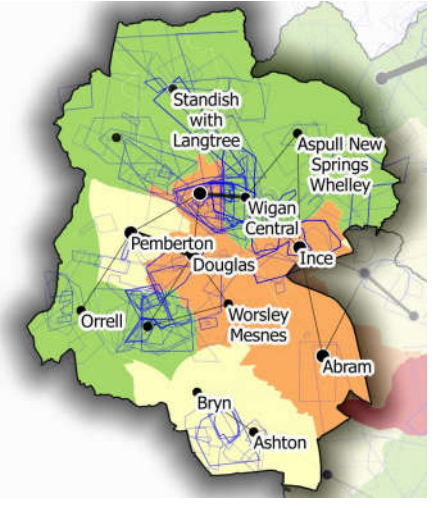
Figure 7.15: Search patterns, market restrictions, optimal choices in each housing market area



<p>Bolton (South)</p>	 <p>The map shows the southern part of Bolton with several areas highlighted in different colors. Rumworth is highlighted in red, Hulton in yellow, and Great Lever, Harper Green, and Little Lever and Darcy Lever in orange. Other areas like Brightmet and Kearsley are in light green. Lines connect Rumworth to Hulton and Great Lever, and Hulton to Harper Green.</p>	<p>There was a lack of searches across the whole HMA. High migration in Rumworth, Hulton presented the issue of sub-optimal choices. Little Lever and Darcy Lever, Brightmet, which seemed to be isolated, experienced a lack of potential demand. Higher numbers of searches were found in Kearsley and Hulton with medium price level.</p>
<p>Bury</p>	 <p>The map shows the town of Bury with several areas highlighted. Ramsbottom, North Manor, Church, Radcliffe North, Radcliffe East, and Unsworth are in light green. Elton, Moorside, East, Redvales, and Holyhood are in orange. Pilkington Park and Sedgley are in dark green. Lines connect Church to Radcliffe North and East, and Radcliffe North to Radcliffe East.</p>	<p>High numbers of searches but low in-migration numbers were found in Pilkington Park and Sedgley. This raises the issue of market restrictions on the supply side, leading to significantly high levels of house prices. Higher levels of in-migration than searches were found in the following medium price areas: Radcliffe North and Radcliffe West and Radcliffe East, Redvales, Moorside or East (low price)</p>
<p>Hyde</p>	 <p>The map shows the town of Hyde with several areas highlighted. Mossley is in light green. Stalybridge South, Dukinfield, and Stalybridge are in orange. Hyde Newton, Longendale, Hyde Godley, Hyde Werneth, and Hyde are in dark green. Lines connect Mossley to Stalybridge South, and Dukinfield to Stalybridge.</p>	<p>This HMA seemed to have a lack of latent demand as there was a low level of searches. Several areas had more searches than the others, such as Mossley, Dukinfield Stalybridge, which had medium price level. In Hyde Godley in-migration number exceeded search number.</p>

<p>Leigh</p>	 <p>A map of the Leigh area with several sub-areas labeled: Hindley, Hindley Green, Leigh West, Leigh, Leigh South, and Lowton East. Leigh West is highlighted in red, indicating high migration activity. Other areas are in shades of yellow, orange, and green.</p>	<p>Latent housing demand was low in this HMA despite a high number of migration activities between Leigh West and its neighbouring areas. Leigh West seems to be attractive because of its significantly low price. This illustrated the issue of suboptimal choices. The high-end price submarket of Lowton East had a lack of both in-migration and search numbers.</p>
<p>Manchester</p>	 <p>A detailed map of the Manchester area with numerous sub-areas labeled: Charlestown, Cheetham, City Centre, Gorton North, Gorton South, Moss Side, Reddish, North, Heaton South, Heaton North, Brooklands, Chorlton Park, Stretford, Flixton, Bucklow-St Martins, Priors, Bowdon, Timperley, and Hale Central. City Centre is highlighted in red, and other areas are in various shades of blue, green, and orange.</p>	<p>This was the most active market regarding both search and migration activities. High potential demand was found in City Centre but it seemed to have a lack of supply. Excess latent demand but lack of supply was significant in Timperley, Brooklands, Priors, Chorlton Park and its neighbours including Didsbury, Stretford, Heaton South. The issue of suboptimal choices was significant in Moss Side and its neighbouring areas or in Cheetham.</p>
<p>Middleton</p>	 <p>A map of the Middleton area with sub-areas labeled: West Middleton, North Middleton, South Middleton, and East Middleton. South Middleton is highlighted in green, and other areas are in shades of orange and yellow.</p>	<p>In general, this HMA seemed to have a lack of housing demand. Higher potential demand was found in South Middleton, with higher searches compared to in-migration. Higher migration activities were found West and North Middleton, South and East Middleton, North and East Middleton.</p>

<p>Oldham (East)</p>		<p>It seems that there was more migration activity than searches in St Mary's (significantly high price), Alexandra (low price), Waterhead (medium price) or St James's (medium price). Saddleworth North and South had a lack of potential demand (less searches), but migration activity was identified.</p>
<p>Oldham (West)</p>		<p>High searches were found in the areas with medium price level such as Crompton, Shaw, Royton South, Royton North and its neighbour to the south. The areas with low price level did have potential demand but at a lower level.</p>
<p>Rochdale</p>		<p>Central Rochdale (red colour) had significantly low price and attracted a high number of in-migration but a lack of searches. A similar situation was found in Healey, Littleborough Lakeside, North Heywood, Hopwood Hall.</p>

<p>Salford</p>		<p>High potential demand for housing was found in Worsley, Langworthy, Ordsall, Eccles. These areas seemed to be affected by supply restrictions.</p> <p>Several areas had a lack of searches but higher migration activity, such as Atherton, Atherleigh, Cadishead, Irlam, Little Hulton, Walkden North. These areas seemed to be affected by the issue of suboptimal choices.</p>
<p>Stockport</p>		<p>Potential demand but low in-migration was found in areas with significantly high price such as Cheadle and Gatley and its surrounding areas.</p> <p>Baguley and Woodhouse Park had a higher amount of in-migration compared to searches.</p> <p>Searches were found at a lower level in Marple North despite it having significantly high prices.</p>
<p>Wigan</p>		<p>Search patterns seemed to be focused on Wigan Central and its neighbours, or on Orrell and its neighbours, or on Bryn and Ashton. High numbers of searches were also found in the areas with high price: Standish with Langtree, Aspull New Springs Whelley. It seems that search and migration activities were more balanced.</p>

Source: the thesis author's own analysis

Chapter Eight: Search and migration: Potential for predictive models

8.1 Introduction

From the previous chapters, it is evident that examining the search process can play an important role in enhancing our understanding of the structure and dynamics of the market. Based on search data, it is possible to identify submarkets based on household preferences and gain information about excess demand relative to supply and potentially about market restrictions. On the other hand, migration may help us understand the connections between submarkets and HMAs and the dynamics of submarkets. This raises questions regarding the nature of the relationship between housing search, migration and house price and whether we can use search and migration in combination to predict house price.

The motivation for studying this topic derives from two sources. First, the previous chapters showed that search and migration play important roles in enhancing our knowledge in terms of the structure and dynamics of a local market which is seen as a system of linked HMAs and submarkets. Therefore, the thesis tries to explore further their roles in building a prediction model for the housing market. Second, motivation derived from the study by Rae (2015b) indicating that search data can be used to predict future housing market activities. Therefore, the migration data for 2011, search data for 2013 as well as house price data for 2005-2014, were used to investigate the possibility of constructing a model to predict future flows and impacts of migration and search.

This model is largely based on previous studies that have used online search data to examine the influence of search and migration in predicting future activity in the housing market. These studies include Choi and Varian (2009), Choi and Varian (2012) and Beracha and Wintoki (2013). They found that online search data can be useful to predict future price or volatility based on Google Insights for Search. However, these studies were mostly based on Google Trends (Rae, 2015b, 3). In contrast, Rae (2015b), who investigated the possibility of using online search data from Rightmove, demonstrated that this kind of data is useful to predict house price and suggested building predictive models of future market activities at the level of sub-national housing market areas.

On the other hand, migration is seen to have a significant impact on the housing market and may affect house prices. How these impacts are on the market depends on the relationship between shifts in housing supply and demand. Many studies have paid attention to the influence of migration outcomes on the housing market, for example, the impact of net-migration on house price (Sá, 2015; Degen and Fischer 2009). They found that immigration has both positive and negative impacts on house price. However, few studies have considered the influence of other migration indicators on the housing market, particularly migration churn and turnover rate. Migration turnover can help understand, for example, why the characteristics and needs of a region may change significantly within the context of a relatively stable population count. Migration churn rate is calculated based on the number of migrants moving out of an area in a specific period of time. Churn rate ratio is a more accurate way to measure the balance in migration in different areas as it counts the intra-migration within the area. The two ratios are supposed to have a connection with house price.

This chapter is structured as follows. First, migration indicators are introduced, including net migration rate, migration churn and turnover rates. Second, search intensity is discussed. Next, the relationship between search activity and house sales is analysed, and the possibility to predict future market activity is examined, particularly predicting house sales based on the total number of detailed searches, the total value of housing sales and the total volume of housing sales. The following section discusses the analysis of the relationship between migration indicators and house paid price. After that, the study considers potential for an analytical model to predict the flows of migration and search and their impact based on search and migration indicators. Finally, the summary is presented.

8.2 Migration indicators: net migration rate, turnover and churn

Migration indicators include net migration rate, migration turnover rate and migration churn rate. Net migration rate is defined based on the number of in-movers and out-movers over a certain period of time. Many studies have investigated the influence of net migration on the housing market, and found both positive and negative impacts. Net migration is also an important factor associated with the state of the housing market and has positive benefits, and increases demand for housing (The Migration Observation, 2016). However, at the local area, this may be different. High levels of immigration could cause house prices to fall in particular local areas. Sá (2015) showed that a 1% increase in low-education migration inflows could lead to an increase of outmigration of wealthy native population as high as 1.6%, and this would lead to a decline in house prices. This may be the first sign of the area's deterioration. Meanwhile, inflows of wealthy migration into other areas tend to cause an increase in price in such areas. Sá (2015) also found that local neighbourhoods with high

migration inflows tend to have high percentages of movers with low earnings. In short, there is a trade-off between immigration and house price. While inflows may influence house prices in a certain neighbourhood, house price influences mobility decisions into an area. As a result, the influence of inflows on house price remains uncertain and it causes difficulties in investigating the connections between house price and level of immigration (The Migration Observation, 2016).

The migration turnover ratio is an indicator of the number of people moving into an area plus the number of people moving out in relation to the size of the population. Migration turnover can help us understand, for example, why the characteristics and needs of a region may change significantly within the context of a relatively stable population count. Therefore, migration turnover rate can be used for measuring neighbourhood stability (Bailey and Livingston, 2007) or changing functions in areas. Turnover rate is also seen to have relationship with level of deprivation in an area. For example, high turnover rates tend to be seen in deprived areas. These high rates are often associated with the high level of deterioration and show a tendency that households are dissatisfied with their current neighbourhoods (Bailey and Livingston, 2007). High population turnover may be beneficial in that it facilitates an efficient allocation of labour and ensures that local employers have access to a broad labour market (Israelsen et al., 2006). Because inter-county and interstate moves are often associated with changes in employment, turnover of a population is closely associated with the mobility of labour (Israelsen et al., 2006). Migration turnover may provide information about the filtering process between neighbourhoods. If the migration turnover rate is high, there may be high levels of filtering between neighbourhoods. Through this process, households may move up, down, or move to similar

submarkets. If the migration turnover rate is low, the filtering process may happen slowly as mobility activity is at a low level.

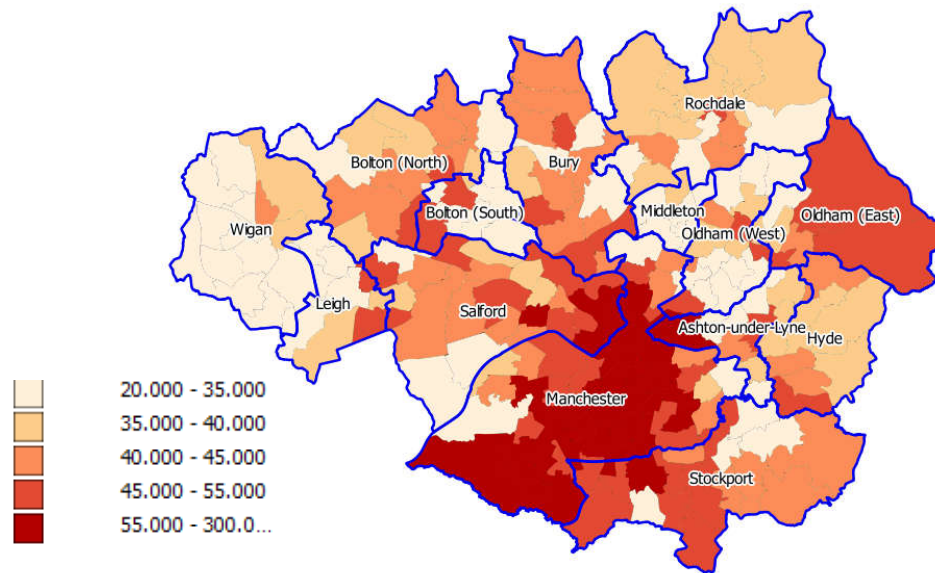
Dennett and Stillwell (2008) described migration churn as a measure of the intensity of migration into and out of a district and including flows that take place within each district. Churn rate provides information about the dynamics of movements within an area. If the churn rate is high, there is a high level of movement inside a neighbourhood. If the churn rate is low, movement inside the neighbourhood is weak and the neighbourhood seems more stable and likely to be attractive to some specific household groups.

All in all, migration turnover and churn rates provide indicators of the stability of mobility activity in an area. Migration churn rate presents the concept of neighbourhood stability better than migration turnover as it pays attention not only to migration activities inside a neighbourhood but also to activities between neighbourhoods. Bailey and Livingston (2007) mentioned that churn rate plays an important role in household migration patterns due to its closer connection with deprivation.

To illustrate, migration churn and turnover rates are shown in Figure 8.1 and 8.2 below. The magnitude increases as the colour changes from white to red. Generally, the highest levels of turnover and churn were found in Manchester and some of the more dynamic urban areas such as Stockport, Salford, Bury, and Oldham (East), whereas the lowest levels were found in Middleton, Oldham (West), Wigan, Leigh. It is argued that with high rates of turnover and churn, demand for housing is high and this causes an increase in local house prices. With high turnover and churn, these areas have active housing markets, which tend to be associated with household

mobility. Newcomers are attracted to the area by job opportunities and they firstly often settle in rented housing and then wait for opportunities to move up to ownership tenure. In contrast, in areas associated with low rates of churn and turnover, the housing market has a low proportion of households living in rented housing. That is the case in areas far from the centre city such as Wigan, Leigh, and Rochdale.

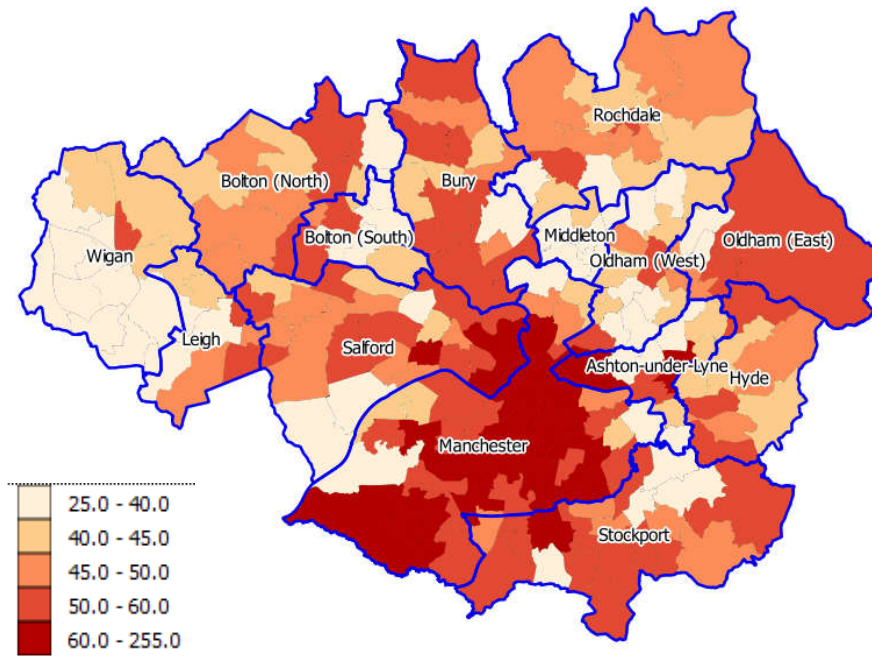
Figure 8.1: Migration turnover rates across Greater Manchester in 2011



Migration turnover rate (%)

Source: the thesis author's own analysis

Figure 8.2: Migration churn rates across Greater Manchester in 2011



Migration churn rate (%)

Source: the thesis author's own analysis

The cause of high rates of turnover and churn may be identified by investigating the characteristics of households who live in a neighbourhood. According to a DCLG study, the causes of turnover and churn are associated with the attributes of households: age, ethnicity, and housing tenure (DCLG, 2010). The level of household movement varies greatly between age groups. Higher turnover and churn rates are more likely to be associated with areas with high proportions of young age groups living in them. These groups often include those in their late teens or early twenties, such as students or young adults who move because of job prospects (DCLG, 2010). In contrast, areas with higher proportions of those aged 65 or older are likely to have lower rates of turnover and churn (DCLG, 2010). These are usually retired households who are less likely to migrate. Housing tenure also is a cause of turnover and churn. Areas with high percentages of rented housing tend to be associated with

high rates of turnover and churn. Rented housing is often the option for younger households who move to areas with high job opportunities.

8.3 Search and search intensity

The study of the acquisition of information can be said to start with Stigler (1961) who researched the search process in relation to goods and labour markets. Later, many researchers began to investigate the role of information in the search process in housing, such as Stull (1978), Yinger (1981), Haurin (1988), and Salant (1991). Studies also started looking at the role of information in buyers' search process (Anglin, 1997), buyer time on market (Elder et al., 1999), or information asymmetry between sellers and buyers (Pope, 2008). Recently search data has been found useful in identifying market segmentation (Piazzesi et al., 2015; Rae, 2015a). Therefore, over the years search data have played an increasing role in investigations of the housing market.

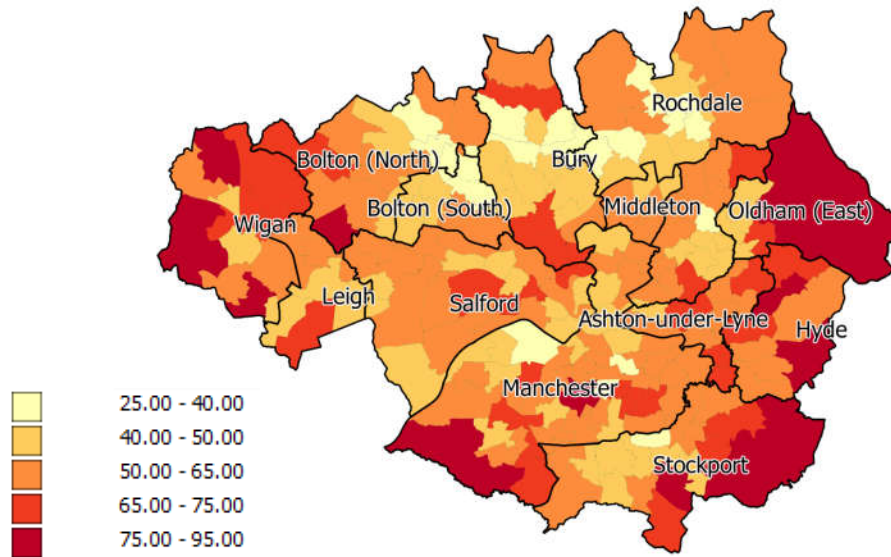
Recently, the possibility of using search data for predicting future market activities has been explored. Choi and Varian (2009) and Choi and Varian (2012) used Google search data to identify a connection between search and market activities, whilst Wu and Brynjolfsson (2009) showed the potential for using Google search data to predict the state of house prices in the housing market. Furthermore, Beracha and Wintoki (2013) produced interesting results in a study that employed Google search data to predict change in future house prices. More recently, Piazzesi et al. (2015) used a dataset from an online search portal to examine factors including housing turnover, time on market, inventory and search queries. All these studies have shown the usefulness of search data in examining housing market activities. More importantly, Rae (2015b) has investigated the connection between search activities and house

price and highlighted the possibility to use search data to predict future activities. In short, these studies point to an important new direction in housing market research based on the use of online search data.

Figure 8.3 below shows ‘search intensity’ in Greater Manchester in March 2013. The term ‘search intensity’ is borrowed from the work of Rae (2015b) to show the level of excess demand based on the volume of searches in relation to the number of available dwelling units. Where there is high search intensity, the area is likely to experience a high level of excess demand based on searches. From this map, it is possible to identify those areas with a lack of housing stock.

Low search intensity can be seen in Bolton (North, South) plus a selection of other locations including Bury and Rochdale. Those areas in Manchester with the highest search intensity can be expected to be very popular with buyers. The map also shows high values of search intensity in areas far from the city centre, such as Wigan, Oldham (East). The situation in Oldham (East) can be explained by the high rate of churn and turnover associated with high demand for housing, while the supply is limited. In contrast, Wigan had low levels of turnover and churn but a high level of search intensity, especially in several areas in the north. The low rates of churn and turnover maybe because a high proportion of elderly people live in the area. Meanwhile, the high level of search intensity implies that the housing supply for this household group, based on a particular housing type, is also limited compared to the demand.

Figure 8.3: Search intensity across Greater Manchester in 2013



Search by property

Source: the thesis author's own analysis

8.4 Relationship between search and house sales

According to the National Statistician's Review of Official Housing Market Statistics (2012), housing market indicators can be categorised into a supply group and a demand group. The supply group relates to housing stock and includes the characteristics of housing units, construction factors, rates of repairs and knocking down, resource cost and available supply, factors associated with planning system, while the demand group includes price of dwelling units, transaction numbers, financial factors and others. Among the demand group factors, transaction volumes and house price play important roles. When the market is on the rise, house prices and transaction volumes increase, whereas when house prices and sales are in decline, the housing market experiences problems. Based on data availability, for predictive purposes this study employs housing sale value (representing for house price) and

sale volume in relation to the total number of searches. The underlying hypothesis is that the higher the total number of searches, the higher the total value and volume of housing sales.

The study aggregates the total number of detailed searches and price paid data to the postcode level and then merged ward level. The search data was for March 2013 while the price paid data were collected six months after. This time lag was recommended by Rae (2015b), based on advice from housing market analysts. The correlation analysis was carried out as described in Figure 8.4. Simple linear regressions were also carried out between the total number of detailed searches and the total value of housing sales and between the total number of detailed searches and the total volume of housing sales as shown in Figure 8.5 and 8.6. The analysis was applied for each of the 215 wards in Greater Manchester.

Figure 8.4: Correlation between search activities and paid house price

	Detailed searches	Correlations
Total value of housing sales 2013	.901** .000 215	Pearson Correlation Sig. (2-tailed) N
Total volume of housing sales 2013	.747** .000 215	Pearson Correlation Sig. (2-tailed) N

** . Correlation is significant at the 0.01 level (2-tailed).

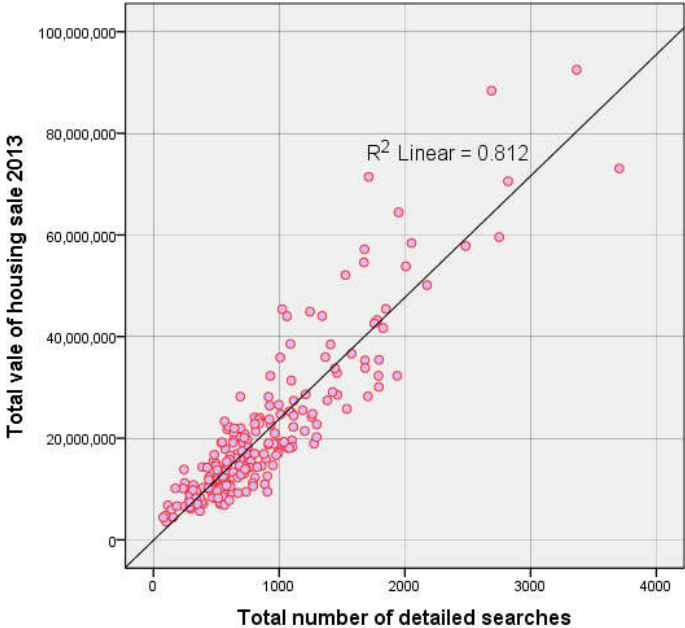
* . Correlation is significant at the 0.05 level (2-tailed).

Source: the thesis author's own analysis

The results are similar to the findings from Rae (2015b), which confirms the potential for using online search data to predict future housing market activities. There is a significant correlation between the total number of views and either the total value of housing sales in 2013 or the total volume of housing sales in 2013. Also, the scatter plots showed the relationships between them. The very high value of the coefficient

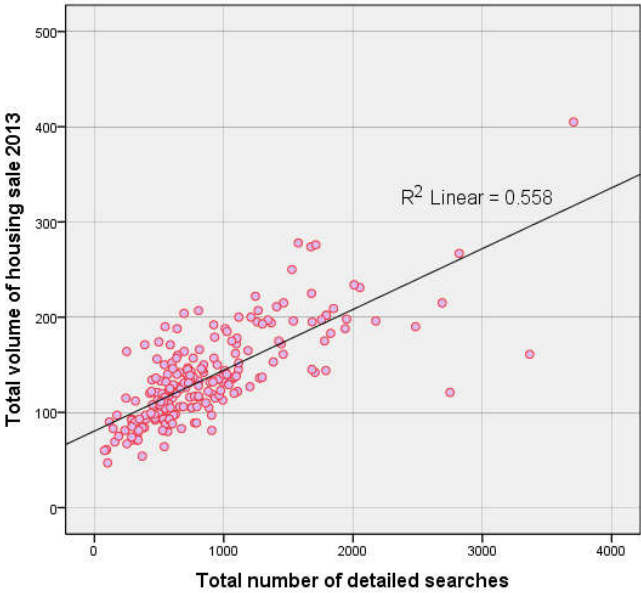
of determination (R^2) between the total value of housing sales and the total number of view suggests the high potential of using online search data to predict future sales.

Figure 8.5: Relationship between housing sales and views in 2013



Source: the thesis author’s own analysis

Figure 8.6: Relationship between housing volume and views in 2013



Source: the thesis author’s own analysis

The total volume of housing sales shows us the number of dwelling units sold in a certain period of time. This is associated with the wealth of the market, as an increase in numbers of housing transactions shows the market is on the rise. In this study, the R2 is smaller in the case of the relationship between the total volume of housing sales and the total number of views (0.558), but this can still be considered as a good result.

In short, the high correlation between search activity and housing sales indicates the potential for constructing predictive models using online search data. However, migration is also considered to play an important role in market activity. This factor will therefore be examined in the following section.

8.5 Relationship between Migration and house sales

In the report to the Research Donation Committee of the Bank of England in 2015, Rae presented a number of important findings. Housing search activities and future market activities are in some ways connected. In particular, online housing search can be connected with total value of future sales and total volume of sales. Rae (2015b) also mentioned the potential for using search indexes in investigating housing market outcomes. While the section above supported the findings of Rae (2015b), it is also necessary to examine the relationship between migration indicators and house price.

It is argued that migration is greatly influenced by the state of the housing market and spatial price variation in the availability and cost of housing. Falls in house prices may prevent households from migration because of the capital loss and difficulties in the housing finance markets (Chan, 2001, Ferreira et al., 2010). On the other hand, higher housing prices may prevent households moving into their desirable areas and

may steer them toward the surrounding neighbourhoods with lower prices. In a particular area, an increase in in-migration tends to cause a rise in house value, while an increase in out-migration may be highly associated with a growth in house price (Jeanty et al., 2010). Therefore, there is a relationship between net migration rate and house value. Generally, there is a complicated relationship between housing prices and household migration. To examine the possibility to use migration data to predict future market activity, this study investigates the relationship between migration indicators, including net migration rate, migration churn rate, migration turnover rate, and volume and value of housing sales.

The correlation analysis was based on migration indicators and house sales (volume, value of sales). The net migration rate, migration turnover rate and migration churn rate were calculated for each output area across Greater Manchester. Similarly, the total value of housing sales and the total volume of housing sales were determined for each of these output areas. The migration data were collected from March 2011 while the 2011 house paid price was collected after March 2011. Using this time period allowed us to examine the influence of migration activities on house sales.

Figure 8.7 Correlation between migration indicators and housing sales

	Migration churn rate	Migration turnover rate	Net migration rate	Correlation
Total value of housing sale 2011	.049**	.049**	.115**	Pearson Correlation
	.000	.000	.000	Sig. (2-tailed)
	6390	6390	6390	N
Average value of housing sale 2011	-.080**	-.081**	.028*	Pearson Correlation
	.000	.000	.024	Sig. (2-tailed)
	6390	6390	6390	N
Total volume of housing sale 2011	.119**	.120**	.127**	Pearson Correlation
	.000	.000	.000	Sig. (2-tailed)
	6390	6390	6390	N

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: the thesis author's own analysis

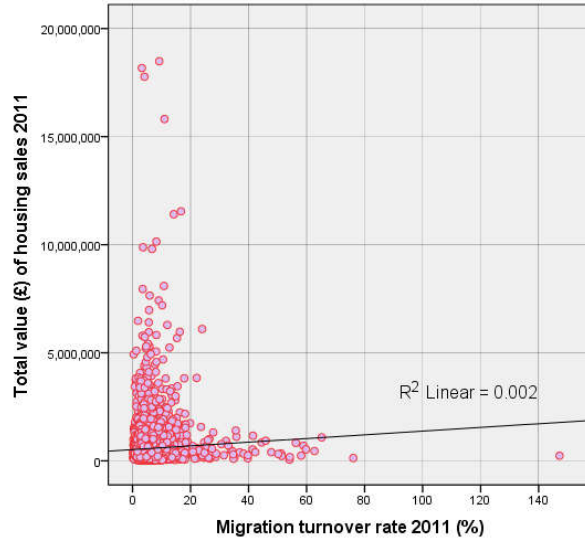
Figure 8.7 shows the correlation between migration indicators and house sales. There is a significant correlation between these migration activities and housing sales, except for a slightly lower level of relationship found between net migration rate and the average value of housing sales. While this high correlation indicates the potential for predicting market activities based on migration indicators, more studies need to be carried out.

Figures 8.8, 8.9, 8.10 show the relationship of migration churn rate and turnover rate with value and volume of housing sales. The coefficient of determination (R^2) between these migration indicators and housing sales is of very small value. In these areas with very small value R^2 , while there is clearly high demand for housing, there is also lack of transactions, maybe because prices are significantly high for people to be able to afford to buy. In short, there is high demand but low affordability. This fits with the narrative of issues affecting areas with high turnover and churn rates.

It is argued that population increase is a major underlying factor affecting demand for housing and lack of supply of new dwelling units pushes up the price both of renting and purchasing dwellings (Karantonis, 2008). Areas with high turnover and churn rates experience strong growth in demand for housing, especially areas with high churn rate. The movement of large numbers of households in and out of an area has serious consequences because it adds to the costs of providing housing services. In highly mobile areas housing supply is more complex than in stable areas as it has to adjust to changing demands. In areas with high churn rates, new arrivals may tolerate overcrowding or sharing in order to pay lower rents, which leads to over-use of

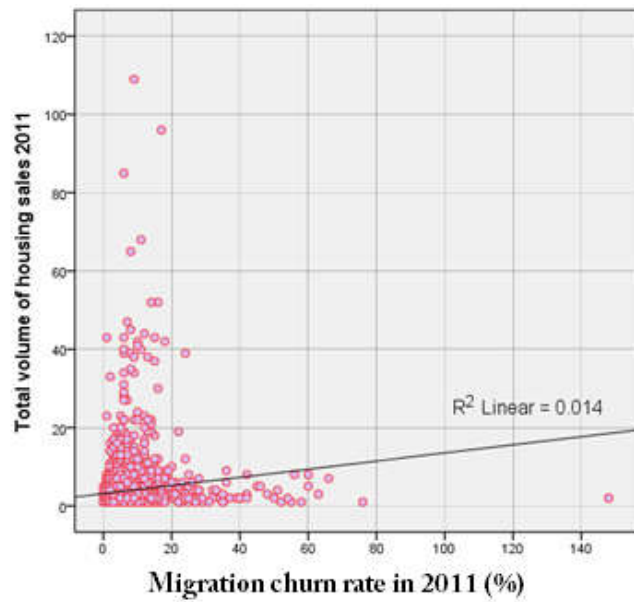
dwelling units across the area. Put simply, although housing demand is very high, people cannot afford to buy.

Figure 8.8 Relationship between total value of housing sales and turnover rate in 2013



Source: the thesis author's own analysis

Figure 8.9 Relationship between total volumes of housing sales and churn rate in 2013

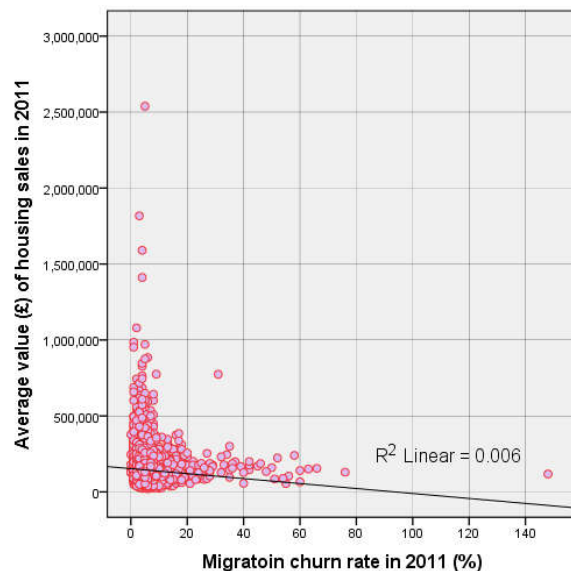


Source: the thesis author's own analysis

According to Figures 8.8 and 8.9, the areas with lower rates of turnover and churn between 0% and 20% had higher total value and volume of housing sales than the areas with higher churn and turnover rates above 20%. On the other hand, according to Figure 8.10, the areas with lower rates of churn, between 0% and 20%, had higher average value of housing sales, while in areas with higher rates of churn, above 20%, the average house price declined.

The negative correlation between either turnover rate or churn rate and average value of housing sales may indicate that migration flows affect the mix of houses sold. Areas with high turnover and churn rates are often associated with high levels of deprivation. In these deprived areas, there may often be a rise in the transaction number of low price units. When calculating the average price for the area, there is a decrease in house price. It is argued that new arrivals typically access the poorest and cheapest housing. This situation can be described through Figure 8.10.

Figure 8.10 Relationship between average values of housing sales and churn rate in 2013



Source: the thesis author's own analysis

The analysis above shows that there is high potential to use migration indicators such as net migration, churn, and turnover in combination with number of searches to construct a model for predicting future market activity. The strong relationships between searches and housing sales and between migration indicators and house sales shed light on further steps needed to build this kind of model. The higher the number of searches was, the higher the value and volume of house sales were. The situation is more complex in the case of migration indicators. While high turnover and churn seemed to have a significant correlation with house sales, the value of value of $R^{(2)}$ was very small. However, these indicators can play a useful role in identifying areas where demand cannot be met for reasons such as lack of affordability or lack of housing stock supply.

8.6 Towards a predictive model

The process of household mobility includes a central role of time, a process of acquiring information, evaluation of available alternatives, and revision of household aspirations (Maclennan, 1982, p. 60; Marsh and Gibb, 2011, p. 217). These influences cause the housing market to become complex and therefore create difficulties for policy makers and practitioners in decision-making. To support the decision-making process, it seems to be important to develop a model to understand the relationship between housing search activity, migration activity and market outcomes. Although the model cannot reflect exactly the real situation, it is a useful tool for investigating the relationships and interactions among various different factors in the housing market. Such models can help us have a better understanding of how the housing market works as a system of linked submarkets and HMAs with the process of housing search. The model should include the influential factors associated with

household migration and search process to reflect the context of market constraints and restrictions. This can help us to understand the mobility decision-making process and the behaviours of market players, and even to make predictions of future market activity in order to estimate housing need and demand more effectively.

To build this kind of model, important indicators should be included, such as those indicators in the work of Hincks et al. (2014). Therefore, a number of datasets can be useful: household census data, house price paid data from Land Registry, online housing search data from online search portals such as Rightmove, and other data types such as deprivation data.

The census data provide migration flows which are collected every 10 years. Using this dataset, migration influential factors can be calculated, including net migration rate, migration churn rate, and migration turnover rate. These migration factors have been analysed in this study and seem to have significant correlation with housing market outcomes such as house price change and housing turnover. Therefore, it is important to include these migration indicators in the development of a model. On the other hand, using house price datasets, it is possible to consider changes in house price based on short and long periods of time for each submarket. Also, it is necessary to consider housing turnover ratios, which show sales volume in relation to total housing stock. This study identified a significant correlation between house sales and searches and house sales and migration indicators, but these relationships are based on average house price for all house type submarkets. Therefore, to gain a more accurate picture, it is necessary to calculate average house price for each housing type.

Regarding online search datasets, these can be collected from online search portals to calculate the total number of searches for each area. Despite the significant correlations found between numbers of searches and house sales, these search data should be used with caution. Researchers should understand the motivations and intentions of the searchers (Rae, 2015a). Particularly, it is necessary to distinguish between those with the intention to buy and those who have no intention to buy. Therefore, it needs to be identified whether the search was conducted for recreational purposes, or whether it was an inquisitive, desirable, active or professional search (Rae, 2015a).

Furthermore, to build a more reliable model, other search ratios should be included. For example, Maclennan & O'Sullivan (2012, p. 329) used a search-based method to determine a market pressure picture for search areas or neighbourhoods. This method used 'fixity' ratio, 'closedness' ratio, and ratio of the number of searches in an area to the number of new units purchased in that area. The ratio of the number of searches in an area to the number of newly purchased dwellings can measure the strength of consumer interest in that area. The higher this number, the higher the potential strength of household interest in the area. This can also show the level of market competition among households and level of housing stock in the area. By the use of this ratio, it is possible to describe a picture of market pressure for all areas: areas with the highest pressure, modest pressure, and the lowest pressure. This ratio can be used in conjunction with 'fixity' ratio and 'closedness' ratio to provide more potential insight. 'Fixity' ratio can show how fixed households' preferences were for the area in which they eventually located. This ratio can be calculated from the number of searches by a household within the area where the house is bought in relation to the total number of searches conducted by that household. 'Closedness' ratio may

indicate the strength of correspondence between the flow of searchers in an area and eventual purchasers. This ratio can be calculated as the number of searches conducted in an area by households who purchase a property there as a proportion of all searches in that area.

8.7 Conclusion

Household mobility is a topic that has attracted many researchers over a long time period, applying both mainstream and behavioural approaches. The analysis of migration patterns has become important in the analysis of the housing market, especially to explore the structures and dynamics of a system of submarkets. Recently, online searching has become popular and is used dominantly in home searches. Online housing search has been studied by a number of researchers recently, mainly to explore search patterns and search behaviours and predict market activity. However, a few studies have examined the interaction between search, house price and migration. By considering these three factors in combination, it is possible to gain a better understanding of how the market works and, potentially, to predict housing market activity in future. This is important as the first step towards construction of a model to understand the market and predict housing market outcomes.

The study also explored the relationship between migration indicators, including net migration rate, churn rate, turnover rate, and housing sale volume and value, and between the number of searches and housing sale volume and value. The findings have identified potential to use migration and search data to build a model for predicting future market activity. The finding of a strong relationship between search and house sales supports the work of Rae (2015b). Where the current study differs is that turnover and churn rates are associated with value and volume of housing sales.

Areas with high rates of churn and turnover have excessively high demand for housing but people are unable to buy because of the lack of affordability and of suitable supply. Also, a negative relationship was found between turnover and churn and average value of house sales; higher rates of turnover and churn caused the average value of house sales to decline. In short, the study highlights the usefulness of these migration indicators for identifying areas suffering from affordability issues. From the analysis above, the study suggests developing predictive models based on migration and search data to forecast market activity in future.

9.1 Introduction

The thesis set out to use visual data methods, some statistical analysis and multiple large datasets to try to enhance our understanding of the dynamics of a local housing system. More specifically the aim was to explore the role that migration and search data can play in shaping the structures and dynamics of a local housing market system and explore the potential to construct a model based on search and migration indicators for predicting the flows and impacts of migration and search in future. It has tried to fill the gap in the literature relating to the links between submarkets, search behaviour during housing search processes, and the relationships between search, migration activity and house price. To achieve this, the study used a systems approach to establish the analytical framework through which to explore change processes and market outcomes. The framework has its intellectual roots in the work of Duncan MacLennan and Tony O’Sullivan (see, for example, O’Sullivan et al., 2004) that has been extended by others including Jones, Watkins, Gibb, Ferrari, Hincks, Leishman and Rae. The application of data visual method is a novel feature of this particular empirical contribution.

The analysis of individual market indicators is important as a means of exploring the relationship between housing, socio-economic conditions and submarkets or neighbourhoods (Wong et al., 2011). Moreover, the Barker Review of Housing Supply indicated the usefulness of market indicators that researchers and analysts should use to estimate and predict housing demand in future. Planners and policy-makers’ approach to estimating housing needs and subsequently releasing land is

traditionally based on market outcomes such as price and migration, household projections and trend household projections with the assumption of market equilibrium. However, planning for local land and housing supply cannot be based solely on market outcome, but should take into account household aspirations and preferences during market processes. These tend to be hidden by outcomes data where migration reveals what has actually been possible rather than what might have been preferable – a phenomena better unearthed by search data. In the real situation facing households and developers, the housing market involves processes which reflect household perspectives on the demand side that are then reflected effectively on the supply side (MacLennan & O’Sullivan, 2012, p. 338). These processes need to be included in the analysis together with other outcome variables. This may require a more bottom-up approach to analysis in order to reflect exactly the ever-changing demand for housing. To achieve this, the first important task is to understand the structure and dynamics of the market system. In the current study, migration and search data were used in combination to shed light on these aspects.

The study provided a review of different schools of economics, and their analytical approaches, covering their philosophical underpinning and reflecting on how these gave shape to conceptual and applied models of market system dynamics. The review also considered the structure of the housing market and reviewed the notions of housing market areas, submarkets, housing search, and market filtering in more detail. Through the literature review, this study found out that little attention has been paid to links between HMAs and submarkets or to the internal submarket dynamics within the market system. Also, only a limited number of studies have examined market constraints revealed by search data or, more precisely by the relationship between search, migration and housing market activity. Further, the thesis has

identified a need to assess the possibility of building a predictive model for forecasting the flows and impacts of migration and search to help policy makers, planners, and other actors to respond to changes in the market system. This should develop the studies of Rae (2015b) and Wong et al. (2012) which demonstrates the importance of using market indicators to reflect changes in housing market performance. From the analysis, this study identified several key findings regarding these issues.

9.2 Summary of research findings

The aim was to explore the role that migration and search can play in shaping the structures and dynamics of a local housing market system and explore the potential to construct a model based on search and migration indicators for predicting the flows and impacts of migration and search in future. It has tried to fill the gap in the literature relating to the links between submarkets, search behaviour during housing search processes, and the relationships between search, migration activity and house price. It is hoped that the framework and methods will be of use to those who are trying to ensure that new homes are developed in the right numbers, of the correct size and type and in the optimum micro locations to meet housing need and demand within local housing systems.

This aims were fulfilled by addressing the following objectives:

1. To develop a conceptual framework to explore the role of migration and search in the dynamics of a market system

2. To explore the role of migration data in understanding the structure and dynamics of a market system by examining the links between HMAs and the interconnections between submarkets.

3. To explore the role of search data in understanding the structure and dynamics of a market system by examining the submarkets based on households' preferences and the mismatch between demand and supply.

4. To examine the possibility of using search and migration data to develop an analytical model for predicting the flows and impacts of migration and search in future.

The thesis has answered the above objectives through the following sections:

9.2.1 Objective 1: Conceptual framework

The study adopted a systems approach and adapted it to give a greater role to search behaviour in exploring the dynamics of a market system. To achieve this, the study reviewed the three main schools of housing economics, the structure and dynamics of the market system as well as the theoretical frameworks for analysing a market system from a number of previous studies. It was noted that a housing market is better seen as a system of linked HMAs and submarkets which are connected and interact together. It is possible to gain a better understanding of the dynamics of a market system through analysis of market filtering, housing search, and migration flows.

After reviewing a number of previous influential studies that have modelled housing market systems, it was realised that these studies have developed their search and choice models by considering households' behaviours through the process of search.

However, such studies have not paid attention to the internal aspects of the market system, especially the influence of search and migration flows on the structures and dynamics of a market system, connections between submarkets, submarkets based on households' preferences, market constraints, and the issues of suboptimal and optimal choices. Crucially, the inclusion of search is important in adding a sense of unfulfilled aspiration and preferences to the analysis (Maclennan et al, 1987; Jones and Watkins, 2009). To analyse these, an appropriate theoretical framework is needed.

It was acknowledged that a neo-classical approach has limitations for many forms of analysis of the housing market because it makes unrealistic assumptions, and permits the housing search processes and behavioural influences only a very limited role. Therefore, it is necessary to augment these assumptions with the actual behaviours of households by advocating a more behavioural approach. From this point of view, the thesis developed a theoretical framework based on a mix of the three schools of thought, mainly neo-classical, but following the Maclennan/O'Sullivan systems view infused with ideas from institutional and behavioural economics (see Jones and Watkins, 2009). Using this analytical framework, the thesis applied a systems approach to explore the role of migration and search in the dynamics of the market system. The framework includes the influence of the intention to move, the relevant parts of the search process, which allow us to proxy the decision making process, and to help interpret the migration outcomes. In this framework, the roles of migration and search are regarded as important as well as the relationships between them and the market outcomes, such as house sale values and volumes. This framework contributes to knowledge through the method of analysis developed and also through providing justification for further analysis based on integration of migration and search within the market system.

9.2.2 Objective 2: The role of migration

The study highlighted the role of migration in the dynamics of the market system of linked submarkets and HMAs. Based on a visual GIS approach, datasets from Census 2011, and house price data from Land Registry 2005 and 2014, the study produced a number of visual maps to explore the links between HMAs and highlight the connections between submarkets, especially poor neighbourhoods' and wealthy neighbourhoods' connections, the proportions of moves up, down, and within similar submarkets. As migration flows are also closely linked to the labour market (Hincks and Wong, 2010), mobility decisions are a trade-off between migration and commuting. The findings of the study offer some insights into how the market system works in terms of the connections between HMAs and submarkets at the local level:

9.2.2.1 Interaction between HMAs

The study provides an understanding of the proportion of moves based on short and long distance between and within HMAs. It identified the most attractive HMAs and the least attractive HMAs based on migration flows and discussed the influential factors on the trade-off between migration and commuting. The study identified the migration patterns based on distance. Patterns of short distance mobility occurred in several particular areas in major and smaller towns of the HMAs and more significantly in the city centre and its surrounding neighbourhoods. When the distance increased, the migration patterns showed that the city centre was the central point for people to move to or from. The long distance analysis identified high levels of migration between the central business area and areas to the west such as Salford, Bolton (North, South), Wigan, and Leigh. It also identified several hotspots with high levels of migration density, including Manchester city centre and its surrounding

areas and a number of major and small towns across the HMAs. This confirms the fact that the Greater Manchester system is composed of a central business district, major towns and smaller towns and is one of the most complex polycentric functional metropolitan areas in the UK. The central business district and major and smaller towns were found to be sites of hotspots of high migration activity.

Through calculating the proportion of moves for each HMA, the short distance moves were found to be dominant, accounting for 60.2% - 73.5% of the total number of migrants. Long distance moves accounted for a smaller proportion of 1.3% - 5.5%. Wigan and Bolton experienced the highest percentage of short moves, while Stockport had the least. On the other hand, Wigan also had the highest number of long distance moves, while Manchester and Middleton had the lowest. Several strong connections were identified, for example, Manchester and Stockport or Salford, Bolton North and Bolton South.

9.2.2.2 Dynamics of the market system

Within the HMAs, the study explored the links between submarkets based on migration flows and house price differentials to understand the filtering process in the Greater Manchester market system. The study identified the proportions of 'upward' moves, 'downward' moves, and moves between areas with similar characteristics. It was found that the proportion of moves within similar submarkets exceeded those of moves up and down. Further, people were most likely to move within similar neighbourhoods and also to make a higher level of upward movements compared to downward movements. A majority of households (50.70%) moved to medium price submarkets, while 10.78% moved to high-end submarkets, and 17.63% to low-end

submarkets. Hence, a very high number of households who moved within similar submarkets bought low price or medium price properties.

9.2.2.3 Connections of low-end price submarkets

The study showed that the low-end price submarkets were not isolated in the market system. They maintained connections with other, better submarkets, even with high-end price submarkets, for example, Central Rochdale with Norden or Leigh West with Lowton East, Harpurhey with City Centre or Rumworth with Heaton and Lostock. The example of Rumworth showed that the highest proportion of moves was within similar low-end price submarkets, accounting for 40.06 % and 36.06% respectively in terms of in-migration and out-migration. The percentages of people moving up the submarkets with high and significantly high price were 2.86% and 3.13% respectively. Rumworth also received 3.55% and 2.27% of in-migrants from areas with high and significantly high price respectively. On the other hand, moves up to the low and medium price submarkets accounted for 29.18% and 28.78% respectively. These results indicate that out-migrants from this area tended not to make long distance moves to other areas.

9.2.2.4 Connections of high-end price submarkets

In this study, high-end price submarkets were considered to have high and significantly high prices. Their connections were made through the different types of submarkets from significantly low to significantly high price levels. Intensive links were found between high-end submarkets and high, significantly high price, and even medium price submarkets. Examples included St Mary's with Waterhead or Alexandra in Oldham East; Heaton South and North in Manchester, Hale Central and Bowdon in Manchester, Didsbury West with Chorlton Park or Didsbury East,

Withington, Old Moat in Manchester; Didsbury East with Didsbury West or Old Moat; Chorlton with Whalley Range or Chorlton Park; within Altrincham itself. However, some strong connections were also found between significantly high price areas and low price areas, for example, St Mary's (significantly high price) with Coldhurst (low price) in Oldham East; or Brooklands (significantly high price) in Manchester with Baguley (low price) in Stockport.

The example of City Centre was used to reflect the proportions of moves in and out of a high-end price area. A high proportion of moves downward to medium price submarkets (44.32%) was identified. Nevertheless, there were also connections with low and significantly low submarkets, accounting for 0.07% and 0.93% respectively, for example, with Gorton North (0.37%), Charlestown (0.15%), Baguley (0.11%), and Farnworth (0.11%). Moves up to significantly high price submarkets and high price submarkets accounted for 6.2% and 48.47% respectively, for example, within City Centre itself (44.36%), Chorlton Park (2.95%), Didsbury West (2.88%), Didsbury East (2.20%) Bromley Cross (0.6%). In general, moving up to better areas and within similar areas were more common than moving down. City Centre also received the highest number of in-migrants from medium price areas at 45.97%, followed by high price and low price areas at 38.48% and 8.15% respectively. The significantly low price and significantly high price areas accounted for the lowest numbers of in-migrants, 0.54% and 6.85% respectively. The study identified strong links between City Centre and other areas such as Hulme, Ancoats and Clayton, Ardwick, Cheetham, Fallowfield, Longsight, Moss Side, Withington, Bradford.

This finding resonates with the work of Clark and Mass (2016). The most disadvantaged neighbourhoods, with low-end house prices, had only slightly less

migration activities than other areas, and were not isolated. Households tended to migrate to a wide range of different submarkets, not just within similar neighbourhoods. Further, the current locations of the households affected their opportunities to move up, down, or move within similar neighbourhoods.

9.2.3 Objective 3: The role of search

The thesis investigated the role of search in the structure and dynamics of the market system, especially in terms of submarkets based on search preferences, latent demand as seen through analysis of search patterns and property availability, as well as market restrictions and housing suboptimal choices. The findings complemented the works of Rae (2015a) by stressing the role of search data in identifying submarkets based on search preferences within HMAs and the relationship between supply and latent demand.

9.2.3.1 Submarkets based on search preferences

The results of the analysis have shown that search patterns have a close relationship with submarkets and fit well into local HMAs derived from the NHPAU study. The analysis identified high-end submarkets with prices over £330K, dominantly concentrated in the south of Manchester and Stockport, submarkets of one bedroom properties, dominantly found in the city centre and its surrounding areas, and submarkets of two bedroom properties priced between £220K - £330K, highly concentrated in Manchester and Stockport. The findings showed that search information can be used to identify submarkets in the market system. This opens a new direction for researching submarkets and local HMAs based on housing search

data, supporting the indication by Rae (2015a) that submarkets can be identified both sectorally and spatially.

9.2.3.2 Latent demand

The study presented a picture of current search patterns and current available opportunities to highlight the demand pressure relative to supply across areas. For example, more searches than property opportunities were found in the segments of 2 or 3 bedrooms and prices above £330K. South Manchester reflected a high level of search intensity but a lack of housing choices in terms of 2-3 bedrooms with prices from £220K - £330K. This finding indicated high latent demand but a lack of housing options for potential buyers, causing high pressure on the supply side. On the other hand, there were also areas with a lack of search but high numbers of available housing units. For example, relative to the high number of available properties in the area, few households searched for 4+ bedrooms priced from £110K - £220K or 1 bedroom houses priced below £220K. The segments of price £110K - £220K and 1 or 2 bedrooms had more available properties but fewer searches. These areas had declined in attractiveness because of reasons such as neighbourhood deterioration, high deprivation levels, and lack of jobs. Therefore, there is a need to improve such low-end price areas and reduce the gap in demand. By analysing search patterns and property availability, we can find out whether demand is high or low relative to supply, and use this information to take better action for such areas.

9.2.3.3 Market restrictions and suboptimal choices

The study also provided a series of maps to illustrate market restrictions and suboptimal choices. The analysis was based on identifying mismatches between search and migration activity. Mismatches in terms of high numbers of searches but

low in-migration numbers presented for market restrictions on the supply side, for example, in Bolton North (Halliwell and Astley Bridge as well as Bradshaw), Stockport (Bramhall South), Bury (St Mary's), South Manchester (Timperley, Priory and the areas close to them), Salford (Worsley, Eccles). In addition, mismatches showing a high number of in-migration but a lack of searches provided us with information about the issue of suboptimal choices, for example, Ashton-under-Lyne (Bradfordshaw), Stockport (Baguley and Woodhouse Park), Wigan (Pemberton and Douglas), Bury (Moorside, East), Leigh (Leigh West), Manchester (Longsight and the areas close to it, Crumpsall, Higher Blackley), Salford (Cadishead, Irlam, Little Hulton), Rochdale (Central Rochdale, Wardle and West Littleborough). The reasons for such mismatches may derive from the planning system, land control restrictions, and households' failure to achieve their preferences and aspirations. Those areas with low searches but high in-migration were often not seen as desirable places to live. These were often the second best options or the best suitable options available to households under the market restrictions or other constraints. Because these were not their desired neighbourhoods, such households would be highly likely to move to better places in future when they have enough resources. Hence, suboptimal choices were driven by market restrictions and constraints and had an impact on the stability of neighbourhoods while also causing pressure on housing and public services and on the labour market.

9.2.4 Objective 4: Assessing the potential to develop predictable models

The thesis went on to, albeit tentatively, explore the potential for using migration and search data to develop a model for predicting flows of migration and search as well as their impacts. Relationships between search activity and house sales and between

migration indicators including net migration rate, turnover rate, churn rate and housing sales were investigated using some standard statistical methods. There were positive findings showing significant correlation between search, housing sales, and house values. This result is similar to the finding by Rae (2015b). Areas with high numbers of searches tended to experience high values and volumes in house transactions. Because buyers' expectations and aspirations change overtime this information is useful for identifying areas that are beginning to attract high levels of attention from potential buyers. For example, while an area may previously have attracted little interest from potential buyers, some kind of change in the neighbourhood's characteristics may awaken their interest. By using information from searches it is possible to review housing supply to cope with such growing interest in particular areas.

On the other hand, the study highlighted the relationship between migration indicators and house values and sales and suggests using these factors to identify areas affected by affordability issues. It showed that net-migration, turnover and churn rates were high correlated with the value and volume of housing sales. Areas with high rates of churn and turnover witnessed high demand for housing, but migration was affected by affordability issues and a lack of suitable supply. Also, in areas with a negative correlation between turnover and churn and average value of house sales, the average value of house sales declined in accordance with rising rates of turnover and churn. Based on the analysis, there is potential to develop a multivariate model to predict possible outcomes in different scenarios, for example, flows and impacts of search and migration in future. The development of such a model should be based on multiple variables including migration indicators

(migration churn rate, turnover rate, net migration rate) and search-related factors and house price.

9.3 Thesis contribution and implication

9.3.1 Thesis contribution

The main contribution of this thesis is to demonstrate the value of adopting a systems approach that integrates the analysis of migration, search and house prices as a means of understanding housing dynamics in three ways. First, is by adopting the position that housing markets operate within a system of linked submarkets and housing market areas. Second, is by integrating the three main economic theories that are features of housing market analyses but which are often treated in isolation from one another: Neo-classical Economics, Institutional Economics and Behavioural Economics. Third, is by applying a GIS-based visual method to provide a systematic analysis of new data (search, migration and house price data) related to a large metropolitan area.

The roles of market analysts, planners and policy makers are important in the forecasting of housing demand and need in future. This thesis has contributed a system approach that has the potential to provide these analysts with better understanding of the role of migration and search data. Migration flows can help analysts explore the interactions between HMAs and submarkets as well as identify household movements. Search data can provide the opportunity to examine submarkets based on the demand side as well as identify market constraints and household satisficing regarding their migration decisions. Furthermore, search and

migration data are seen to have potential for developing predictive models to estimate housing market activity in future.

The availability of migration and search data could be used to support decisions from market planners and policy makers. Housing policy makers need to focus on housing demand as a key factor (O'Sullivan, 2003). In order to estimate housing demand accurately, it is important to study households' aspirations in order to gain information on their mobility intentions, and their expectations of housing tenure, type/size or location. In the past, housing market literature has ignored the role of search and focused instead on market outcomes such as house price and migration. However, it is argued here that integration of migration and search may support market planners and policy makers in formulating effective housing market policies regarding owner occupation. Below, this thesis discusses several implications.

9.3.2 Thesis implications

9.3.2.1 Identifying high and low demand areas

Search data are useful to identify areas with high demand or low demand. Areas with high searches but low opportunities tend to be hotspots with high latent demand for housing. Meanwhile, areas with high housing opportunities but a lack of searches may be suffering from neighbourhood deterioration and high levels of deprivation. Such information is important to investors, real estate agents, potential buyers and sellers as well as market planners in the process of decision-making.

Further, it is possible to identify changes taking place in neighbourhoods based on analysis of house price, migration and search. For example, a particular submarket with low house prices and low migration may suddenly have an increasing number of

searches. This may indicate an increase in the neighbourhood's attractiveness due to the positive impact of such as improvements in the transport system, house quality, quality of schools, or creation of more jobs, etc. On the other hand, if an area with high prices and high migration starts to experience a lack of searches, this may be a sign of a decline in neighbourhood quality, area deterioration, or deprivation. Market actors should be aware of such changes in neighbourhoods. In short, house price, migration and search data may be used to identify problematic areas and measure the impact of policy implementation in addressing change in neighbourhoods.

9.3.2.2 New home supply

The construction of new dwelling units is a key consideration in tackling the issue of housing affordability in Greater Manchester. There are a number of crucial decisions in relation to where to build, what to build and how many to build. To answer these questions, it is necessary to understand household preferences and how these drive mobility and ensure that new supply meets demand from highly pressured submarkets. Mismatches between supply and demand could be prevented by identifying submarkets based on a supply and demand approach. In this context, the need for new housing developments should be assessed through the lens of variation in housing market search and migration flows. First, search patterns are likely to influence new housing opportunities. Second, when search patterns are examined in combination with migration patterns, market constraints and restrictions can be identified, such as areas with a lack of supply relative to demand or areas with a lack of demand relative to supply. Also, the links between HMAs and submarkets are important. For example, if there is a strong connection between a number of areas, building new houses in one area can draw demand from the other areas. Therefore,

such information is useful for market planners in enabling them to allocate appropriate available land for the construction of new housing developments, for example, by identifying those areas that need to build a high number of new houses to respond to the high latent demand, or improving the commuting system and public transport infrastructure between areas to change the migration patterns.

The traditional approaches to estimating housing need and demand were mainly reliant on trend-based household projections combined with official surveys and administrative resources (Bramley et al., 2010). These approaches were mainly based on purely market-determined outcomes, and therefore behavioural forecasting of outcomes was ignored (Bramley et al., 2010, p. 35; Meen & Andrew, 2008). Thus, to estimate housing demand more accurately, alternative models should take account of household expectations when considering housing market processes (Meen & Andrew, 2008), since household aspirations and expectations play an important role in the housing market, and reflect latent housing demand and need.

In Greater Manchester, a joint plan for 227,000 new homes, known as the Greater Manchester Spatial Framework (GMSF), was drawn up by the combined authority in 2014. This plan is intended to ensure that the right land is available in the right places to deliver homes up to 2035, and to identify the new infrastructure (such as roads, rail, Metrolink and utility networks) required to achieve this. This plan will enable local planning authorities to identify in more detail sites for homes in their own area. Based on this joint plan, it is crucial that accurate estimates of housing demand are made so that the right land is allocated in the right areas. This will require the investigation of household preferences relative to the existing supply, in which context the analysis of housing search and migration flows will be crucial.

9.3.2.3 Submarket and HMA identification

It is widely held that housing market areas are composed of a system of submarkets and this, of course, is a central feature of the framework employed here. One of the most important aspects of Strategic Housing Market Assessments or any market analysis is to identify housing market areas and submarkets as a prior step to better estimation of housing demand and need at local or regional level. Significantly, given recent criticism of the role of the land-use planning system in the delivery of new homes, a framework of linked submarkets and HMAs could provide a useful basis for more effective monitoring and decision-making by local planning departments (Jones et al., 2005). However, traditionally, submarkets have been based on a mainstream approach, concerned with market outcome and the supply side (Watkins, 2008). On the other hand, in practice HMAs were be identified based on migration and travel to work patterns (Brown and Hincks, 2008; Hincks and Baker, 2012). These approaches to identify HMAs or submarkets do not reflect household preferences and aspirations. However, the combined use of migration and search will help us identify submarkets and HMAs more accurately in the reality. According to Hincks & Baker (2012), HMAs should be identified based on the consideration of both spatial arbitrage and housing search. This is because search patterns may help us identify search hot spots, which can be used to identify prospective HMAs. As mentioned by Rae (2015a), analysis of search patterns based on both spatial and sectoral factors is a more effective and accurate way to identify submarkets. Furthermore, when combined with migration data and/or house price data, the use of housing search data may help us identify mismatches between supply and demand in submarkets. In short, although this study adopted a priori the set of market areas developed by previous leading edge

research undertaken by Hincks, there may be scope to revisit the robustness of these methods given the ready availability of search datasets.

9.3.2.4 Applied system analysis

This study proposed a potential market system approach to the analysis of the housing market. This is based on the availability of migration, house price, and housing search data. The process of system analysis entails the following steps:

Figure 9.1: The process of system analysis with visual data method based on house price, migration and search data

Step	Content
1	<p>Define HMAs.</p> <p>This may be based on migration flows, travel to work patterns and other possible methods.</p>
2	<p>Define submarkets.</p> <p>This may be based on house price differentials, house types or other possible methods.</p>
3	<p>Review the current market system.</p> <p>This review explores the characteristics of each HMA in the current market system and identifies current issues related to house price, demand and supply through employment of house price data, housing stock and other available data sources</p>
4	<p>A migration analysis includes:</p> <ul style="list-style-type: none"> - Migration patterns between HMAs - Mobility distance analysis: patterns and proportions of short, medium and long moves - Dynamics of submarkets: proportion of moves between submarkets, connections between submarkets (importantly low-end and high-end submarkets)

5	<p>A search analysis includes:</p> <ul style="list-style-type: none"> - Submarkets based on search preferences - Latent demand based on the patterns of searches and available housing units - Market restrictions and suboptimal choice based on search, migration flows
6	<p>Develop a multivariate model to predict possible outcomes.</p> <p>This is based on a number of variables:</p> <ul style="list-style-type: none"> - Migration indicators: turnover, churn, net migration rates - Search-related factors - Price-related factors - Other important factors (depending on data availability)

Source: the thesis author's own analysis

9.4 Limitations of the study

The notion of 'market system' used in this thesis related only to the owner occupied sector. Despite that, the thesis has demonstrated the importance of a systems approach and can potentially be applied in other tenures. The interactions between the owner occupied sector and the social and private rented sectors are arguably an important omission from the analysis.

The thesis assumes that the boundaries of HMAs are based on those defined in the NHPAU study. Moreover, the study examines only the Greater Manchester system and therefore ignores trade-offs between the outside areas and this system.

Migration data collected every ten years are difficult to use in conjunction with other datasets because of the time frame. For example, house price, migration flows were based on 2010 to 2011, while search data were tracked in March 2013. Furthermore,

the migration data used in this study included only people who are property owners. Also the number of migrating persons included the entire range of household ages, from children to old people, which may have had an impact on the results. Further, the migration data were outcome data and cannot show current demand, but proved to be useful when being combined with the search data.

Search data are important but subject to weaknesses. It is necessary to be aware that much search information is not trustworthy (Rae, 2015a). There are two issues worth taking into account (Rae, 2015a). First, we need to distinguish those who actively search with an intention to buy from those who have no such intentions or those who are real estate professionals. Second, those households who are actively searching and have motivations to move may revise their search expectations and aspirations over time because of market constraints and restrictions. Therefore, it is a challenge for future research to find a way to use search data effectively.

In terms of conceptual problems, there are difficulties associated with the search process. During the search process, households may change their expectations and aspirations when they update market information and face market restrictions. This is the central part of the process of decision-making and plays an important role in households' choices on housing, for example, whether to stay or go. Meanwhile, suboptimal or optimal options also reflect market restrictions and constraints. Because households' aspirations and expectations are not predefined, this causes difficulty in deciding how to develop a conceptual framework to illustrate this search process. Another problem relates to households' behaviours under imperfect information, market restrictions and constraints, especially regarding rules or shortcuts that households use in their decision-making process.

9.5 Future research

This thesis has highlighted the role of migration and search and the potential for developing a model to predict future activity. It provides information which may be useful to policy makers and planners. Further research could focus on the following suggested topics.

9.5.1 Relationship between search, migration and price change

Researchers could consider the relationships between search, migration and price change. Particularly, it is worth examining whether migration and search activity influences (or is influenced by) changes in house price. Price change shows us the relationship between demand and supply. If demand is higher than supply, price tends to increase. If supply is higher than demand, price tends to decline. In areas with a high number of available housing options but lack of potential buyers, sellers tend to reduce the price to attract buyers; therefore, the price may decline. Depending on housing availability and the sellers' intentions to sell, the price may increase or reduce accordingly. In areas with higher demand than housing availability, potential buyers may increase offers to secure the purchase, and this depends on competition between buyers. On the other hand, housing demand may be measured by examining the patterns of search preferences. Search patterns show us the latent demand for housing and may influence the price of housing products. Households looking for housing options in an area may take into consideration the rate of house price change in the area. They may conduct more searches in those areas with a decline in price or increase in price. It is worth noting that when buying houses households consider the

state of the market and hope that their house's price will increase in future. Also, people may avoid areas with fluctuations in house price and tendencies for prices to decline, because this will impact on house values and then on households' finances. Therefore, it is argued that there should be a relationship between price change, housing search and migration.

9.5.2 Identifying submarkets based on search, migration and price data

It is worth considering the combined use of migration, house price, and housing search data in identifying submarkets within HMAs. The use of housing search data provides a picture of submarkets based on the demand side. These demand patterns can be used to supplement the identification of submarkets based on outcome data such as migration and house price. Therefore, identifying submarkets based on search data and migration/house price data will reflect both household preferences and housing supply.

9.5.3 Predictive models

It is necessary to take into account the key housing and neighbourhood indicators to reflect the performance of different areas and to identify the housing problems in these areas (Wong et al.,2011). These key indicators are also important to estimates of housing need and demand. Housing demand is traditionally estimated based on household surveys that provide information on household mobility intentions, household aspirations and preferences. With the availability of search and migration data, there is potential to integrate these data to develop a predictive model for estimating housing needs and demands accurately. The significant correlations this study has presented between search activity and housing sales and between migration

activity and housing sales have provided the first step to further development of predictive models. The increasing spatial richness of these datasets should also be combined with insights from temporal dynamics. As Wong et al (2011) argue it is important that changes in suites of indicators are interpreted through time. With that in mind, some technical development of panel estimation methods would be desirable.

The development of predictive models could also be further developed either by using search data or migration data or a combination of both datasets. Researchers may be interested in using search data with a longer time frame to build models to track the changes in housing demand in a particular area. This could aim to review the impact of policy implementations or identify problematic areas associated with excess demand or supply. Further, search models can be developed based on original locations and search locations to understand the search patterns of different household groups. On the other hand, migration data could be used to build agent models to predict housing choices. For example, a model could be developed based on migration data for 2001 and then could be tested by using migration data for 2011.

However, it would be more useful to develop multivariate equations, preferably in panel models, based on spatial and temporal house price, search and migration data. This type of model can be used to predict possible outcomes, for example, to consider flows of search and migration and their impact on the structure and dynamics of a market system under different scenarios. These multivariate models integrate important variables associated with house price, housing search and migration. They include, among other variables, migration indicators such as net migration rate, turnover rate and churn rate and search-rated factors such as search numbers and

search intensity, as well as price-related factors such as house sale volumes and house sale values. These multivariate models will be beneficial to policy makers, planners and analysts through enhancing their knowledge about the market. They will be able to take into account both market outcomes and market processes and therefore will be likely to produce more accurate estimates.

The predictive models above may also be of benefit to related business organisations in improving their service. For example, Rightmove could decide to help potential buyers to speed up their search process by adding a feature to let home searchers know the probability of finding their desirable homes in specific locations. For example, a potential buyer who lives in location A may want to search for a house in location B on the Rightmove website. The website could then show this householder the probability of successfully moving from location A to location B. Furthermore, the website could also show on a visual map the likelihood of a household successfully leaving location A for other destination locations. It is important that the analysis of movement probability from location A to location B and to other destinations is based on, among other things, outcomes of household migration, breakdown of household groups capturing social-economic characteristics and the characteristics of neighbourhoods (house price and price change, housing stock, crime rate, job, schools etc) as well as the level of latent demand relative to property opportunities based on housing search data. Home searchers may lack market information and thus may not realise that market restrictions and constraints exist. As a result, they may change their search aspirations and expectations, for example, changing target destinations or finding new suitable destination locations. This feature may help them search more efficiently and quickly by informing them of the probability of moving from their origins to a wide range of destinations based on the

characteristics of household groups, the characteristics of neighbourhoods and search pressure as well as other important factors.

9.5.4 Harnessing the power of visual data methods

Visual data methods include the creation and study of visual representations of data to improve implementation of data analysis. This is demonstrated by Wong et al. (2015) to highlight the usefulness of applying GIS in the analysis of the housing market and planning. In this method, numerical data are presented on maps to visually provide a quantitative message. The method uses analytical techniques to make complex data more accessible, understandable and usable based on patterns or relationships in the data for one or more variables. Visual data methods are associated with the availability of 'Big Data' and the use of visual analysis soft-wares such as QGIS, ArcGIS. In housing market studies, their influence and power are increasing because of the availability of important data sources including housing search, migration flows and house price and the advance of visual analysis soft-wares. Therefore, researchers and analysts should harness the power of these methods to gain a better understanding of how a housing market system works.

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