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The Interaction of Housing and Labour Markets: A Study of North West England

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Abstract

The consideration of housing and labour market interaction is a relatively recent development in a continuing academic and policy debate, which has traditionally considered housing and labour markets in isolation from one another. Although the importance of the home-work link has long been recognised, the conceptualisation of home and work has been undertaken in a narrowly focused and limiting way, which does not recognise the inherent interdependencies that exist between the two arenas. The neglect of the interaction of housing and labour markets is problematic because the relationship between the two markets is not static or universal and is likely to vary through time and over space. This neglect has been further compounded by the fact that many complex multi-agent and multi-sector interactions have not been adequately captured by traditional approaches for measuring interaction whilst a paucity of basic intelligence regarding the changing spatial distribution of people and jobs over the last two decades has further hindered our understanding of housing and labour market interaction. The lack of awareness of the relationship between housing and jobs led to the commissioning of a number of research studies in the 1990s, which provided much needed intelligence into complex jobs-housing issues and the changing nature of the distribution of housing and jobs. However, what is still lacking is a systematic examination of the interaction of housing and labour markets.

This research seeks to provide an exploratory examination of the interaction of sub-regional housing and labour markets, focusing on the process of commuting, via a study of North West England. The research begins with a literature review, designed to provide the theoretical framework for the study, structured around three core components: housing and labour market conceptualisation and identification; the commuting process and its key components; and the influence of 'people' and 'place' factors on commuting. Following this, a policy review is undertaken in order to situate the interaction of housing and labour markets within the context of current policies and debates. The spatial implications of the interaction of housing and labour markets are then explored focusing on three major spatial consequences: the North-South divide and differential regional development; cross-boundary spatial implications; and the decentralisation of population and employment from urban areas. Finally, the interaction of housing and labour markets is situated in the context of the current policy framework and key policy delivery mechanisms. The policy review highlights that the traditional understanding of housing and labour market interaction is embedded in the belief that rigidities in the housing market have the effect of constraining labour mobility. However, this overly macroeconomic perspective fails to recognise the complexities associated with housing and labour market interaction, the corollary of which is an underdeveloped and fragmented policy agenda at national and regional levels. Having established the theoretical and policy contexts, a conceptual framework is developed to guide and inform the design and execution of the empirical components of the study. The empirical contribution of the study begins by identifying sub-regional housing and labour markets in the North West. The review of the literature and the development of the conceptual framework highlight the benefits of retaining the current 1991-based travel-to-work areas (TTWAs) as sub-regional labour markets, whilst housing market areas (HMAs) are identified as an appropriate framework for conceptualising and delineating sub-regional housing markets. Thus, an assessment of the current 1991-based TTWAs in the North West is undertaken in order to determine the validity of adopting the 1991-based TTWAs as approximations to sub-regional labour markets, which is complemented by the development of a new housing market area framework. The final empirical chapter explores the interaction of the HMAs and TTWAs at sub-regional level based on commuting. The analysis indicates that housing and labour market interaction is a highly complex process and that policy agendas need to be sensitised to such complexities in order to address effectively the interaction of housing and labour markets.

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CHAPTER 1
INTRODUCTION

Housing and Labour Market Interaction

'Housing and labour markets need to be examined not as isolated elements, but through their interconnections' (Morrison and Monk, 2006:1115).

This thesis explores the interaction of housing and labour markets via a study of North West England. The consideration of housing and labour market interaction is a relatively recent development in a continuing academic and policy debate, which has traditionally considered housing and labour markets in isolation from one another (Hanson and Pratt, 1988). Allen and Hamnett (1991a) provide the most thoroughly developed consideration of housing and labour market interaction in their publication, *Housing and Labour Markets: Building the Connections.* However, the authors acknowledge that their work is about '...setting a research agenda...' in which the '...tone is tentative...' and '...its purpose is to build some of the links that connect the areas of home and work...' (Allen and Hamnett, 1991b:4). Essentially, housing markets are regarded as the place where people live and labour markets are regarded as the place where people work and this divide has been reinforced by an academic division of labour. As the authors argue:

> 'Homes and jobs – or lack of them – constitute two of the most central and important areas of social life. It is therefore not surprising that a large volume of academic research has focused on work and housing. What is surprising is that despite the strong links between home and work in people's daily lives, and in the structure of cities and regions, there have been few systematic studies of the relationship between the two areas' (Allen and Hamnett, 1991b:3).

The explorative analysis undertaken by Allen and Hamnett (1991a) stemmed from the theoretical and conceptual foundations laid by Hanson and Pratt (1988). The authors argue that while the importance of the home-work link has long been recognised, the conceptualisation of home and work has been undertaken in a narrowly focused and limiting way, which does not recognise the inherent interdependencies that exist between the two spheres (Hanson and Pratt, 1988). As a result, Allen and Hamnett sought to address a number of key issues raised by Hanson and Pratt and attempted to lay the foundations for the development of a research agenda that explicitly targets the specific issue of housing and labour market interaction. However, the traditional conceptualisation of housing and labour market interaction – that being narrow in focus and limited in extent – has tended to continue unabated. The neglect of the interaction of the two spheres is problematic because the relationship between housing and labour markets is not static or universal and is likely to vary through time and over space. The neglect of the interaction of the two markets lies in the fact that many complex multi-agent and multi-sector interactions have not been adequately captured by traditional approaches for measuring interaction (Wong *et al*, 2000; Wong, 2002). In particular, there is a lack of understanding of the dynamic processes involved in the interaction of different issues (Turok *et al*, 1999) and there is a lack of quality statistical information to support the development of models to explore such issues (Wong, 1998a).

The advancement of our understanding of housing and labour market interaction has been further hindered by the fact that there was a paucity of basic intelligence regarding the changing spatial distribution patterns of people and jobs over the last two decades. In spite of the thorough review of the prospects of urban renaissance in the Urban Task Force Report (DETR, 1999a), the spatial structure of employment distribution as a factor for development is neglected (see Breheny, 1999a). The current understanding of the distribution of people and jobs – characterised by a lack of basic intelligence – is suitably encapsulated by Gillespie (1999:9) who comments 'if, as government policy is consistently emphasising, new housing should be located close to jobs, the question is raised as to *where these jobs currently are...*' (emphasis added). The lack of awareness of the relationship between housing and jobs led to the commissioning of a number of research studies in the 1990s. These included a study of the job gaps in British cities (Turok and Edge, 1999), a study exploring the urban-rural shift in population over the last two decades (Champion *et al*, 1998), an investigation of the relationship between housing, migration, and employment (Champion and Fielding, 1992), and a study exploring the relationship between planning for housing and employment and the need for an integrated planning framework to tackle such issues (Wong *et al*, 2000). In addition, two further contributions to the housing and jobs debate came in the form of the Town and Country Planning Associations' (TCPA) regional inquiry into housing need and provision in England (see Breheny and Hall, 1996), which was later supplemented with an inquiry into the changing geography of regional employment in England (see Breheny, 1999a).

Together these studies provide insight into complex jobs-housing issues and the changing nature of the distribution of housing and jobs. However, what is still lacking is a more systematic examination of the daily interaction of housing and labour markets, and the complex processes that characterise the interaction of the markets. The value in undertaking such a study lies in the fact that the paucity of basic intelligence on housing and labour market interaction has negatively impacted on the effectiveness of current policy agendas to tackle housing and labour market issues in an integrated way (Wong *et al*, 2000).

Indeed, from a policy perspective, despite the fact that the changing relationship between housing and labour markets has altered the spatial structure of cities and regions in the UK, housing and labour market interaction has acquired a relatively narrow and fragmented focus in UK policy at national and regional levels. At national level, housing is the remit of the Department for Communities and Local Government (DCLG) (formerly ODPM), whilst labour and employment is the remit of the Department for Work and Pensions (DWP), complemented by the Department for Trade and Industry (DTI). The result of this is the fragmentation of housing and labour market policy at national level, which has filtered through to the institutional arrangement of housing and labour market policy at regional level. Housing at regional level is the responsibility of a number of actors including the Housing Corporation, Government Offices for the Regions (GORs), and Regional Assemblies/Chambers whilst employment is the remit of Regional Development Agencies (RDAs). This division reflects the fact that housing is essentially regarded as a planning issue whilst employment is regarded as a key driver of economic growth and competitiveness (Wong, 2002). The result of the departmental and institutional division between housing and labour issues is the fragmentation of housing and labour market policy agendas at national and regional levels.

Further to this, recent planning policy agenda in Britain has been pre-occupied with the over-heated housing market and lack of affordable homes in the South East and London, and the problem of low demand and abandonment of housing in the northern English regions (DETR, 2000a; ODPM, 2003). With this has come the recognition that a policy framework is required to combat the challenges of a changing population, the needs of the economy, and the boom and abandonment process that characterises housing markets in the UK (Mumford and Power, 2003; ODPM, 2003; Nevin, 2004). However, the government's understanding of the relationship between housing and labour markets is taking a crude macroeconomic perspective. The traditional understanding of housing and labour market interaction is embedded in the belief that rigidities in the housing market have the effect of constraining labour mobility. This is reflected throughout the debates surrounding housing and labour market interaction and is particularly evident in recent government policy, notably in the key messages emerging from the *Review of Housing Supply* (Barker, 2004), the sustainable communities agenda (ODPM, 2003), *Planning Policy Statement 3 (Housing)* (ODPM, 2005a), the urban renaissance agenda (DETR, 1999a; DETR, 2000b), and the *Northern Way* framework (ODPM, 2004). Whilst the government's understanding of the nature of the interaction of housing and labour markets is compelling, the broad-brush macroeconomic perspective has been challenged as partial and unhelpful (Jarvis, 1999; Baker and Wong, 2006). The argument is that the geographic mobility of labour does not simply entail the movement of individuals between two locations, but is dependent on the willingness of the entire household to move. In addition, shifts in the labour market towards more 'flexible' working practices, the rapid increase in female participation rates, increase in part-time employment, and changes in fixed-term contracts have effected the traditional division of labour at household level.

The consequence of this is that the residential mobility process is much more complicated than the traditional view of housing and labour market interaction suggests. As such, even with the understanding that housing problems need to be tackled by taking into account a broader spectrum of factors including labour market change and access to transport (ODPM, 2003), there is very little policy guidance on how to join-up housing policy with other strategies, sectors, or services (Cole, 2003; Slocombe, 2003; Cole and Nevin, 2004). This lack of integration means that the traditional (and limited) conceptualisation of housing and labour market interaction prevails despite the fact that there is much more to housing and labour market interaction than the process of housing markets constraining labour mobility.

There is also an emerging trend of spatial disintegration between residential and workplace locations, which has resulted in increasingly complex commuting patterns between residential and workplace locations, increasing car ownership, and the diversification of commuting patterns away from traditional patterns of commuting to the central business district (CBD) to non-traditional patterns that do not necessarily include the CBD as a destination (Wong, 2002). This complexity in commuting has been exacerbated by the increase in dual career households with long distance commuting trips from their chosen residential location (Green, 1997). The logistics of transport network and car usage have enlarged commuting patterns, which is illustrated in the fact that the total number of travel-to-work areas (TTWAs) has been reduced from the original 642 to the current set of 308 (1991-based) (Coombes and ONS, 1998). In addition, a recent study undertaken on behalf of the Royal Town Planning Institute (RTPI) identified a commuter ring, which stretches outwards from central London to the surrounding South East, within which between 10 and 20 per cent of workers commute over 60 miles to work (Wong *et al*, 2006). The prospect of the increasing use of ICT and 'flexible' working practices means that the location of certain jobs will become footloose (Gillespie, 1999), which is likely to result in the acceleration of the spatial disintegration of housing and jobs, and increasing complexity in housing and labour market interaction in the future.

The government's key policy argument for reducing population and employment decentralisation is again embedded in the traditional idea that housing markets need to be made more efficient in order to reduce constraints on labour mobility, which is apparent in the urban renaissance agenda (DETR, 1999a;

DETR, 2000b). This is particularly reflected in the government's suggestion that providing more housing in close proximity to employment opportunities in urban areas will reduce decentralisation and reduce car dependent commuting (see DETR, 1998a). However, the government's understanding of the issue fails to recognise that decentralisation is dependent on residential and business location decision-making and not solely on the availability of housing near to employment locations. Indeed, the problem is that such a view represents an overly simplistic conceptualisation of the interaction of housing and labour markets. In relation to residential location decision-making, preference for space over accessibility has encouraged longer commuting journeys especially among professionals and dual career households, and it is unlikely that such households will be convinced to move back into the city based on directive government policy. Furthermore, the government's understanding of business location decision-making processes is poor and guidance on the issue is underdeveloped, which is why the issue has tended to be overlooked in relation to the decentralisation process (Boon, 2003). Bearing these issues in mind, and extending them further through the course of the thesis, the research seeks to provide intelligence, which can be used by regional agencies to develop regional policy, as well as informing national policy debates surrounding housing and labour market interaction. It also seeks to advance current knowledge of the interaction of housing and labour markets from the theoretical, conceptual, and methodological perspectives, which are currently in an embryonic stage of development.

Research Problem and Conceptual Issues

The research problem under consideration is that from a spatial planning perspective, the interaction of housing and labour markets has been under-theorised, conceptualised, and operationalised in empirical research, the corollary of which is a paucity of basic intelligence of the process, and inadequately informed policy agendas at national and regional levels. From a strategic perspective, the lack of intelligence and awareness of the interaction of housing and labour markets is significant. The hierarchical nature of the UK planning system – national policy statements informing regional strategies, which in turn inform local development documents – means that issues at national level tend to dictate, to a large extent, regional and local agendas.

However, with respect to economic development and regeneration agendas, much of this is coordinated at regional level, and since housing and labour market interaction has significant economic implications (Wong *et al*, 2000), there is a pressing need to address the current research gap. This would provide regional and local agencies with the intelligence needed to develop policy agendas, which take into account national policy issues, but which are specific to the requirements of the different regions.

However, counterbalancing the need for research intelligence into the nature of housing and labour market interaction is the fact that a single piece of research is unlikely to have the capacity to capture all of the complex processes and issues that characterise the interaction of housing and labour markets. As such, this thesis deals specifically with the *daily* interaction of housing and labour markets, which is one component of a much wider issue. However, this in itself is a complex process, which has not been adequately captured by existing research (Wong, 2002). Thus, the utility of this research lies in its ability to inform the research and policy processes of a specific aspect of the interaction of housing and labour markets, and as a tool for stimulating and informing further research into the wider issues surrounding housing and labour market interaction.

Given the focus of the research, it is necessary to provide a conceptualisation of the issue in order to guide the research. Although this is developed at length in forthcoming chapters, an introduction to the conceptual issues is necessary here to foreground the research. In considering housing and labour market interaction on a daily basis it is fundamental to recognise that this interaction is embedded in space in the form of the housing and labour markets themselves and in the connection between the markets in the form of commuting[1]. The benefits of delineating spatial housing and labour markets are reflected in the work of a number of authors (outlined in detail in the next chapter). Three approaches have dominated the theoretical debate relating to housing market and labour market structure and operations: the neoclassical approach, theories of segregation, and the radical approach, with neoclassicism representing the

[1] As implied earlier, other processes can also be considered to connect housing markets and labour markets such as migration, telecommunication, flows of services and goods.

most accepted and applied theoretical approach in both housing market and labour market studies (see Maclennan, 1982; Hasluck and Duffy; 1992). Although it has been argued that markets do not require a 'spatial form', when considering the spatial interaction of two markets, and the requirements of spatial planning, it is important to delineate spatial market areas that conform to economic principles, in order to situate the process of interaction (e.g. DTZ Pieda, 2004a; DTZ Pieda, 2004b).

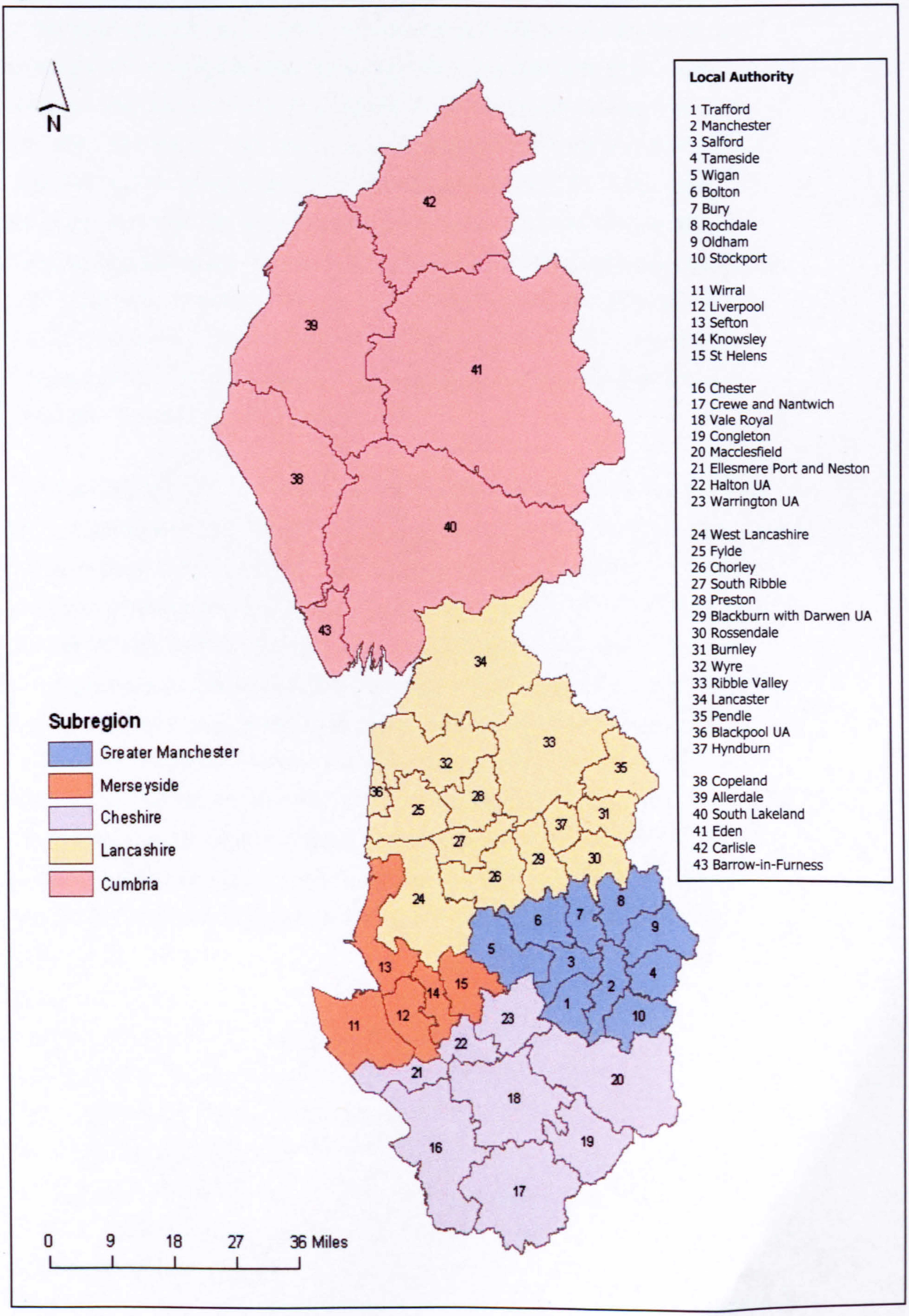
With this in mind, it is important to state that a focus on commuting is central in understanding the daily interaction housing and labour markets because commuting is a function of the location of residential and workplace locations, and thus the mechanism through which housing and labour markets interact on a daily basis. The fluidity that characterises the journey-to-work has contributed to the increasingly complex daily interaction between home and work as improvements in transport have occurred and people are more able to choose their housing location away from their employment centre (Spence and Frost, 1995; Moss *et al*, 2004). Indeed, increasingly, residential and workplace locations are becoming separated, commuting is becoming more and more complex, and work trips are lengthening in relation to both distance and time. This changing relationship reflects the outcome of the complicated process of balancing residential and workplace locations, which are both functions of residential and business location decision-making regimes. With this in mind, it is necessary to measure the process of commuting in order to allow an assessment of the nature of housing and labour market interaction to be made. Through research a number of approaches have been developed and applied in establishing commuting patterns which include econometric commuting models (see Van der Laan *et al*, 1998), the excess commuting measure (see Horner and Murray, 2002), spatial interaction models, and approaches which analyse commuting flows through interaction matrices (see Christaldi, 2005).

Further to this, the complexities associated with patterns of commuting and thus the daily interaction of housing and labour markets are determined by a plethora of key trends and processes. On the one hand, the structural nature of the commuting flows is determined by the demographic and socio-economic characteristics of the commuters, which can be termed 'people factors'. On the other hand, 'place factors' such as spatial structure, employment and population decentralisation, and the balance between jobs and housing influence the nature of commuting and the daily interaction of housing and labour markets. Therefore, both the 'people' and 'place' factors represent important determining factors in the interaction of housing and labour markets (Coombes and Raybould, 2001; Owen and Green, 2005). Thus, through an exploratory approach, this research attempts to consolidate housing and labour market theory and delineation with an examination of commuting between the identified housing and labour markets, and seeks to explore the influence of 'people' and 'place' factors on the nature of the interaction of housing and labour markets via a study of the North West of England.

North West England: The Study Region

The North West extends from Cheshire in the south, sweeps north through the metropolitan conurbations of Merseyside and Greater Manchester and extends through Lancashire and into Cumbria (Figure 1.1). The region is the most densely populated region in England, after London, with a population density of 4.77 people per hectare. Of the 6.9 million population the Mersey Belt is home to some 4.5 million people and a substantial proportion of the region's industrial base. The majority of the region's population is confined to the area extending from the Liverpool-Merseyside conurbation in the west of the region to the eastern border of the Greater Manchester and Lancashire conurbations around Tameside, Oldham, and Rochdale. In Lancashire, the main urban areas include Preston, Blackburn, Lancaster/ Morecambe, and Blackpool. The pattern in Cheshire is one of small industrial and service towns, which are separated by rural areas, with the notable urban centre being Chester. Cumbria lies on the periphery of the region with the urban centres of Barrow, Carlisle, Kendal, Workington, and Whitehaven separated by extensive rural areas and the Lake District National Park. Indeed, over half of the North West is rural and relatively sparsely populated which is illustrated when examining the contrast between Cumbria, which has an average population density of 0.7 people per hectare and the coastal resort of Blackpool, which has a population density of 40.75 people per hectare.

Figure 1.1: The Official North West Sub-Regions and Administrative Geography



Between 1982 and 2001, the North West experienced a decline in population of 2 per cent compared to a growth of 5.2 per cent in the UK population for the same period. Merseyside was the worst performing area with a population decline of 9.3 per cent whilst the population of Warrington increased by 11.8 per cent. This decline has been relatively concentrated in the principal cities of Liverpool and Manchester and particularly associated with the Merseyside conurbation, which can be contrasted to the non-metropolitan areas, which have been experiencing population increase over the last twenty years (Robson, 1996; Wong and Madden, 2000; Regional Economic Forecasting Panel, 2004). Indeed, a number of sub-regions have experienced growth in their population between 1982 and 2001 including Cheshire (6.5 per cent), Cumbria (2.3 per cent), and Lancashire (4.2 per cent).

The North West is multi-centred in nature, a characteristic that is unexploited at present particularly in relation to economic growth potential. Manchester has a strong regional influence and as such acts as the regional capital with Liverpool providing further regional functions. Manchester has successfully engaged in a number of high profile ventures, aided in a large part by a range of urban policy and regeneration initiatives which according to Puglisi and Marvin (2002:265) has demonstrated Manchester's ability to reinvent itself as a European Capital. Alternatively, Liverpool was nominated as the European Capital of Culture in 2003, a title that will be bestowed upon the city for one year in 2008. Complementing the roles of Liverpool and Manchester are towns and smaller cities, which provide opportunities for retail and employment in the region and as such operate both dependently with and independently of the larger urban cores.

However, in comparison other English regions, the North West is geographically, economically, and politically peripheral, particularly in comparison to the South East, which lies at the heart of the UK economy (Musson *et al*, 2002). In the context of European Union criteria for development and growth, the North West lies outside of the narrow band of concentrated growth and development. The peripherality of the region is further highlighted by the fact that GVA per head is 87 per cent of the UK average, ranking the North West ninth out of the twelve UK standard regions. Furthermore, the North West is the largest UK recipient of

European funding with respect to supporting regeneration, business, and skills development. Objective 1 funding covers Merseyside, Objective 2 funding covers Greater Manchester, Lancashire, Cheshire, and West Cumbria and Furness[2] and Objective 5b funding covers the Northern Uplands[3].

In terms of economic output and employment, the regional economy is polarised and contrasting. At regional level, there is a diverse range of jobs with construction, manufacturing, wholesale and retail, hospitality, logistics, and professional industries all with high participation rates. At sub-regional level, the distribution is more varied. The traditional agricultural area in Cumbria and part of Lancashire still dominate the agricultural job distributions in relation to the overall distribution in the region although the numbers involved are relatively small. Manufacturing and construction are particularly concentrated in Greater Manchester, Merseyside, and Lancashire, which is indicative of the region's urban-industrial legacy. Retail and wholesale industries are evenly distributed throughout the region with greater concentration in the larger urban conurbations of Greater Manchester and Merseyside and Lancashire. In relation to hospitality industries, the urban centres again have high concentrations, particularly Greater Manchester; however, Cumbria also has a high proportion of hospitality industries as a means of servicing the flourishing tourist industry.

The Greater Manchester conurbation contains the largest share in employment opportunities in the region (Wong *et al*, 1999), with the largest concentrations in professional, service, and manufacturing industries. Cumbria has been adversely affected by job losses in the nuclear, defence industries particularly nuclear fuels, and defence shipbuilding. Lancashire has been relatively successful in diversifying its economy from heavy dependency on textiles and coalmining towards high technology industries in the defence and aerospace industries, although in recent decades these industries have been threatened with contraction because of defence cuts. However, the region's buoyant sub-region is Cheshire, which has experienced high population growth, the creation

[2] West Cumbria and Furness relates to the West coast of Cumbria, which incorporates Barrow-in-Furness, Workington, and Whitehaven.
[3] All European funding is guaranteed until 2006 at which time the funding regime will be reviewed in the light of EU enlargement. The impact of enlargement for the region is debated although Merseyside is in risk of losing Objective 1 funding.

of new firms and business and high levels of inward investments, and this has resulted in high residential demand and contributed to the comparatively high house prices found across Cheshire.

In contrast, the Merseyside urban area has experienced the greatest reversal of fortune with the decline of the Port of Liverpool, on which many aspects of the economy were dependent. In the case of Merseyside, the economic and social problems associated with the area have been targeted through European Objective 1 funding since 1993 when Merseyside was designated an economically lagging region of the EU. The £1 billion injection in Merseyside from European funding represented a '...significant opportunity for Merseyside to begin to tackle its entrenched problems' (Boland, 1999:788). Similarly, in Greater Manchester unemployment, social deprivation, and population decline have been problematic. However, Manchester has grown to become the largest commercial and financial service area outside of London and the South East and is aided with the development, along with Liverpool, of its knowledge economy through university and higher education institutions.

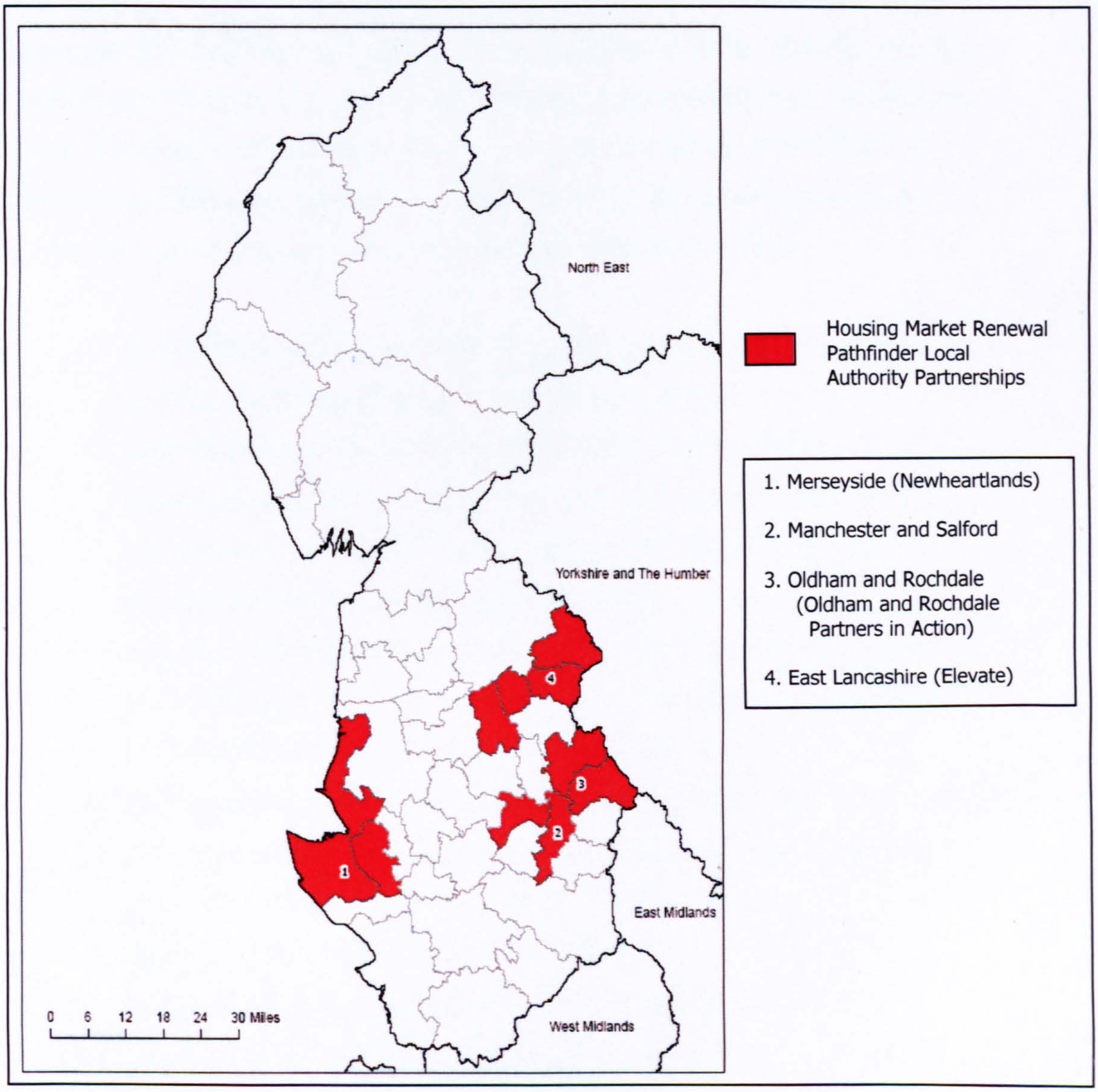
The publication of the first Regional Economic Strategy (RES) in 2003 was intended to plan the route towards competitive regional development for the North West at a time when economic competition had intensified significantly. The strategy was expected to perform multi-level functions, integrating regional, national, and European objectives into a coordinated framework through which the development requirements of the region were to be fostered. An examination of recent North West economic performance has highlighted that in recent years the region has performed better than in the past. At the time of the publication of the 2003 RES, the North West had an economy, which totalled £78 billion GVA and was the fourth largest in the UK (NWDA, 2003).

Contributing to the economic performance of the North West are the 350,000 enterprises, which are based in the region. Furthermore, the development of the knowledge economy through the seven universities in the region, which have a turnover of £1.2 billion per year, is fundamental to improving R&D in the region and thus strengthening the competitiveness of the North West economy (see Peck and McGuiness, 2003; Simmie, 2003). During the period 1998-2002, GVA per head increased at a slightly faster rate than the UK average and the region has continued to perform well against other UK regions outside the East and South East (Regional Economic Forecasting Panel, 2004). This growth has continued to be fostered in the three years since the publication of the original RES. At the time of the publication of the updated RES (NWDA, 2006), the region had an economy, which totalled £98 billion GVA, an increase on the 2003 total GVA of £20 billion.

However, despite the optimism surrounding the current growth in the North West, GVA per head is 12 per cent lower than the average for England, resulting in an output gap of £13 billion. Of this differential, £3 billion is due to fewer people working per head of population whilst £10 billion is due to lower productivity (GVA per employee). In addition, indication from recent forecasting suggests that the regional economy is expected to follow a cyclical pattern of growth and decline between 2004 and 2007, which is more amplified than that of the UK. Growth in 2003 outpaced UK performance averaging 2.4 per cent and in 2004, growth averaged 3.1 per cent. However, this growth has been projected to slowdown to 1.8 per cent in 2007, which falls behind UK growth as a whole (Regional Economic Forecasting Panel, 2004). Current growth in the North West is attributable to the growth of the manufacturing sector which has been strategically targeted by regional policy (see NWDA, 2002) and to the growth in high value service industries, both of which are projected to have lower growth rates over the period to 2007 (Regional Economic Forecasting Panel, 2004). It is unlikely that this decline will be offset by an increase in growth in other sectors. Consequently, it is likely that unemployment will slowly increase post-2006 as output growth declines and the size of the labour force increases (Regional Economic Forecasting Panel, 2004), and a projected decline in public sector spending suggests that the next few years will be tougher for the region than the period since 2000 (NWDA, 2006).

In relation to housing, there are problems of low demand and abandonment in some of the region's housing markets which have been targeted through the creation of four market renewal pathfinders in the North West, the largest number of pathfinders in any region (Figure 1.2). These areas of decline provide latent potential for social development and economic productivity but the extent of the problem in the North West is severe. Consequently, developing low demand and abandoned housing areas will require the strategic targeting of resources for an extended period, but is essential for the social and economic regeneration of deprived areas in the region.

Figure 1.2: North West Housing Market Renewal Pathfinders (Local Authority Partnerships)



Source: ODPM (2004:27)

Why Adopt North West England as the Case Study?

There are a number of reasons for selecting North West England as the case study region. One of the main reasons for adopting the North West as the case study was due to the fact that the North West Development Agency (the North West RDA) sponsored the research. The NWDA acknowledged in the original

Regional Economic Strategy that the North West is experiencing significant economic and social challenges (NWDA, 2003). When the research was commissioned in 2003, the NWDA was in its infancy and was barely into a 15-year strategy that targeted specific economic, regeneration, and social issues. Indeed, the original RES comments, '...detailed understanding of the regional economy is still developing. Further work will be undertaken by the NWDA to provide better information and develop responses to economic changes at international, national, and regional levels' (NWDA, 2003:4). It is against this context that this research was commissioned by the organisation. In addition, there are a number of additional factors reported by Wong *et al* (2000) and Nevin *et al* (2001), which make the North West an appropriate case study region to explore the interaction of housing and labour markets.

- The region's housing markets have been subject to considerable change. Growing affluence is exacerbating the process of decentralisation from older towns and cities in the region, which has resulted in a greater separation of home and workplaces and this separation is particularly pronounced in the areas that are worst affected by changes in the housing market.
- Four Housing Market Renewal Pathfinder areas have been created in the North West, the highest number in any region, which illustrates the regeneration problems facing localities in the region.
- The economic structure in the region has become increasingly similar to the national structure, but the region retains a greater proportion of manufacturing jobs and lower levels of service sector jobs. The structure of the region's economy is likely to have significant implications for the interaction of housing and labour markets.
- The regional economy has followed national economic changes by becoming increasingly service sector driven. However, the closer of branch plants and manufacturing rationalisation during the 1980s resulted in a substantial decline in the number of manual jobs in the region but this decline was not offset by increases in service sector jobs. The result has been an overall decline in the number of employment opportunities in the region, which again will have

implications for the spatial and structural interaction of housing and labour markets.

- Changes to the regional economy have resulted in a switch from a traditional male-centred employment culture to a more flexible and gender-neutral situation, which is embedded in the decline of full-time male employment and an increase in the number of part-time jobs being taken up by female workers. Research suggests that such trends are likely to influence the nature of housing and labour market interaction by altering the commuting patterns, times, and distances travelled.
- The process of population decentralisation has been complemented by a shift of employment opportunities away from traditional manufacturing and inner urban areas towards more prosperous suburbs, towns and rural locations, which has resulted in increasingly complex commuting patterns in the region.
- The region also has two major metropolitan conurbations with contrasting economic circumstances. Manchester has emerged as a significant service centre despite the city's overall underperformance in terms of job creation and persistent economic and social deprivation. However, Manchester's performance has been linked to the performance of its wider metropolitan area. In contrast, Liverpool has been unable to escape the spiral of decline that has faced the city, which has affected the wider regional economy (NWDA, 2003). The contrast in the performance of the two metropolitan areas is likely to create a complex web of housing and labour market interaction across the urban-industrial belt extending from Liverpool to Manchester.

Research Aim and Objectives

The aim of the thesis is to explore the interaction between housing and labour markets, focusing on the process of commuting, via a study of North West England.

In order to achieve this aim, a number of objectives have been formulated to guide the research:

1) To identify housing and labour markets at sub-regional level in North West England through the adoption and application of appropriate housing and labour market frameworks.
2) To explore the interaction of the sub-regional housing and labour markets in the North West based on the process of commuting.
3) To explore the effects of 'people and place factors' on the interaction of housing and labour markets in the region.
4) To synthesise the key research findings related to the interaction of housing and labour markets and draw out policy implications.

Outline of the Thesis

- **Chapter 1 - Introduction:** This introductory chapter provides a context for the thesis, and specifies the key issues to be examined in the research.

- **Chapter 2 - Literature Review:** This chapter contains a comprehensive and critical review of existing literature regarding housing and labour market theory, approaches for conceptualising and delineating housing and labour markets, key approaches for measuring and analysing commuting, and a review of key issues relating to 'people' and 'place' factors, which are important determinants of commuting trends and patterns.

- **Chapter 3 - Policy Context:** This chapter seeks to establish the current policy context for housing and labour market interaction and to explore the extent to which the interaction of housing and labour markets is addressed in current policy agendas. It draws on key policy debates at national and regional levels to inform the understanding of the current policy context, and explores the integration of housing and labour market policy objectives in key delivery mechanisms for housing and employment at national and regional levels.

- **Chapter 4 - Conceptual Framework and Methodology:** The chapter is divided into two parts. The first part develops a conceptual framework, which is regarded as the means through which to guide the progress of the research. It also outlines a set of research objectives and questions through which to inform the consideration of housing markets and labour market interaction. The second part of the chapter provides an overview of the data and research methodology adopted during the course of the research. The research methods adopted for specific aspects of the research are developed in detail in relevant chapters.

- **Chapter 5 - Sub-Regional Labour Markets in North West England:** This chapter focuses on establishing the labour market context for the research. It examines the nature and applicability of the current 1991-based travel-to-work-areas (TTWAs) as current approximations to sub-regional labour markets in the North West when related to 2001 commuting flow data and 2001 ward boundaries. The approach does not seek to define a new system of TTWAs for the North West but rather seeks to optimise the boundaries of the 1991-based TTWAs in relation to 2001 ward boundaries. Having optimised the 1991-based TTWA boundaries the TTWAs are examined in relation to criteria outlined by Coombes and ONS (1998), specifically, population and self-containment criteria.

- **Chapter 6 - Sub-Regional Housing Markets in North West England:** This chapter establishes the housing market context for the research and delineates housing markets at sub-regional level. It develops a new framework for defining housing markets at sub-regional level based on the housing market area (HMA) approach. The chapter begins by developing a conceptual understanding of the HMA framework and by considering the concepts and practicalities associated with developing and delineating a system of HMAs. The methodology gives particular emphasis to the iterative use of the functional regionalisation of inter-ward migration flows to identify groupings that constitute HMAs, in a process that is informed by estate agent knowledge of local housing markets.

- **Chapter 7 - The Interaction of Housing and Labour Markets:** This chapter explores the interaction of the housing and labour markets in the region. The analysis explores the spatial intersection of the sub-regional housing and labour markets, and provides a typology of the relationship. It then goes on to explore the interaction of the markets in relation to commuting by drawing extensively on aggregate commuting flows extracted from the 2001 Census of Population Special Workplace Statistics (SWS), and travel-to-work data, notably distance and mode of travel variables, extracted from the 2001 Census of Population. The 'people' and 'place' factors, which are significant in determining the nature of the interaction of the markets, are then explored.

- **Chapter 8 – Conclusions and Policy Implications:** The final chapter concludes the thesis by drawing together the key findings of the research. It reflects on the theoretical aspects of the thesis and the empirical observations made during the course of the study. It goes on to consider the implications of the findings for policy. Finally, the limitations of the research are explored and some directions for future research are proposed.

CHAPTER 2

HOUSING AND LABOUR MARKET INTERACTION: A LITERATURE REVIEW

Introduction

This chapter aims to establish a theoretical context for the research. First, it explores the theoretical frameworks employed to conceptualise housing and labour market functioning. Second, it goes on to consider the ways in which housing and labour markets have been delineated in previous research, which will inform our understanding of the most appropriate techniques for delineating housing and labour markets in this research. The third part of the chapter explores the issues associated with connecting housing and labour markets on a daily basis. These include exploring the key components of the commuting process such as, commuting patterns, mode of travel, and time and distance issues. Further to this, the section explores the different approaches that have been developed to 'measure' the commuting process to inform the interaction of housing and labour markets. The key feature of many studies into commuting is the recognition that commuting is influenced by demographic and socio-economic characteristics, namely 'people factors', as well as a range of physical or 'place factors', and these are explored in the final part of the chapter.

Unique Features of Housing Markets and Labour Markets

The concept of a *market* appears obvious enough. However, Moss (1984:81) comments, '...for all that is written about markets and market forces, it is remarkably difficult to find a definition of 'the market' in...economic literature'. Stigler and Sherwin provide the most developed conceptualisation of a market in economic terms:

> 'The role of the market is to facilitate the making of exchanges between buyers and sellers...whether of one good for another good or for money. The market is the area in which price is determined: the market is that set of suppliers and demanders whose trading establishes the price of a good' (Stigler and Sherwin, 1985:555).

However, whilst housing and labour form distinct markets in their own right, in contrast to generic commodity markets housing and labour markets are unique. In relation to labour markets, Bosworth *et al* (1996:175) suggest, 'a labour market exists where buyers and sellers of labour meet or communicate to agree on a price (a wage) at which they are willing to exchange a given volume of labour services'.

In relation to housing markets, Bourne (1981:72) suggests that a housing market is primarily an economic market, which is set within a political framework. He suggests that it may be defined '...as a set of institutions and procedures for bringing together housing supply and demand – buyers and sellers, renters and landlords, builders and consumers – for purposes of exchanging resources'.

Quigley (1979) details the unique features of the housing market. First, the high cost of housing implies that houses are expensive, that rental markets will exist and that mortgage repayment makes owner-occupation an attractive instrument for wealth accumulation. Second, the high durability of housing implies that there are narrow bounds to the rate of disinvestment in existing structures and that as housing ages the unit does not necessarily lose substantial market value. In addition, durability and supply cost indicate that it is relatively difficult to convert a unit in the existing stock from one configuration to another which suggests that the supply curve for housing services is inelastic. Third, the heterogeneity of housing indicates that housing units differ in a number of important dimensions and thus units that command the same market price might be viewed as significantly different by both suppliers and consumers. Fourth, the locational fixity of housing implies that the spatial characteristics of housing units, namely location, are purchased jointly with structural characteristics.

Bosworth *et al* (1996) outline the unique features of labour markets. First, each worker sells his/her effort, but retains his/her inherent capital. Second, in contrast to machines, workers cannot by separated from their effort and they are not inanimate or passive agents in the market which is illustrated by preferences for certain types of jobs and employers and places of employment.

Third, the supply of effort and the consumption of goods are related because effort is often proportional to wages, which influence the amount of capital available to purchase goods. Fourth, workers (and employers) can form collective groups to increase their bargaining power through trade unions. Fifth, employers have preferences over recruitment such as age and gender. Sixth, workers will often make decisions concerning employment as a collective household, rather than as an individual, decision.

Theorising Housing and Labour Markets

Due to the unique characteristics of housing and labour markets, it is inherently difficult to construct a framework that takes account of all the features outlined above. However, the neoclassical economic framework has assumed a position of prevailing orthodoxy in housing and labour market studies (see Maclennan, 1982; Hasluck and Duffy, 1992), despite the existence of competing theoretical frameworks (Table 2.1). Indeed, research focusing on the conceptualisation and delineation of housing and labour markets has predominantly drawn on neoclassical assumptions, particularly in relation to those approaches associated with New Urban Economics (e.g. access-space model), and functional regionalisation procedures (e.g. travel-to-work-areas)[4]. Therefore, the neoclassical approach provides an established theoretical framework through which to conceptualise and delineate housing and labour markets in this research.

This section seeks to briefly outline the assumptions of the neoclassical framework in relation to housing and labour markets. The purpose of this exercise is to provide a basis for exploring the approaches that have been used to conceptualise and delineate housing and labour markets from the dominant neoclassical perspective, which are explored in forthcoming sections.

A key assumption of the neoclassical position is the requirement that the analysis of social behaviour, including that in housing and labour markets, be grounded in a rigorous analysis of individual behaviour. The consequence of this is the antagonism of the neoclassical approach to any explanation based on

[4] The derivation of labour markets in particular through functional regionalisation methods (e.g. travel-to-work-areas) has been developed based on the assumption that commuting flows represent an approximation to the supply and demand for labour.

collective, social, or institutional factors, except insofar as these 'non-economic' factors can be reduced to self-interested individual decision-making (Hasluck and Duffy, 1992:12). The advantage in adopting the neoclassical approach lies in the fact that it can be used to explain the operation of *both* housing and labour markets. This means that housing and labour market delineation can be undertaken within a symmetrical framework, whereby the same principles are used to inform the conceptualisation and delineation of both markets. In contrast, such an advantage is not afforded by competing approaches (although it is recognised that competing theories have advantages as well as disadvantages in relation to the neoclassical approach). In addition, from a spatial planning perspective, the delineation of housing and labour markets based on spatial boundaries is fundamental. However, the alternative approaches are inefficient at 'operationalising' housing and labour markets in a spatial context. Thus, a set of general neoclassical assumptions can be applied to understand and operationalise both housing and labour markets (see Maclennan, 1982:36-37; Hasluck and Duffy, 1992: 12).

In general, the neoclassical framework defines a set of conditions sufficient for the existence of perfectly competitive housing and labour markets. The general neoclassical assumptions relating to the operation of housing and labour markets are:

1) There are many buyers and sellers in both markets.
2) In relation to the aggregate volume of transactions, the sales or purchases of each household are insignificant (housing market).
3) There is no collusion among or between buyers and sellers in either market, and firms and workers are unorganised (labour market).
4) There is free entry into and exit from both markets for both consumers and producers.
5) Consumers have continuous, transitive, and established preferences over a wide range of alternatives. In the housing market, these choices relate to housing and non-housing goods, whilst in the labour market individuals may choose to substitute more work and less leisure time (or vice versa), and firms may choose to implement new technologies involving different skilled labour.

6) Consumers and producers are assumed to possess perfect knowledge of the respective markets and the opportunities that arise in the markets at no additional cost. In the housing market, consumers are assumed to possess perfect knowledge with respect to prevailing house prices and current bids and perfect foresight with respect to future prices and future bids. In the labour market, the worker is assumed to have perfect knowledge of employment opportunities and wage rates anywhere in the market, whilst firms are assumed to possess perfect knowledge of labour supply and labour market functioning anywhere in the market.

7) All economic agents engage in the promotion of self-interest by maximising utility.

8) Housing and labour markets are assumed to be homogenous with no barriers to mobility in either market and there is assumed to be no artificial restrictions imposed to restrict the functioning of either market.

9) Housing and labour markets are assumed to possess strong tendencies to clear with market forces expected to result in housing and labour markets being in, or approaching, a state of equilibrium.

However, despite the advantages afforded by the neoclassical framework, and the fact that the neoclassical approach is the prevailing orthodoxy in housing and labour market studies, a number of criticisms have been directed towards the approach, which need to be acknowledged. First, it has been criticised for being too focused on the individual and neglectful of the decision-making process. Second, the approach focuses on the process of exchange under unrealistic market conditions with little consideration of the social elements inherent in market processes (Harvey, 1973). Third, the approach has been criticised on the basis that the input-output conceptualisation of the approach conceals the underlying exploitative relationships that exist between different groups in society (Bassett and Short, 1980). Fourth, the approach is formulated within a static equilibrium framework, a criticism particularly directed towards micro-economic aspects of the approach (Bassett and Short, 1980).

Table 2.1: Summary of Competing Theoretical Approaches to the Neoclassical Framework

Theoretical Approach	**Housing or Labour Market**	**Key References**	**Assumptions and Characteristics**
Filter Down Theory – *Human Ecology Tradition*	Housing Market	Burgess (1928); Hoyt (1939); Grigsby (1963).	The theory assumes that housing markets are in a state of disequilibrium. The theory dictates that urban residential structure and its evolution are explained through the processes of *competition* and *invasion and succession*. It developed as a result of observations that the higher the income of the household the further from the city centre the household lived. Therefore, high-income households tended to live in the newer houses on the edge of the city whilst the poorest households tended to live in the poorer quality households closer to the city centre. The pattern of residential location was explained by the 'filtering down' of housing. So, as the city expanded the richest households moved to the newest housing on the edge of the city, leaving their former housing to slightly lower-income households who in turn left their former housing to still lower-income households until at the city centre, the oldest housing was left to the poorest households. The basis of the theory is the assumption that population increases due to in-migration and it is in the zone of transition (residential area closest to city centre) where these populations congregate which intensifies land-use pressure and competition for housing and space (Park, 1936a; Park, 1936b; Quinn, 1971).
Institutional Perspective - *Segmentation Approach*	Labour Market	Kerr (1950); Edwards *et al* (1975); Cain, (1976); Loveridge and Mok, (1979); Morrison (1990); Pinch and Storey (1992); Peck (1996)	The segmentation approach rejects the formal theoretical system of neoclassical labour economics and considers the concentration of long-term unemployment and the occupational instability of certain social groups to be an indicator of the inability of the neoclassical approach to explain the nature and operations of labour markets. Early segmentation theories proposed the division of the labour market into two sectors (Loveridge and Mok, 1979) of higher and lower paying wages, offering differential opportunities for career progression, differing levels of stability and restricted mobility across the primary and secondary sectors. The more radical segmentation theorists developed the segmented labour market duality approach, postulating that labour markets are structured by capitalist demand for different types of labour (Pinch and Storey, 1992). A number of developments have been made to the early segmentation approaches including the development of a three-way model which divides the workforce into the categories of routine subordinate and creative, self-initiating, independent occupations within the primary sector as an addition to the secondary sector (Edwards *et al*, 1975). Furthermore, Peck (1996) proposes a theoretical advancement in the form of the fourth generation segmentation approach, which recognises spatial aspects of labour market processes. Kerr (1950) recognises the increasing importance of the institutional labour market through the notion of the 'balkanization' of the labour market. Within this, each job market is regarded as operating differentially in relation to other external job markets and in their internal functioning, which does not equate with the neoclassical notion of perfect competition.
Institutional Perspective – *Discontinuity Theory* (Radical)	Labour Market	Kreckel, (1980); Storper and Walker (1983)	Discontinuity theory stresses the importance of conflict between labour and capital as the organising component of labour market structure. It breaks from the traditional segmentation, dualist, and neoclassical approaches by recognising the extent to which the bargaining power of the workforce shapes labour market outcomes (Storper and Walker, 1983)
Institutional Perspective – *Integration of Segmentation and Discontinuity Theories*	Housing and Labour Markets	Randolph (1991)	In a framework for examining housing market and labour market interaction, Randolph (1991) draws on the theoretical construct of discontinuous labour market theory and applies the notion of segmentation to the housing market to highlight that different segments characterise both housing markets and labour markets. Discontinuities are considered to arise due to the shifting and sorting of individuals into different sectors and occupations by labour market processes which is constituted by the

			supply and demand for labour. The result of these elements is a series of spatially discontinuous labour market segments, which vary over time and between localities. Randolph suggests that it is the position of individuals in the hierarchy of segments, which is the major determinant of their ability to consume housing services. The outcome of this relationship is a locationally specific set of spatially discontinuous housing market segments, reflecting both the structure of housing opportunities in the locality and the characteristics of households consuming opportunities.
Radical Approach	Housing Market	Altvater (1973); Harvey, (1973); Harvey and Chatterjee (1974); Lamarche, (1976); Castells, (1977); Harvey (1982); Harvey (1985); Foglesong (1986)	In relation to the housing market, radical theorising attempts to refrain from isolationist conceptualisations of urban housing market systems and attempts to engage the wider debates, concerning modern capitalism. Radical approaches integrate the housing issue with that of the processes of urbanisation, capital accumulation, and the labour process (Harvey, 1973; Castells, 1977). They consider housing to be a commodity and a source of surplus value for capital (Lamarche, 1976), part of the necessary consumption of workers and an important aspect in the reproduction of labour. They argue that the housing system is an arena for social class conflicts and a locus for various forms of state intervention due to the inherent instability of capitalism (Altvater, 1973). It is this control and facilitation, which filters into housing provision through direct provision in the form of social housing and through the land-use planning system (Foglesong, 1986). Fundamental to the radical analysis of housing is the theory of rent and its influence on spatial organisation (Harvey, 1982 and 1985) because residential differences in space are linked to the wider problems of class divisions, differences in modes of production and the reproduction of social relations. According to radical theorists, such issues are inadequately accounted for in the neoclassical framework.
Radical Approach	Labour Market	Harvey, (1973); Harvey (1982); Massey (1995); Swyngedouw (2003)	In relation to labour markets, radical theory suggests that the capitalist process of production involves both a labour process and a surplus value producing process. In this process, labour as a commodity is applied to other commodities such as raw materials through different means of production, with the desired result of producing further commodities, which have a greater value than the costs expended to produce it. Surplus value dictates that for production to be maintained and the capitalist mode of production to survive, sufficient value (wages) must be allocated to labour to permit it to sustain and reproduce itself through the consumption of goods and services (Harvey, 1973). The process of production must combine the labour process with the creation of value and consequently, the labour process is connected to the struggle for profitable production (Harvey, 1973). The extent of capital accumulation is thus dependent on the efficiency of the production process, capitalist investment and location decisions (Massey, 1995:31), the drive towards surplus value and the class relation between labour and capital (Harvey, 1982). Radical theory argues that capital operates to create a profit at the expense of labour, which results in conflict between those actors operating within the market. In contrast to the neoclassical equilibrated and self-regulating market, the radical approach does not consider the market to operate in equilibrium. Indeed, radical theory dictates that under capitalism there exists a division between those who own the means of production and those owning labour, which they need to sell as a labour force in order to secure their own short and medium term survival (Swyngedouw, 2003).

Approaches for Conceptualising and Delineating Housing Markets

The evolution of housing market delineation techniques has a chequered history. As such, the development of complementary and competing approaches to housing market delineation has contributed to a theoretical conundrum, which has resulted in the development of a plethora of conceptualisations of housing markets, creating a theoretical inconsistency in housing market studies (Rothenberg *et al*, 1991). The previous section has highlighted that despite the limitations of the neoclassical approach, it represents the dominant approach for conceptualising and delineating local housing markets. Thus, this section focuses on the neoclassical approaches used to conceptualise and delineate housing markets, which are summarised in Table 2.2.

The Access-Space Model

The neoclassical approach dominates housing market studies and within this, the access-space model dominates neoclassical housing market studies (see Wingo, 1961; Alonso, 1964; Muth 1969, Mills, 1972; Evans, 1973; Maclennan, 1982). The access-space model essentially seeks to model the factors underpinning residential location patterns in an urban area. Wingo (1961) and Alonso (1964) illustrate how, under conditions of perfect competition, the household chooses its location to maximise its utility, balancing the costs of location against the advantages of cheaper land with increasing distance from the centre.

The model is based on a simplification of reality within the context of a flat urban area. A single employment centre is assumed to exist in the Central Business District (CBD) with accessibility to employment centres regarded as the primary influence on spatial variations in house prices. Transport systems are assumed to extend in a uniform fashion from the employment centre and all land on which housing is constructed is assumed to be analogous. The choice of household location involves maximising consumer utility within a framework of preferences and budgetary constraints (see Wheaton, 1979). Within the neoclassical framework, housing is assumed to be homogenous, conceptualised through the notion of housing services (Olsen, 1969). The framework distinguishes between the assets inherent in the housing unit as an investment for the landlord and the flow of housing services as consumed by the tenant (Bourne, 1981). This framework is appealing from a neoclassical perspective because the landlord can be treated as a profit maximising firm. Housing supply is controlled and provided through perfect competition between suppliers but supply constraints are dependent upon the provision of land and non-land elements of construction. Non-land elements are assumed constant across the geographic area and the interaction between demand and supply and household utility maximisation is considered in the long-run to create equilibrium in the market. The supply and demand interaction is influenced by the condition and characteristics of the current stock. Vacancies provide suppliers with the potential to meet demand for housing in the short-run but only if individuals choose to sell the dwelling. These vacancies are complimented by the production of newly built housing units and through tenure changes. As land value decreases from the CBD, builders use more land in relation to other factors of production with increasing distance from the centre causing a decline in population densities and an increase in housing space as distance from the CBD increases.

Since all externalities are assumed away in the model, one factor is considered significant for the household in choosing a residential location, the cost of the journey-to-work (Evans, 1985). The basis of the theory is that in travelling to the centre of the city, the household bears higher transport costs but is compensated by lower housing costs, meaning that the household trades off housing costs with transport costs. Therefore, each household is assumed to consider housing costs and transport costs equally in their location decision-making process. The first issue to consider is the amount of space that is required for the household, with the largest residential spaces located further from the CBD. Second, are the costs associated with travelling to work. Therefore, if the households' demand for space remains constant but journeys to work increase, then the household can save money by moving closer to the CBD. Under such assumptions, as household income increases so does its demand for space, thus higher-income households should locate out from the city centre. Evans (1985:19) highlights that the dominance of either of these two forces depends on the exact relationship between the demand for space and the increase in income.

The Hedonic Approach

The hedonic approach adopts neoclassical assumptions but recognises the inherent heterogeneity of housing through the varied characteristics of each dwelling. Rosen (1974:34) defines hedonic prices 'as the implicit prices of attributes...revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them'. Hedonic theory is applied to house price studies as a means of determining how a bundle of attributes with implicit prices are aggregated to form a composite price of all relevant attributes and thus determine the overall price of the unit (see Lancaster, 1966; Rosen, 1974[5]; Maclennan, 1977).

The hedonic approach is applied in a number of studies. Tse (2002) applies hedonic regression to determine the effects of social externalities on housing valuation. Kain and Quigley (1970) incorporate a consideration of the externality of neighbourhood characteristics on property valuation. A further application has been in the construction of house price indices and the relationship between housing attributes and their prices (see Costello and Watkins, 2002). Goodman (1978) utilises the Box-Cox method in the construction of housing price indices, compared the hedonic coefficients of structural and neighbourhood characteristics of two localities, and highlighted that the coefficients were not constant across time or space, indicating that housing markets were segmented.

However, it has proven particularly difficult to construct price indices based on attributes because different studies adopt different attributes and construct indices in different ways (Ball and Kirwan, 1975). As such, Maclennan (1982) criticises the subjectivity of selecting the content and form of the hedonic price regression and the fact that the approach devotes little attention to differences in the quality of housing attributes.

The Housing Market Area (HMA) Approach

The housing market area (HMA) approach is embedded in the neoclassical access-space model. HMAs are functional areas within which households search

[5] For a critique of Rosen (1974), refer to Epple (1987) who argues that some applications of Rosen's model have used inappropriate estimation procedures for models with linear demand and supply functions.

for alternative accommodation without necessarily changing their job. The HMA approach is a functional regionalisation procedure, and corresponds to the definition of a spatial housing market provided by Bourne (1981:73). He defines the spatial housing market as a '...contiguous geographic area, more or less bounded, within which it is possible for a household to trade or substitute one dwelling unit for another without also altering its place of work or its pattern of social contacts'.

Jones (2002:549) argues that empirical studies of housing markets have suffered from the use of administratively convenient boundaries (e.g. local authority boundaries), which are subject to arbitrary change and often have no functional meaning within the housing system. However, traditionally HMA research has been undervalued in the UK largely because of its limited requirements within the planning system. The most concerted effort in HMA delineation has been in the Scottish context (see Strathclyde Regional Council, 1994; Jones, 2002). Jones (2002) develops the HMA approach by integrating the economic principle of spatial arbitrage into the framework. He adopts an approach, which groups contiguous areas using an iterative approach based on achieving a level of 50 per cent migration self-containment. The approach uses data from the Sasines Register, which records property transactions and individual property characteristics, over ten-years in order to develop a system of self-contained HMAs in the former Strathclyde Regional Council area.

Coombes and Champion (2006) delineate HMAs in North East England by adapting the traditional approach of only using migration patterns to take account of non-migrants who are not captured by migration statistics. The approach is unique and allows the natural evolution of HMAs without factors such as self-containment or population thresholds constraining the development of HMA boundaries (see also Coombes *et al*, 2006). In contrast, Bibby (2005) abandoned the traditional approach used to delineate HMAs by estimating a 'neighbourhood price' for each housing transaction in the West Midlands. It is based on the idea that despite the heterogeneity of housing and the impact this has on market form, 'price formation effects' (Bibby, 2005:2) can be used to identify areas with similar house prices. The assumption is that by examining whether dwellings are linked by chains of substitutability, rather than whether they are perfect substitutes for one another, it is possible to infer that prices realised in two transactions are products of the same market even if the respective properties and their immediate neighbourhoods are very different.

However, the HMA approach has been criticised on the basis that HMAs are likely to differ depending on the socio-economic status of households (Forster *et al*, 1995). Furthermore, the approach adopted in Strathclyde Regional Council study has been criticised for not integrating market search analysis in the delineation of the HMAs, the first stage in the migration process (Maclennan, 1992).

The Housing Submarket Framework

The submarket framework originated in filtering models (Grigsby, 1963) and challenges established neoclassical housing market assumptions by assuming that housing markets are in a state of disequilibrium (Whitehead and Odling-Smee, 1975; Maclennan and Tu, 1996). As such, submarkets are associated with coordination failure in the market but still draw on assumptions of the neoclassical framework.

The existence of spatial submarkets has been determined based on the aggregation of neighbourhood characteristics into a spatial context (Straszheim, 1975). Schnare and Struyk (1976) examine price differentials of housing in Boston and identify submarkets based on occupancy income levels and stock characteristics using census boundaries to develop neighbourhood dimensions. They conclude that there were differences in price but these were not sufficient to explain the existence of submarkets. Similarly, Ball and Kirwan (1977) group neighbourhoods in Bristol to delineate spatial submarkets using factor analysis. However, it was concluded that there was no evidence of submarket existence.

There have also been attempts to delineate spatial submarkets based on the catchment areas of estate agents (Palm, 1978). In contrast to the spatial elements, structural factors have been investigated as determinants of submarkets. House price data has been used to identify structural submarkets. Indeed, Bajic (1985) examines asking prices of dwellings in Toronto and concludes that structural segmentation was evident. Such approaches have been complimented by studies which combine property 'bundles' into a structural property framework to determine submarket existence (see Allen *et al*, 1995).

However, some studies combine spatial and structural elements in submarket delineation. Watkins (2001) identifies submarkets in Glasgow through an analysis of demand and supply side dynamics to reflect both spatial and structural influences on housing choices and urban form. Goodman (1981) analyses single-family house sales in New Haven and concludes the existence of spatial submarkets with similar physical and structural characteristics. Bourassa *et al* (1999) examine the existence of housing submarkets in Sydney and Melbourne. They apply a number of methods for deriving submarkets but suggest a method that includes the adoption of local government areas and the clustering of dwelling characteristics.

Table 2.2: Summary of Neoclassical Housing Market Approaches

Approach	**Definition**	**Key References**	**Approach Characteristics**
Access-space Model	Contains spatial and structural elements	Wingo (1961); Alonso (1964); Mills (1972); Evans (1973)	The model is based on a simplification of reality within the context of a flat urban area and the existence of a single employment centre. Transport systems are assumed to extend in a uniform fashion from the employment centre and all land on which housing is constructed is assumed to be analogous. The household chooses its location to maximise its utility within time and budget constraints, balancing the costs of location against the advantages of cheaper land with increasing distance from the centre.
Hedonic Approach	Contains spatial and structural elements	Kain and Quigley (1970); Rosen (1974); Goodman (1978); Tse (2002)	Hedonic theory is applied to house price studies as a means of determining how a "bundle of attributes" with implicit prices are aggregated to form a composite price of all relevant attributes and thus determine the overall price of the unit (see Maclennan, 1977). Maclennan (1982:42) highlights the two-step procedure on which hedonic pricing is based. In the first step, the implicit prices of characteristics are estimated by the hedonic technique. The second step, assumes that the individual housing consumer is a price taker and is therefore faced with a number of implicit marginal price schedules for various characteristics. The household then maximises its utility by moving along each marginal price schedule until marginal willingness to pay for each attribute is equal to its marginal implicit price thus creating equilibrium.

Housing Market Area (HMA) Framework	Predominantly spatial	Strathclyde Regional Council (1994); Foster *et al* (1995); Glasgow and Clyde Valley (2000); Jones (2002); Bibby (2005); Coombes and Champion (2006)	The motive behind the HMA approach originates from the access-space model. The concept of a housing market area may be conceptualised as a self-contained functional boundary within which a household will seek alternative accommodation without necessarily changing jobs.
Submarket Framework	Contains spatial and structural elements	Grigsby (1963); Schnare and Struyk (1976); Ball and Kirwan (1977); Palm (1978); Goodman (1981); Bajic (1985); Allen *et al* (1995); Maclennan and Tu (1996); Bourassa *et al* (1999); Watkins (2001)	Submarkets represent co-ordination failure in the market. House buyers are distinguished based on preferences, resources and requirements. Similarly, to the neoclassical approaches, market search costs, budget and time constraints and inelasticity in the construction process impinge on the consumers operations and their ability to utility maximisation. Differences in supply and demand interactions means that price differences will exist for different housing types, size and so on, reflecting short-run supply and demand inelasticity leading to different submarkets structures.

Approaches for Conceptualising and Delineating Labour Markets

The operations of local labour markets in Britain have been subjected to increasing empirical and theoretical focus (Peck, 1989; Lawless, 1995; Manning, 1995; Turok, 1997a; 1997b; 1999; Peck and Tickell, 2000; Adams *et al*, 2002; Green and Owen, 2003; McCulloch, 2003). However, the use of the term local labour market has been criticised for the loose way in which it has been applied in studies of labour markets (Morrison, 1990). Conceptualising local labour markets represents an important empirical and theoretical exercise. As Peck (1996:262-263) comments, '...labour markets function in different ways in different places, and moreover...the case can be made theoretically for the spatiality of labour markets'. The local labour market and its internal processes are under-theorised with the dominant labour market models and theories ignoring spatial aspects, assuming spatial conditions away in the long-term, and simplifying the functioning of labour markets (Isserman *et al*, 1986). Consequently, this section outlines the neoclassical approaches, which have recently been applied to delineate spatial local labour markets.

The Travel to Work Area (TTWA) Approach

The standard TTWA approach has come to dominate the delineation of labour markets in the UK (Goodman, 1970; Smart, 1974; Smart, 1981; Champion *et al*, 1987; Green and Owen, 1990; Coombes and Raybould, 2004)[6]. TTWAs were initially devised to provide a meaningful geographical space for calculating and relating local unemployment rates in the UK which had been collected since the early 1950s (Smart, 1974). However, Coombes and Openshaw (1982) also highlight that in policy terms a standard delineated geographic space allows investment to be targeted at appropriate areas to benefit the unemployed rather than being displaced and benefiting residents and industry in surrounding areas.

The TTWAs have been adjusted on a number of occasions in response to updated Census data, and with each updated TTWA delineation has come advancements in the methodology used to revise the previous delineations (see Coombes *et al*, 1982; Green and Owen, 1990). The process has seen the reduction in the number of TTWAs in Britain from 642 before 1968, to 297 in England, Scotland and Wales and 11 in Northern Ireland after the 1998 revision (Coombes and ONS, 1998) reflecting the lengthening of the journey-to-work. The current TTWA framework is based on commuting data gathered through the 1991 Census of Population, which provides a randomly selected ten per cent of the population in the form of an origin and destination matrix of commuters (Coombes and ONS, 1998)[7]. Through the flow data, 308 TTWAs with high levels of self-containment and low levels of in-commuting and out-commuting were identified.

The methodology outlined here relates to this most recent revision of the TTWAs in 1998. The algorithm applied consists of five stages. First, wards are identified which may form part of the core of a TTWA. The core consisted of wards that were main destinations of journeys-to-work, and have relatively high levels of self-containment. The second stage groups together those areas identified in the first stage, which have significant grouping of flows between them to form areas of job foci. The third stage is to group further wards around these areas of foci. However, the algorithm does not seek to create sufficiently self-contained TTWAs on the periphery of larger areas; rather it seeks to

[6] The current spatial labour market framework, namely the TTWA approach, owes much to the development of Standard Metropolitan Labour Areas (SMLAs) in the UK.
[7] Towards the end of the research, the process of delineating 2001-based TTWAs was underway, but no official release date was set for the release of the 2001 TTWAs.

develop moderately self-contained areas with ratios of 50 per cent or more, which is achieved by ranking the job foci identified in stage 2 according to the function used to assess an area's viability as a TTWA. At the end of this stage, there remain wards, which do not form part of job foci in stage three. The fourth stage allocates these wards to areas with which they have the closest commuting links but not all of these areas are sufficiently self-contained. In the fifth stage, the areas, which are furthest from qualifying as a TTWA, are divided into their component wards and these wards are then allocated to the remaining area with which it had its closest commuting link and this process continues until all areas qualify as TTWAs (Coombes and ONS, 1998).

There have been a number of criticisms of the TTWA approach (see Ball, 1980). Green *et al* (1986) argue that the TTWAs of men and women are invariably different and that a standard TTWA cannot fully appreciate the differential nature of labour markets for both men and women. The approach has also been criticised because the self-containment level is largely an arbitrary value, which is compounded by continuously changing travel patterns (Goodman, 1970). Coombes *et al* (1988) highlight that TTWAs, particularly those around urban centres are large with higher levels of cross-boundary leakage. In addition, Peck (1989) argues that TTWAs do not take account of the processes occurring within space and argues that TTWAs as local labour markets are simply containers within which generalised labour market processes operate because the role of space is reduced to the friction of distance.

The European Regionalisation Algorithm

The European Regionalisation Algorithm (ERA) is a deviation of the TTWA approach with simple adjustments made (Coombes 2000). The approach is a multi-step method but the method is simplified to make the approach transferable in relation to alternative data sets and purposes (Coombes, 2000:1506). However, Coombes (2000) also highlights that the approach remains exposed to criticisms of any locality delineating technique such as those directed at the TTWA approach. The ERA approach has been applied in a modified form in Spain where functional regionalisation of labour markets has been neglected (see Casado-Diaz, 2000). The ERA method is as follows:

- Identify foci around which the regions will be built

- Group closely interconnected foci
- Progressively associate all non-foci areas to one or other region
- Disassemble regions which fail to meet statistical criteria and associate their constituent areas individually with one of the other regions
- Consider further optimising draft definitions through improving the regions overall statistical strength (optional criteria)

The Killian-Tolbert Approach

The Killian-Tolbert approach was developed because of the continuing debate surrounding the delineation of labour markets in the US. Killian and Tolbert (1991) suggest that all aspects of geographic space can be mapped in a variety of ways including politically through administrative boundaries and behaviourally through commuting and migration patterns. They argue that the latter of the two is the most appropriate approach. Many US methods used the county as the basis for data aggregation to construct delineated geographic space, which Killian and Tolbert argue, are biased towards urban centres where population density is highest. The Killian and Tolbert (1991) approach uses a two-way commuting flow between residency and workplace using a hierarchical clustering technique to delineate labour market areas.

The data used in the aggregation procedure relies on US Census data, which records the residencies and workplaces of individuals. The procedure is restricted by the requirement that geographical identifiers include 100,000 people, otherwise a further aggregation is required. The procedure is reliant on identifying the strongest commuting linkages and outlining the spatial proximity of areas where insufficient commuting links exist. The first stage involves identifying and grouping contiguous basic data units (BDUs) which have significant grouping flows between them. The second stage involves allocating the BDUs that have not been grouped in stage one to a group. The BDUs that were not grouped in stage one are either allocated to a group that was formed in stage one or they are aggregated to form a new group. The third stage identifies commuting isolates, which are those BDUs that have low levels of commuting with contiguous BDUs and a decision is taken as to which group the isolates are allocated based on the relative strength of flows between the commuting isolate and contiguous BDUs. As the stages of aggregation progress, so the cluster analysis groups the BDUs into a single cluster.

A problem with the Killian-Tolbert approach is that the labour market areas that are identified are inherently biased towards the labour market areas of technical, professional and managerial workers but this criticism can be levelled at most approaches defining functional labour market areas. Hanson and Pratt (1992:375) suggest that the standard defined local labour markets, using the census standard metropolitan areas (SMAs), county and city-region scales (in the US) is pragmatic, but that their size often does not equate with actual employment opportunities. Rather employment opportunities are far more spatially constrained for the majority of workers than those that assumed are to exist in approaches adopting similar delineation procedures to that of Killian and Tolbert.

The Subcentre Approach

The employment subcentre approach moves away from the functional regionalisation approaches adopted in the earlier methods and focuses on the specific concentrations of employment activities in different locations. Subcentres are areas where employment is significantly concentrated outside of the urban CBD (see McDonald and McMillan, 1990). As such, the subcentre approach provides a more localised approach to labour market identification than the functional regionalisation procedures. Subcentres are an important indication of the existence of a polycentric urban form and provide a number of advantages to the city, supplying contiguous residential areas with employment opportunities and services and providing a complementary addition to CBD economic activities.

A number of measures have been used to delineate subcentres. The measure used to delineate land rent function in the traditional monocentric model has been redeveloped to allow a generalisation to determine land rent and thus subcentre existence in the polycentric model (see McDonald, 1987; Anas *et al*, 1998). A bid rent function has also been applied to delineate employment subcentres (see McMillan and McDonald, 1998a; 1998b). In addition, McMillan (2003) defines subcentres as contiguous census tracts that have positive residuals in the first stage of a non-parametric regression model using employment density data. However, an alternative approach is provided by McDonald (1987) who suggests that the identification of subcentres can best be achieved by examining the gross employment density, which is employment in an area divided by total land area or by the employment-population ratio in an area. However, he suggests that for a centre to qualify as an employment subcentre its value for the measure in question must exceed the value for each contiguous zone.

Connecting Housing and Labour Markets on a Daily Basis: The Process of Commuting

The justification for focusing on the daily interaction of housing and labour markets lies in the fact that commuting is a function of the location of residential and workplace locations and is the mechanism for the spatial equilibration of housing and employment on a daily basis. In the UK, Europe, and the US the number of journeys made to work has increased over the last 10-15 years accounting for over 20 per cent of all journeys (Banister *et al*, 1997). On the one hand, the increase in journey-to-work has contributed to increasing congestion, environmental problems, and energy consumption issues and these problems have been recognised in research and policy agendas (Banister, 1994; Gordon and Richardson, 1995; Banister *et al*, 1997; DETR, 1998a; Banister, 1999; Vigar, 2002; Horner, 2004). On the other hand, the journey-to-work has become increasingly complex but in contrast to the environmental, energy, and congestion concerns associated with commuting, the daily interaction of housing and labour markets has been neglected. Thus, this section explores the key components of the commuting process and the different approaches that have been developed to 'measure' commuting.

Key Components of the Commuting Process

Commuting Patterns

Commuting patterns are significant in that they provide a means for analysing directionality of journey-to-work flows, the volume of commuters, and the strength of interaction between different places (Rain, 1999). Significantly, research that incorporates commuting tends to feature an analysis of commuting patterns in some form (see Horner, 2004). Indeed, the majority of studies reviewed in the forthcoming parts of the chapter explore commuting patterns in some form. As such, awareness of the different contexts in which commuting patterns feature is continually developed throughout the remainder of the chapter. However, it is useful to foreground this with a review of a selection of studies that illustrate the explicit application of the analysis of commuting patterns.

Davies and Musson (1978) draw on data from the 1951 and 1971 Censuses to examine the changing pattern of journey-to-work in South Wales. They highlight that although total employment grew only slightly between the two Censuses, the volume of commuting increased substantially. In addition, they suggest that the spatial patterns of commuting have become increasingly complex.

Van der Laan (1998) suggests that changes in urban systems are caused by the interdependency of regional and local levels. Therefore, he suggests that a framework is needed that takes account of both spatial scales. The analysis draws on commuting patterns and urban labour markets in the Netherlands, as the basis for a framework that relates changes in urban systems to changes in regional employment structures. The study considers the total volume of commuting measured at municipal level, disaggregated into incoming and outgoing commuting. The presence of multi-nodality is examined by exploring the direction of commuting patterns within 26 daily urban systems (DUS). For this, four different types of commuting patterns are identified: traditional commuting (suburb to city centre); cross-commuting (suburb to suburb); locally employed (central city to central city); and reverse commuting (central city to suburb). The analysis of the commuting patterns at local and regional levels indicates that three types of urban systems coexist. The first is the traditional hierarchical model based on commuting from suburbs to city centre locations, which is particularly evident in less urbanised and peripheral areas. The second is where the hierarchal urban pattern is still dominant, but particularly at the local level, there is an increase in horizontal, non-nodal flows (i.e. cross-commuting). The third shows multi-nodality at the local level, and the integration of DUS at regional level. The first pattern suggests the existence of central place cities, whilst the second and third suggest the existence of 'network' cities (Van der Laan, 1998:244).

Lowe (1998) explores the degree to which patterns of commuting are concentrated or dispersed across the Washington metropolitan area. He suggests that workers should commute to the labour market, which is closest to their residential location, and therefore, that commuting from particular locations should be concentrated on a limited number of local labour markets. If this is not the case, commuting is likely to be dispersed due to workers travelling to other labour markets. In Washington D.C., he suggests that commuting patterns are simultaneously more complex and simpler than might have been expected. He found that there is a distinct pattern of increasing commuting dispersion outward from the centre, but towards the periphery of this zone, the increasing decentralisation of employment and declining residential densities stimulate dispersed commuting patterns. Beyond this point, he found that commuting patterns became diffuse as both high levels of concentration and dispersion coexist at comparable distances from the centre.

In an analysis of commuting fields in New England, Plane (1981) uses commuting patterns as a means of exploring the complexity of urban interaction. He develops a five-fold classification of commuting patterns: (1) within central city commuting, (2) inward commuting, (3) reverse commuting, (4) lateral commuting and (5) cross-commuting. The purpose of the classification is to identify different types of commuting flows. The analysis highlights that traditional commuting to city-centres from suburbs is commonplace, as is commuting from city centres in one urban area to city centres in another. In addition, he highlights that nearly half of workers living in city centre locations commute to jobs in non-central locations, and a substantial proportion of commuters were identified as living and working outside the city centre, suggesting that decentralisation was having a significant impact on settlement patterns (Plane, 1981). However, one issue that needs to be acknowledged is that the complexity of the commuting process meant that some flows were included in more than one category leading to multiple counting of work-trips. This reflects the complex nature of the classification developed by Plane, which created problems of interpretability and validity of the analysis of commuting patterns for the different commuting categories.

Johannsen *et al* (2005) highlight that in Denmark commuting patterns identify a core-periphery dependency and significant commuting to larger urban centres. The authors highlight that commuting patterns over the last 20 years have shown a trend away from commuting between local residential and employment locations to a much more uniform directional bias towards larger urban centres, reflecting increasing concentration of employment opportunities in large urban areas.

Similarly, in a study of the interaction of urban and rural areas in Northern Ireland, Moss *et al* (2004) explore commuting patterns of individuals living in disadvantaged rural areas through data collected by a household survey. The analysis of aggregate commuting patterns highlights the high level of dependency of rural dwellers on urban areas for employment. The analysis also disaggregated commuting flows into categories including gender, whether the respondent had an association with farm or non-farm working, and whether the respondent was employed in the public or private sector. The analysis highlights significant variations in commuting patterns depending on the combinations of characteristics for the respondents, particularly related to gender.

Spence and Frost (1995) analyse commuting patterns associated with London, Birmingham, and Manchester to explore changing commuting patterns between 1971 and 1981. In relation to London, the study identifies high levels of long-distance patterns to the city centre as well as to the inner and some outer areas. In addition, trips attracted by outer areas tend to be relatively short in distance. In relation to Manchester, the city centre is an important workplace location but there also tends to be a significant volume of commuting to an employment zone ranging of 8-12 kilometres from the city centre. According to the authors, this reflects the historical development of industry in Manchester, where a ring of industrial centres has remained a substantial attractor of workers. In contrast, commuting patterns in Birmingham are quite different, characterised by short and long-distance commuting flows to the west and north west of the city reflecting the city's asymmetrical structure and proximity to neighbouring towns (Spence and Frost, 1995).

Bram and McKay (2005) explore the evolution of commuting patterns in the New York City metropolitan area between 1980 and 2000 drawing on commuting flow data at county level. The analysis highlights that although the monocentric pattern of commuting to the city centre remains important, it is not as prominent as it once was, which has resulted in increasingly complex commuting patterns across the metropolitan area.

Renkow and Hoover (2000) analyse commuting patterns in North Carolina between 1960 and 1990. The analysis indicates that there has been a significant growth in cross-county commuting over the period and there has been a five-fold increase in the number of workers commuting into metropolitan areas, and a four-fold increase in the number of workers commuting into rural areas.

As part of the TCPAs regional inquiry into the changing geography of regional employment in England (see Breheny, 1999a), Gordon (1999) explores commuting patterns in London and South East England. The analysis reveals that the region is characterised by complex commuting patterns almost all of which are linked directly or indirectly to the London labour markets. In particular, the analysis identified substantial amounts of cross-commuting, which has been exacerbated by growth in car-ownership, and shifts in the distribution of jobs.

Shuttleworth *et al* (2000) also apply the 1991 Special Workplace Statistics (SWS) data to analyse commuting patterns in Belfast as means for exploring the effectiveness of spatial policy targeting in deprived localities. The analysis reveals the traditional pattern of high inflows of commuters taking up jobs in the urban core. The analysis of commuting patterns also revealed that non-local workers take up a high proportion of local job opportunities.

Housing and Labour Market Interaction and the Theory of Spatial Interaction

Commuting is the representation of the spatial interaction of residential and workplace locations, and is the expression of a demand and supply relationship over geographical space through patterns of commuting. With this in mind, Ullman's theory of spatial interaction provides a sound basis for informing the analysis of the daily interaction of housing and labour markets. Ullman (1956) suggests that the process of spatial interaction is conditioned by three interlinked components: complementarity, transferability, and intervening opportunity (Figure 2.1).

Complementarity dictates that for interaction to occur between places there needs to be a demand for a particular commodity in one area and another area needs to have the capacity to supply that commodity. In relation to housing and labour market interaction, housing markets supply labour with different skills, qualifications, and characteristics to firms and businesses which are located in specific labour markets and which demand the labour from the housing markets. In addition, labour markets represent a significant element of the demand-side of the housing market, which means that the two markets exist in a state of mutual dependence (Randolph, 1991). The resulting spatial dynamics of this supply and demand for housing and labour between housing and labour markets is embedded in the patterns of commuting between the two locations. As such, if all the factors that constrain the commute are removed all housing markets can interact with all labour markets.

The second concept, transferability, dictates that a commodity, which is involved in the interaction between two places, must be capable of being transferred from one area to another. Transferability implies that the origin and destination must be connected usually through transport infrastructure and the greater the accessibility the greater the interaction is likely to be (Cox, 1972). However, different commodities have different degrees of transferability, measured by the real cost of transfer and this transferability is related to the price of the good before the good obtains place utility[8]. In relation to housing and labour market interaction, the fact that spatial interaction takes place dictates that the costs incurred by the interaction are lower than the benefits derived from the interaction and that commuting costs do not exceed wages otherwise interaction would not occur. However, the costs of commuting will differ for individuals depending on the degree of separation between residential and workplace locations (e.g. see Rouwendal, 2004).

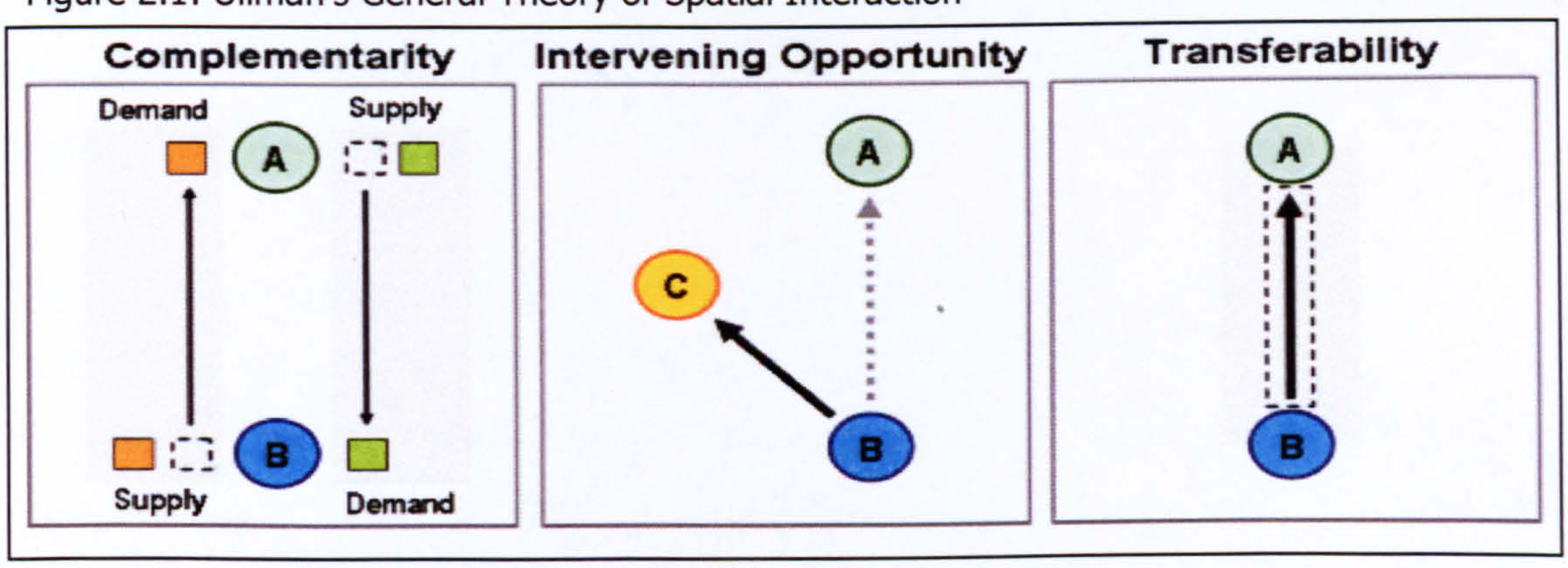
The concept of intervening opportunity, nevertheless, recognises that spatial interaction will not necessarily occur simply because complementarity exists. The interaction of different places is dependent on the availability of alternative, closer, and more accessible sources of supply. In relation to housing and labour market interaction, theoretically, housing markets will supply labour to the labour markets that are in closest proximity to the housing market (Lowe, 1998). This is informed by the assumption that residential and workplace locations are in a state of equilibrium for each worker. Therefore, the *majority* of workers will theoretically commute to labour markets that are closest to their residential location and therefore the direction with the greatest intensity of flows will be towards local labour markets (Ommeren *et al*, 1997; Lowe, 1998). This is based on the assumption that the rational commuter will change either their place of residence or employment location to minimise the costs associated with commuting to work (Kain, 1962). Subsequently, commuting from specific housing markets will theoretically focus on a limited number of local labour markets (Lowe, 1998).

However, a *minority* of workers will not conform to the practice of 'live local, work local'. Indeed, the interaction of housing and labour markets is likely to be a suboptimal process. The interaction of the markets is dependent on the dynamics of the residential versus workplace location decision-making regime and on the supply and demand for housing and labour operating between different housing and labour markets. Individuals might choose an adequate job near to their place of residence rather than choosing a job, which is further away but better suited to the individual. Alternatively, individuals might be

[8] Place utility is the added economic value of a commodity created by moving the commodity from one place to another. In this process, the utility of the commodity is changed from being of little use or value in the origin to being of significant use and high value in the destination.

forced to choose a job that is further away from their housing market because of the inability to access housing near to their place of work or by their inability to find a suitable job in a labour market in closer proximity to their place of residence (Gordon, 1999; Wong and Madden, 2000). In addition, individuals might choose a residential location, which is further away from their workplace location because of the benefits gained for the individual or their household in living in a certain residential location (Green, 1997; Wong, 1998b; Filion *et al*, 1999; Wong *et al*, 2000). Indeed, higher paid and higher skilled workers are often willing to substitute migration with commuting because they are able to offset the costs associated with commuting whilst benefiting from the advantages of their residential location (Green *et al*, 1999). This suggests that there will be a proportion of longer distance commuting between housing and labour markets as workers substitute commuting for migration (Green, 1999; Green *et al*, 1999; Green 2004).

Figure 2.1: Ullman's General Theory of Spatial Interaction



Source: http://people.hofstra.edu/geotrans

Mode of Travel

In the EU the number of cars owned per 1000 people increased from 184 in 1970 to 451 in 1997 (Eurostat, 2000)[9]. Banister *et al* (2000) highlight that car ownership per capita is likely to double in Europe between 1995 and 2014. In the UK in 1991, 71 per cent of work-trips were made by car, compared to 13 per cent for public transport, 11 per cent for walking, 4 per cent for bicycle, and 1 per cent for motorcycle (DETR, 1998a). Significantly, the majority of households in the UK now have access to at least one car and over 25 per cent

[9] This figure does not take into consideration the candidate member states integrated into the EU. As such, the figure takes account of EU15 rather than EU25.

have access to two cars (DETR, 1998a), and this has important implications for the nature of the commuting process.

In relation to the UK, Banister and Gallent (1998) explore commuting trends using the 1991 Special Workplace Statistics datasets. Their analysis indicates that the highest levels of car usage tend to be in rural areas of England. However, the authors highlight that the largest increases in car usage has been in major urban areas outside of London, the South East, and the North of England. The largest decline in public transport has been in metropolitan counties with public transport accounting for less than 20 per cent of journeys made in these locations. However, use of public transport in metropolitan counties remains higher than elsewhere where public transport accounts for less than 10 per cent of trips made, reflecting an overall decline in service provision. The authors highlight that the decline came at a time when private car ownership increased (16 per cent), which was driven by a decline in the real costs of car usage and a sharp increase in real costs associated with public transport. The popularity of walking and cycling is low; however, it is evenly spread across the country.

In an analysis of the relationship between the built environment and travel behaviour, Dieleman *et al* (2002:524) highlight that car ownership is the most important variable for explaining modal choice, largely because if people own a car they tend to use it. Car usage is particularly dominant in suburban and rural areas as people rely on the car in these areas to access urban services and employment opportunities. The study also found that travel by car dominated all distance bands. In relation to journey-to-work, this is likely to reflect the fact that access to a private car increases accessibility to more distant workplaces when compared to access to non-private travel (Levinson, 1998; Axhausen *et al*, 2001). However, public transport was particularly important for journeys between 1 and 7 kilometres, whilst people are likely to walk if the destination is within a reasonable distance to their home.

Kingham *et al* (2001) explore the factors that influence modal choice based on data collected through a survey of workers at two large UK companies. The study highlights the dominance of car usage across both companies (97 per cent and 88 per cent respectively), whilst there were comparatively low levels of use of public transport (0-3 per cent), cycling, and walking. The analysis highlights that people understand the issues associated with congestion and pollution, and recognise the benefits of moving out of their cars. However, the respondents continually cited the problem of lack of alternatives to private transport as a reason for not adopting other modes of travel. In addition, the authors suggest that increasing separation of home and workplaces is reducing the likelihood that car dependency will decline, especially when public transport, particularly travelling by bus, is time consuming, and walking and cycling are impractical except for short distances. Indeed, they suggest that the only way to achieve a substantial shift in modal choice is for people to live closer to their workplace.

In a historical analysis of commuting in Britain, Pooley and Turbull (1999) highlight that modal choice has remained relatively stable over time, except for two shifts occurring in the 1930s and 1960s. From 1890 to 1930, walking was the dominant mode of travel with more than 40 per cent of those in employment walking before 1920. From the 1930s to the 1950s, walking declined rapidly, whilst the use of buses and bicycles increased significantly. Train use was relatively stable during this time. From the 1960s, the car became the dominant mode, and more than 40 per cent of people in employment commuted by car from the 1970s. Commuting by bicycle, walking, and bus continued to decline, although the use of the train remained stable. The analysis suggests that once a mode of travel becomes established breaking the reliance on such a method is difficult.

In an analysis of commuting trends associated with respect to married couples in Oslo, Hjorthol (2000) highlights that in single car families, men are generally the dominant users whilst women will tend to adopt public transport. As such, men are likely to benefit from the use of private transport in relation to accessing employment opportunities in a wider range of labour markets when compared to women. Indeed, in an analysis of adjustment to job loss in major UK cities, Bailey and Turok (2000) found that men are more likely to adjust to job loss through commuting to alternative labour markets than women.

Time and Distance

The growth in car dependency has exacerbated the increasing separation of residential and workplace locations, and consequently extended average journey lengths (Banister, 1999). Travel is a derived utility and this means that both travel time and distance should be regarded as a disutility that the commuter should seek to minimise (e.g. see Dijst and Vidakovic, 2000; Tiefelsdorf, 2003).

Travel Time

Although it is often assumed that travel time has generally been on the rise, Pooley and Turnbull (1999) suggest that most people have an upper threshold of time until which they are willing to commute, and that this limit has remained relatively stable over time. Indeed, their analysis suggests that the average time spent travelling to work has barely doubled over the past hundred years, from 18 minutes in 1890 to 35 minutes in 1998. The upper threshold level of 35 minutes has been reflected in other studies, most notably in an analysis of commuting trends across Europe (Kenworthy *et al*, 1999). In addition, Pooley and Turnbull (1999) suggest that a substantial proportion of this increase in travel time occurred between 1890 and the 1920s, and that the average length of time spent travelling has increased little since the 1930s. Interestingly, the analysis found that women had longer journeys when compared to men in most decades prior to the 1960s, and that it is only since the 1980s that men have had substantially longer commuting times than women, which is likely to reflect the impacts of economic restructuring.

Drawing on evidence from the British Household Panel Survey (BHPS), Benito and Oswald (2000) suggest that there is evidence of increasing average commuting times for workers in the UK, although the increase is relatively small. The study found that average commuting times have been rising for workers in the South East and London, and these increases are evenly spread between men and women.

Schwanen *et al* (2002) use multiple regression analysis to model the influence of a selection of socio-demographic characteristics on travel time in the Netherlands, using data from the 1998 Netherlands National Travel Survey. The analysis found that socio-demographic variables are generally more important than residential context in explaining travel time. In particular, the study highlights that travel time is relatively high for men, and increases with the number of workers in the household, age, and educational level. Interestingly, they found that the influence of car ownership and income was relatively low for travel time. However, in relation to residential context, the study highlights that car travel times are lower in suburban and less-urbanised areas, which have lower population densities than urban areas where higher population densities and congestion levels affect commuting times.

In support, Gordon *et al* (1989) found that in US metropolitan areas with populations above one million inhabitants, average commuting times increase with increasing city size for inner city residents and decrease for suburban residents. The results suggest that the colocation of residential and workplace locations as a result of decentralisation has the effect of reducing commuting times (Levinson and Kumar, 1994). However, there are uncertainties associated with this contention. In particular, Cervero (1996) found that whilst decentralisation had increased the balance of jobs and housing in the San Francisco Bay area during the 1980s, this did not result in lower commuting times. Cervero and Wu (1997) suggest that the explanation for such trends is that housing supply actually lagged behind employment creation, forcing people to commute longer distance initially to access jobs that had decentralised ahead of population.

Travel Distance

In relation to distance, it is generally assumed that as the distance increases the propensity for interaction decreases[10]. Cox (1972:19) comments, 'distance-biased movements are movements in which the intensity of movements is an inverse function of distance; short-distance movements tend to be relatively more intense than long-distance movements'. From an economic perspective, distance to work is a cost associated with commuting, and the ability to commute longer distances tends to be associated with higher wages (Shearmur, 2006). Indeed, distance to work is regarded as an outcome of rational decision-

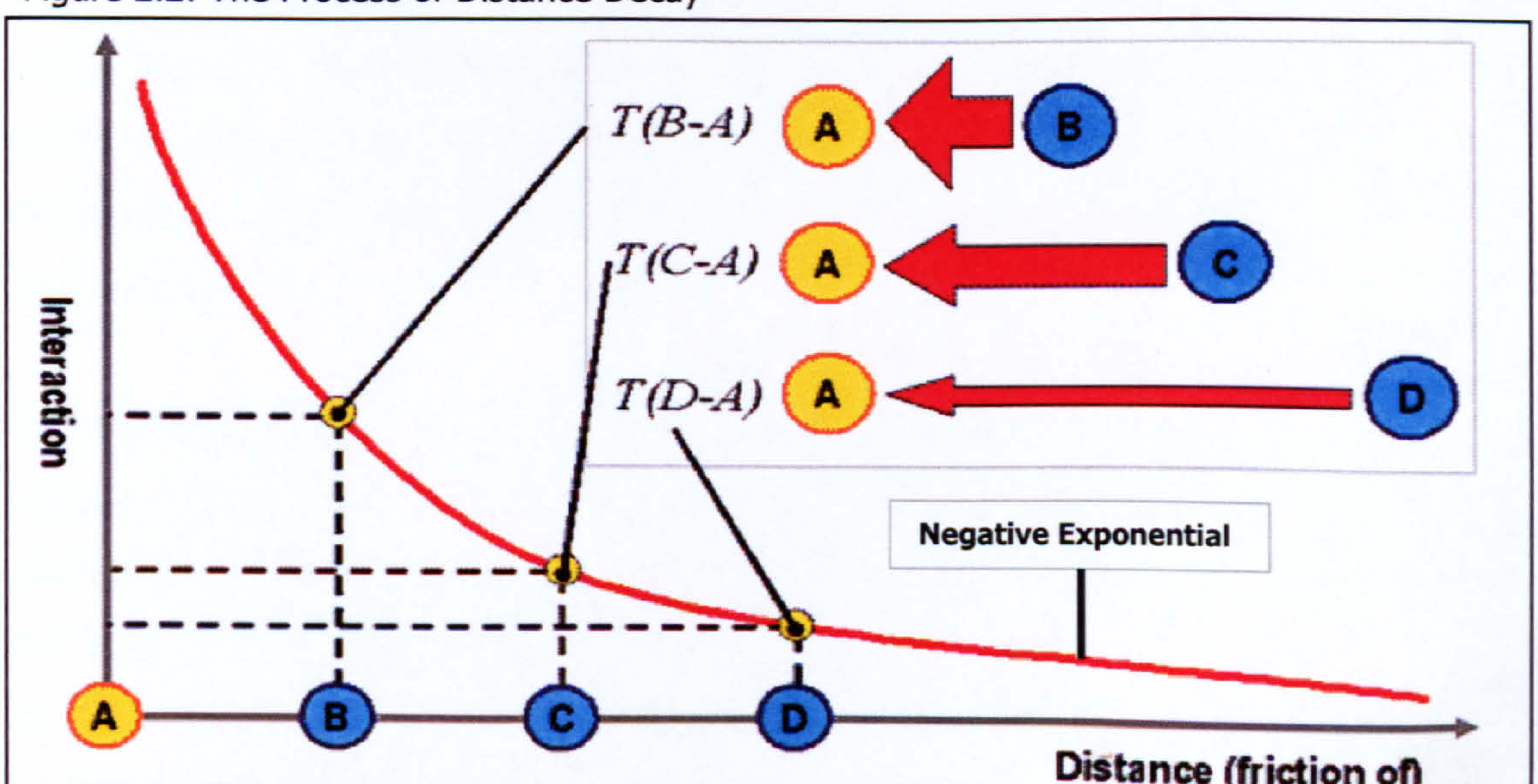
[10] Tobler (1970) states that the first law of geography is that everything is related to everything else but that closer things are more related than distant things.

making, which reflects the trade-off between wages, housing choices, and transport costs (Rouwendal and Nijkamp, 2004).

Figure 2.2 represents the process of distance decay associated with spatial interaction. The flows from A-B are short in length but have a high intensity of flows. Flows from A-C are longer than flows from A-B but have a lower intensity of flows. Finally, the flows from A-D are the longest in length but the lowest in intensity and by combining these differential flows, the process of distance decay is illustrated.

Distance decay is assumed to be a product of the costs associated with commuting (and other forms of movement). However, whilst the notion of distance decay dictates that the intensity of the interaction decreases with increasing distance, it is generally accepted that the intensity of flows does not decrease in proportion to distance but instead decreases at a decreasing rate (Tiefelsdorf, 2003). In other words, the relationship is often more curvilinear than linear, represented by the negative exponential shown in Figure 2.2. This concept suggests that movements do not cease beyond a certain distance but rather it implies that there will be a gradual attenuation of movement with increasing distance (Cox, 1972)[11].

Figure 2.2: The Process of Distance Decay



Source: http://people.hofstra.edu/geotrans

[11] It should be noted at this point that distance decay is measured logarithmically rather than arithmetically which is important because there is no lowest point on a logarithmic scale.

In an analysis of the links between residential moves and job location, Clark *et al* (2003) examine the extent to which households are sensitive to the length of the commute. The findings of the model developed emphasise the rational behaviour of reducing commuting with greater separation of home and work. The authors also confirmed the existence of a critical isochrone, which they highlighted through commuting data for Seattle. The analysis suggests that beyond 8 miles the likelihood of decreasing the distance to work increases rapidly in Seattle. The general findings of the study are supported by earlier work undertaken by Clark and Burt (1980) who suggest that there is a marked tendency for the majority of people to move closer to their place of work as distance between home and work increases.

Pooley and Turnbull (1999) highlight that between 1890 and 1998 there has been a four-fold increase in the mean one-way journey-to-work, from 3.6 kilometres in 1890 to 14.6 kilometres in the late 1990s, with average commuting distances increasing steadily over the decades. Between 1890 and 1929, the modal distance travelled one-way to work was less than 2 kilometres, rising to 2-4.9 kilometres between 1930 and 1959, increasing again to 5-9.9 kilometres in 1960-1989, and reaching 10-19.9 kilometres in 1990-98 (Pooley and Turnbull, 1999:285). The authors attribute these increases in distance travelled to changing transport modes and the increasing access of commuters to faster forms of transport. The analysis also highlights that women have consistently travelled shorter distances than men. These differentials were particularly large in the 1890s, then narrowed until the 1930s, but then substantially widened so that from the 1970s men were travelling almost twice as far as women.

The majority of commuting trips in England and Wales are relatively short in distance (Spence and Frost, 1995; Banister and Gallent, 1998). Across England and Wales, 52 per cent of commuting is less than 5 kilometres in length, and 27 per cent are less than 2 kilometres in length. Only 27 per cent of trips are above 10 kilometres or more length. Banister and Gallent (1998) found that Greater London has the lowest levels of short commuting trips, where the 45 per cent of trips are less than 5 kilometres in length (Banister and Gallent, 1998). In contrast, the metropolitan counties have the highest proportion of shorter trips and the lowest proportion of trips over 10 kilometres in length. However, in all cases, trip lengths increased by more 10 per cent between 1981 and 1991. Areas with high levels of shorter journeys were found mainly in rural areas, self-contained large towns, and areas outside major conurbations. However, all areas experienced a decline in shorter journeys between 1981 and 1991, and substantial increases in longer distance journeys, although the authors acknowledge that such trips still make-up just a small proportion of all journeys.

In an evaluation of the spatial structure of the UK, Wong *et al* (2006) explore commuting distances based on data derived from the 2004 National Travel Survey and 2001 Census of Population. The analysis found that 70 per cent of journeys in 2001 were less than 10 kilometres in length (Nielsen *et al*, 2005), and the highest proportion of shorter journeys tend to be concentrated in urban inner city areas, where the authors suggest employment is concentrated (Wong *et al*, 2006). Long-distance commuting (over 20 kilometres) was found predominantly around London and the South East, and in shire areas that border major conurbations (Wong *et al*, 2006).

Approaches for Analysing the Interaction of Housing and Labour Markets through Commuting

A number of methods have been developed which can be used to analyse the daily interaction of housing and labour markets through commuting. This section explores these methods in order to inform the adoption of an appropriate method for 'measuring' the commuting process and thus the interaction of housing and labour markets.

Modelling the Commuting Process

Modelling is one approach used to analyse the nature of commuting. Three relevant models are identified through which to explore the process of commuting (Van der Laan *et al*, 1998).

Model of Fully Concentrated Employment

The fully concentrated employment model is developed on the assumptions of the access-space model (Figure 2.3). The model assumes that the location of residential locations is given and all employment is concentrated in the CBD. Therefore, the model does not require a calculation of direction because it is assumed that commuting is directed towards the one dominant employment centre, the CBD, which means that direction is assumed *a priori*. The method consists of three steps. First, the maximum commuting distance for each of the urban regions is calculated. Hamilton (1982) uses a limit of 100 people per square kilometre and Van der Laan *et al* (1998) use the edge of the urban region to calculate the maximum commute (i.e. the maximum distance that anyone living in the urban area can theoretically commute from their residential location to the CBD). The second step is to determine the potential population density function in which the relationship between the distance to the city centre and the place of residence of the potential labour force is highlighted. Hamilton calculates the population density function based on the entire population and Van der Laan *et al* only use the potential labour force, those between 15 and 65 years of age. The model is based on an assumption of full employment and as such, the potential labour force equals the potential number of commuters.

The model begins with the assumption that the function for the density of the potential labour force is a negative exponential, which is based on the monocentric assumption that population density decreases with distance from the CBD, which is represented as:

$$B(x) = Cx^{-\tau} \qquad (1)$$

Where:

$B(x)$ = the potential labour force living at a distance x to the city centre; the density function for the potential labour force

C = the constant

x = distance to the centre of the urban region

τ = the distance gradient

The final step in determining the commuter distances is the calculation of the average commuting distance. The calculation of the average distance is represented as:

$$A = \frac{1}{P} \int_{x=0}^{x=max} x \; B(x) \; dxdy \qquad (2)$$

Where:

A = average commuting distance, given full concentration of employment

x = the distance to the centre of the urban region

$B(x)$ = the density function for the potential labour force

P = the potential labour force in the area

$dxdy$ = area within circle at distance x

The potential labour force in the area P is represented as:

$$P = \int_{x=0}^{x=max} B(x) \; dxdy \qquad (3)$$

When the equations (1) and (2) are substituted the resulting configuration occurs:

$$A = \frac{2 - \tau}{3 - \tau} x_{max} \qquad (4)$$

However, it is assumed that there is no potential labour force living at a distance less than 1 km from the city centre because this is the area of employment. Consequently, the area between 1km from the centre (x=1) and x_{max} is calculated. However, in many cities the urbanisation of CBDs has been occurring since inner city and CBD regeneration (see Couch, 1999; Seo, 2002) thus obscuring the assumed divide between employment, which is centred in the CBD and residency, which is located in the suburbs. In addition, the growth of polycentric urban areas means that the assumption of the existence of a single employment centre does not do justice to the geography of employment in many areas.

The Model of Deconcentrated Employment

In the model of deconcentrated employment (Figure 2.4), multiple employment subcentres are assumed to exist (McDonald, 1987; Giuliano and Small, 1991; McDonald and Prather, 1994). The deconcentrated employment model is also based on a number of assumptions concerning household behaviour and commuting direction. First, the *rational* commuter will change their place of residence or employment to minimise commuting costs. Second, deconcentration of employment from the city centre can lead to a reduction in total commuting distance because employment is concentrated closer to the place of residence. Third, employment location can be found on the radial between residency and the CBD. Van der Laan *et al* (1998) calculate the reduction in distance in the case of deconcentrated employment centres using the methods applied by Hamilton (1982). The reduction in the commuting distance is due to the reduction in distance that occurs between the new employment centre and the existing CBD where employment was previously fully concentrated:

$$B = \frac{1}{W} \int_{x=0}^{x_{max}} x \, W(x) \, dxdy \qquad (5)$$

Where:

B = average distance of deconcentrated employment from the centre of the urban region

x = distance to the centre of the urban region

$W(x)$ = total employment at distance x from the centre: employment density function

$dxdy$ = area within circle at distance x

The deconcentrated model also assumes the existence of full employment, which means that the number of commuters within an urban region equates to the number of jobs. This means that $W(x)$ is formulated by calculating the number of employed within the municipalities (Van der Laan *et al*, 1998:391), the distance between the municipalities and the city centre, which is represented as:

$$W(x) = C\,x^{-\tau} \qquad (6)$$

Where:

$W(x)$ = the employment density function

C = the constant

x = distance to the centre of the urban region

τ = the distance gradient

The minimum commuting distance is thus determined, which is the distance between the commuting distance at full concentration of employment and the reduction in distance, which can result with deconcentrated, and multiple employment centres. To calculate the reduced commuting distance, the reduction in distance in the case of deconcentrated employment is subtracted from the commuting distance calculated in the concentrated employment model. The advantage of the deconcentrated model over the concentrated employment model is the fact that the model acknowledges the existence of employment centres outside of the CBD.

The Cross-Traffic Model

Within the cross-traffic model (Figure 2.5), commuting is not centred on the CBD but assumes that commuters will travel to the closest urban node. This assumption is based on two considerations. First, that a potential commuter has to commute and second, that commutes are undertaken with the aim of minimising costs. Although the journey-to-work has been highlighted as a determinant of residential location (see Kain, 1962), one problem which this assumption presents is that in actual commuting flows the non-random nature of commuting is unlikely to be realised due to the many other variables which can influence residential location decisions. Consequently, when examining actual commuting flows the non-random assumption is omitted from analysis. The cross-traffic model presents a simpler alternative to the concentrated and deconcentrated models because in the cross-traffic model the average distance of commuting is the weighted average of the number of commuters of each municipality and the distance to the nearest municipality, which means that population and employment density functions are not required. The calculation of the average distance equation of the cross traffic-model is represented as:

$$C = \frac{\sum_i \sum_j P_i \cdot d_{ij}}{\sum p_i} \qquad (7)$$

Where:

C = average distance of the urban region to employment in the nearest municipality

p_i = number of commuters of the residential location *i* orientated at nearest municipality *j*

d_{ij} = distance between the residential location *i* and the nearest municipality *j*

$\sum p_i$ = total number of commuters in the urban region

The three models are empirically tested by Van der Laan *et al* (1998) using commuting data from the Netherlands for four urban regions. The first stage in this process is to compile commuting and distance matrices, the commuting matrix showing commuting between areas within the urban region, and the distance matrices showing the distance by the usual road between different localities. This means that each commuter gets a specific distance value based on the distance between the residential and workplace location (Van der Laan *et al*, 1998). The testing of the monocentric model begins by determining the distance from the city centre to the edge of the urban region (x=1) towards the periphery of the urban region $x_{\max}$ through equation (2).

Following this, the potential population density function is calculated. The potential labour force (P) is relatively simple to determine, but is dependent on the definition used to define the 'labour force'. The constant in the equation (C) and the coefficient (τ) are calculated through loglinear regression, the values of which are then substituted into potential population density function. The regression model also provides an r^2 value, which represents the expected exponential relationship between the actual and the expected dispersion of the residential locations of the potential workforce, and represents the ability of the model to explain actual commuting behaviour. Using the potential population density function, distance x and the total labour force, the average distance of commuting is calculated (equation 2) with limits x=1 and x_{max}.

In the deconcentrated model, loglinear regression is again used to calculate the constant (C) and coefficients (τ), and this is substituted into the employment density function between locations of employment and the centre of the urban system. Again, the regression model provides an r^2 value, which calculates the ability of the model to explain actual commuting behaviour. By obtaining information related to the total number of jobs available within x_{max} and by using the distance from the centre towards the edge of the system, it is possible to solve equation (5).

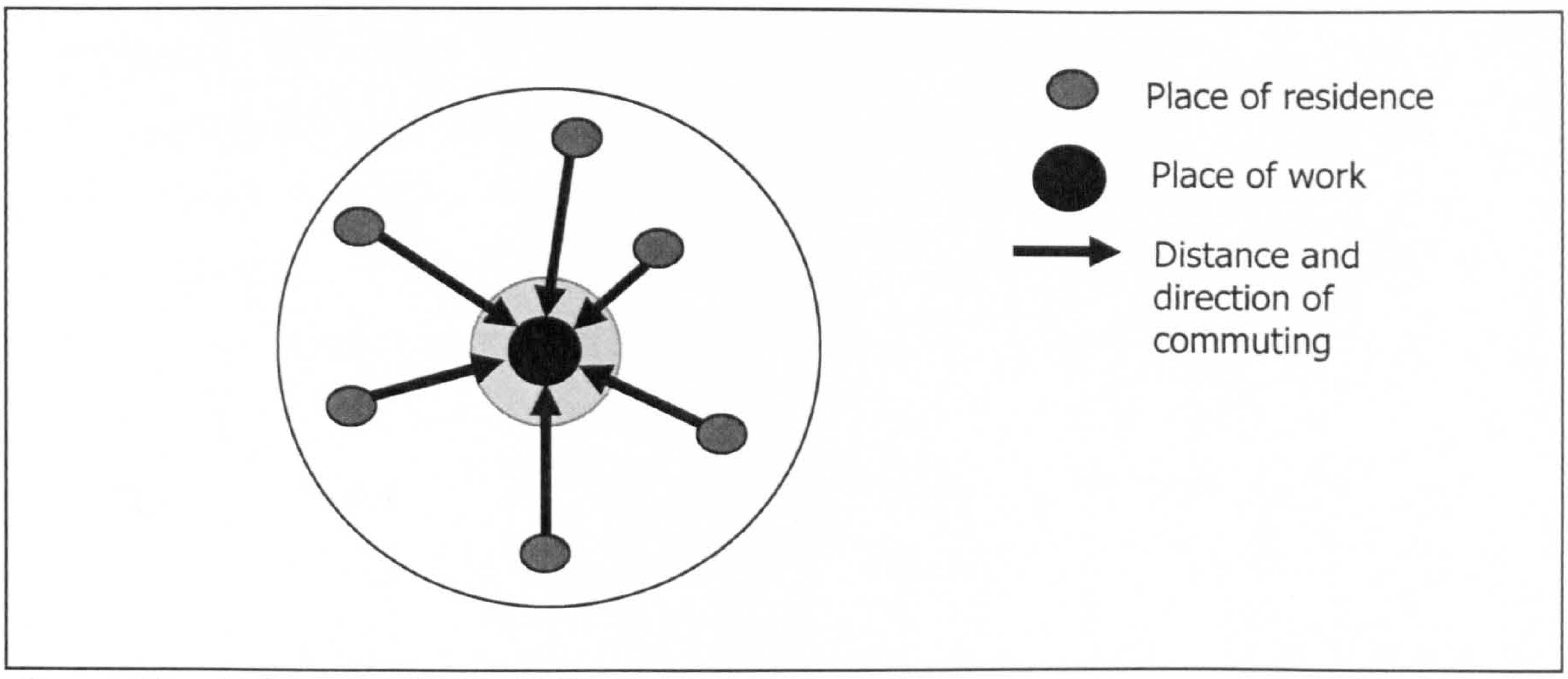
However, because the deconcentrated model assumes the existence of deconcentrated employment locations, it is necessary to calculate the minimal distance in the model. This is the average distance calculated in the concentrated model minus the reduction in distance made possible in the deconcentrated model. Van der Laan *et al* (1998:394) suggest that differences in minimal distance are related to differences in residential and employment locations, reflected by potential labour force destiny functions, and employment density functions. The difference between the actual average distance and the minimal distance is the amount of wasteful commuting in the system. This is commuting distance that cannot be explained by the concentrated model.

The cross-traffic model acknowledges that not all commuting flows are directed towards the CBD, and therefore incorporates the notions of polycentricity and cross-commuting into a model of commuting. Commuting distance in the cross-traffic model is calculated from the potential labour force per place (e.g. district, ward, municipality), and the distance towards the nearest place by road. The figures for each of the urban regions are totalled and related to the entire potential labour force of those regions. All other presumptions hold including the assumption that employment location is exogenous to population location (Van der Laan *et al*, 1998).

The evaluation of the models draws a number of significant conclusions. The monocentric model has been criticised for not taking account of the diversity of commuting. Indeed, Van der Laan *et al* (1998) highlight that the monocentric model explains just 4 per cent of actual commuting distances in their case examples. This suggests that the traditional assumption of commuting from suburbs to city centres is only one element of a more complicated commuting process, the majority of which cannot be explained by the monocentric model. This appears to be a corollary of the fact that the monocentric model is based on restrictive assumptions regarding the direction and behaviour of commuters, which reduces the efficiency of the model.

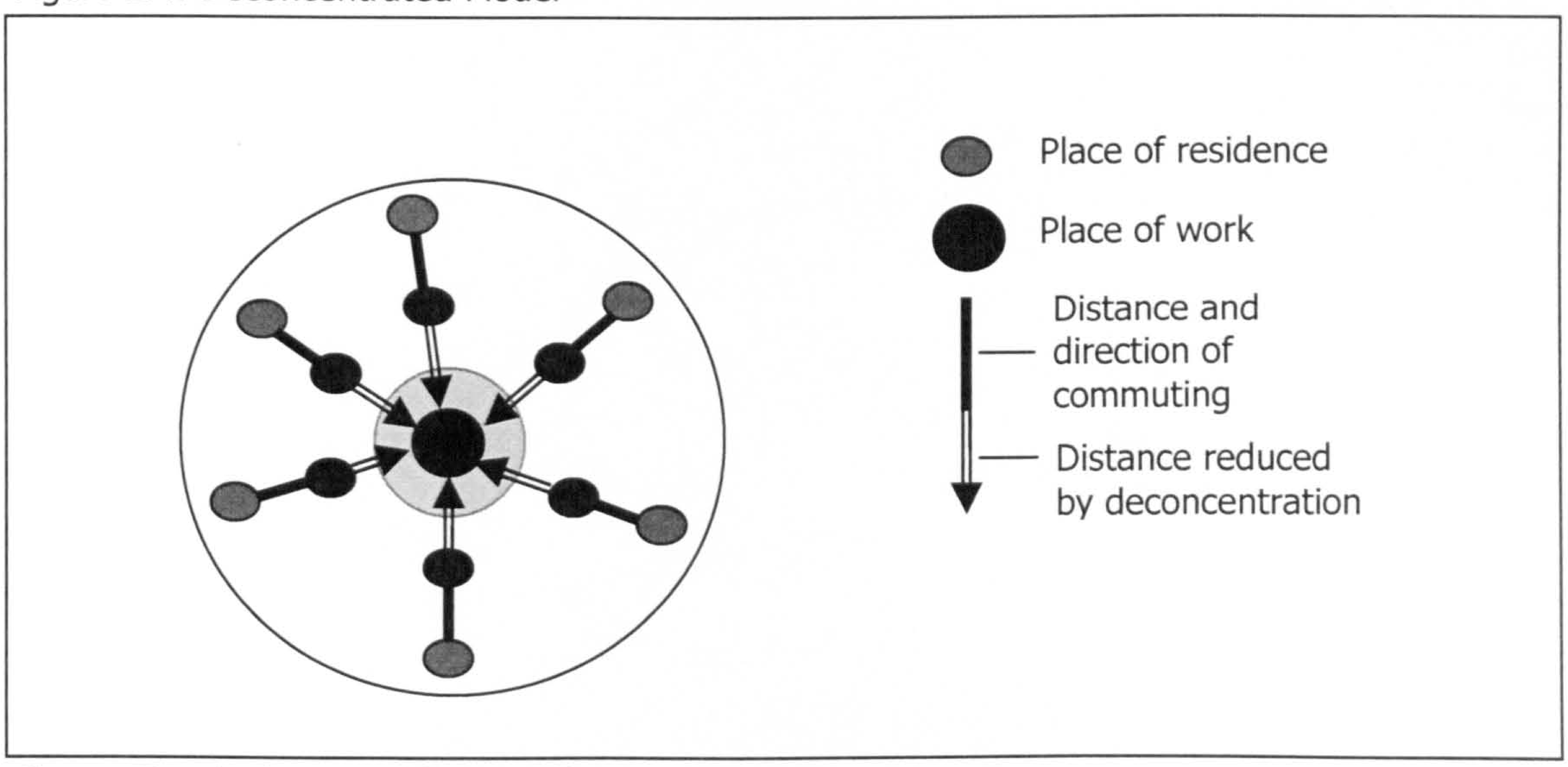
However, the adapted deconcentrated model only resulted in a small improvement in the explanation of commuting behaviour (19-59 per cent). In contrast, adjustment to the basic model, through the cross-traffic model, resulted in much better and much more consistent explanation of the actual commuting behaviour of between 40-55 per cent. However, a large part of commuting behaviour remains unexplained even by the cross-traffic model.

Figure 2.3: Concentrated Model



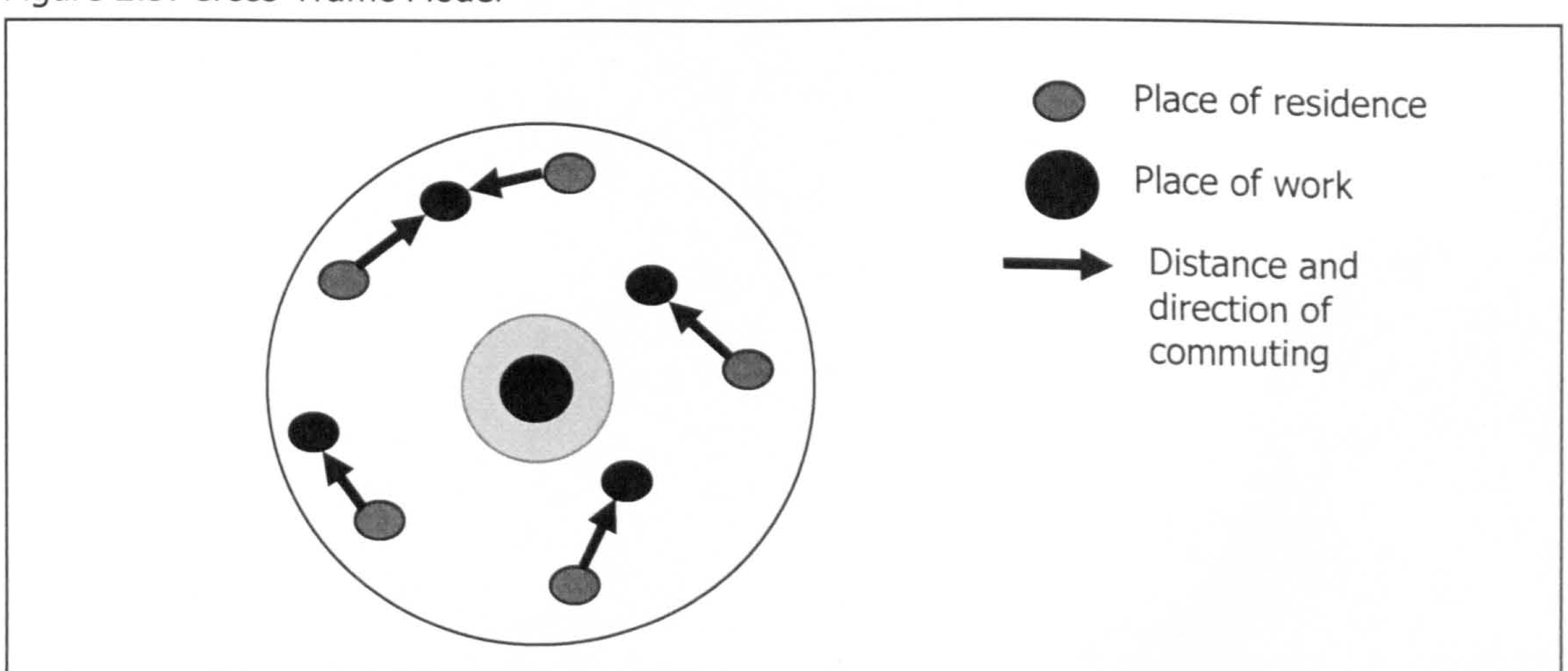
Source: Van der Laan et al (1998:389)

Figure 2.4: Deconcentrated Model



Source: Van der Laan et al (1998:390)

Figure 2.5: Cross-Traffic Model



Source: Van der Laan et al (1998:392)

Excess Commuting Measure

The concept and research focus relating to excess commuting can be attributed to the inability of the monocentric model to explain all aspects of residential and employment locations and the resulting commuting (Croper and Gordon, 1991). The average required commute is the minimum average commuting cost, given residential and employment locations. Excess commuting is the difference between this value and the actual average commute in terms of time or distance and measures the efficiency of the commuting process, expressed as a percentage of the actual commute. Calculating the excess commute is subject to much debate and the actual procedure for calculating the extent of 'wasteful commuting' has been extended since the work of Hamilton (1982) and White (1988) (see Small and Song, 1992; Kim, 1995; Frost *et al,* 1998; Horner, 2002; Horner and Murray, 2002). Excess commuting may be defined as follows:

$$E = \left(\frac{Ta - Tr}{Ta} \right) * 100 \qquad (8)$$

Where:

E= Excess commuting

Ta= Observed average commute

Tr=Theoretical minimum commute

Excess commuting is the ratio of the difference between the observed average commute and the theoretical minimum commute over the observed commute expressed as a percentage (Horner and Murray, 2002; Horner, 2002). However, the problem with this measure is the estimation of the unknown element of the equation, *Tr.* The first approach which has been adopted for calculating *Tr,* is the linear optimisation model known as the transportation problem (White, 1988). The transportation problem identifies the optimal flow pattern between origins and destinations by minimising travel costs (Horner and Murray, 2002). The second approach is based on access-space model assumptions (Hamilton, 1982). Small and Song (1992) suggest that the transportation problem approach is appropriate for assessing if the observed commute is excessive within a specific city. The calculation of the transportation problem is outlined below (Horner and Murray, 2002:133):

$$Tr = \frac{1}{W} \sum_{i=1}^{n} \sum_{j=1}^{m} C_{ij} x_{ij} \qquad (9)$$

Subject to:

$$\sum_{i=1}^{n} x_{ij} = D_j \qquad \forall_j = 1,\ldots\ldots,m \qquad (10)$$

$$\sum_{j=1}^{m} x_{ij} = O_i \qquad \forall_i = 1,\ldots\ldots,n \qquad (11)$$

$$x_{ij} \geq 0 \qquad \forall_{i,j} \qquad (12)$$

Where:

n= number of origin locations

m= number of destination locations

O_i = number of workers living in location i

D_j = total employment in location j

C_{ij} = travel costs between location i and j

W= total number of commuters

x_{ij} = journey to work trips from i and j

The objective function (9) is designed to minimise average travel costs. Constraint (10) is designed to ensure that no employment demand is left unfulfilled, constraint (11) limits the supply of workers to the resident workforce as opposed to taking consideration of the entire population or non-resident workers and constraint (12) restricts the decision variables to positive values (Horner, 2002:547).

However, the calculation of the transportation problem is subject to a number of problems. Horner and Murray (2002) highlight the problem of the modifiable areal unit problem (MAUP) in calculating the excess commute. The MAUP is associated with the fact that a geographical space can be spatially defined in different ways using different spatial units (Flowerdew and Manley, 2006). The aggregation of spatial units results in a change in the analytical process as spatial units become coarser. Openshaw and Taylor (1981) show that quantitative results are altered because of changes in the spatial unit used to calculate a measure. In terms of the excess commute, this is problematic because the origins and destinations used in the calculation are usually administrative units and there is a need to decide which unit is most appropriate for the calculation. Indeed, one unit might indicate a certain excess commute measure whilst another might indicate a different result. Furthermore, there is ambiguity as to how to represent and interpret travel costs. Thus, the difficulty and ambiguity associated with calculating the transportation problem means that misspecification of the transportation problem could result in fundamental flaws in the results obtained through the excess commuting measure.

Gravity Modelling

A further approach that might be adopted to measure the commuting process is gravity modelling. The gravity modelling tradition is far too complex to discuss effectively here, and numerous adapted gravity models have been developed to predict flow behaviour (Wilson, 1974; Isard, 1998; Wilson, 2000). Therefore, the purpose of this section is to briefly outline the potential of gravity modelling for exploring the interaction of housing and labour markets.

Gravity modelling seeks to make predictions with regard to potential future interaction between origins and destinations, not only the length of these trips, but also the amount of interaction between origins and destinations. The assumption of the gravity modelling approach is that the amount of interaction between two areas is directly related to the attraction of the areas and inversely related to the distance between the two (Sen and Smith, 1995). The function describing the attraction value between origins and destinations within a certain distance is referred to as the distance decay function.

Gravity modelling consists of three types of analysis (Van der Zwan *et al*, 2005). The first is the calculation of the mean trip length of observed trips in the past. This analysis calculates the distance that people are willing to travel for a certain purpose. The second type is the calculation of the distance decay function of observed trips. This provides a tool for analysing distance decay over a certain period in the recent past between a set of origins and destinations in a given area. The third type is an analysis during which predictions are made about future trips between origins and destinations. Four types of models are distinguished to carry out this analysis. The first is *the unconstrained model,* in which a distance decay parameter is calculated using an estimate of the mean trip length between origins and destinations, and the number of trips between origins and destinations is determined by their production and attractions values. The second is *the origin-constrained model,* in which it is also necessary to make an estimate of the mean trip length between origins and destinations. In addition, the sum of the estimated number of trips from every origin must be equal to a preset number per origin, and the number of trips to every individual destination is determined by the attraction value of the destinations. The third is the *destination-constrained model,* which also requires an estimate of the mean trip length between origins and destinations. The sum of the estimated number of trips to every destination must be equal to a preset number per destination. The number from every individual origin is determined by the attraction value of the origins. The fourth is the *doubly-constrained model,* in which the sum of the estimated number of trips from every origin must be equal to a preset number per origin, and the number sum of the estimated number of trips to every destination must be equal to a preset number per destination. Besides that, the number of trips from every origin to any destination is inversely related to the distance between origin and destination (Van der Zwan *et al,* 2005:121).

A useful study in relation to this research is that undertaken by Fotheringham *et al* (2000) in which destination attractivity is measured. The study is concerned with migration attractivity, but it could be easily adapted to measure destination attractivity based on commuting (e.g. see Tadei and Williams, 1994). The study applies an origin-constrained model to 1991 Special Migration Statistics data to measure the attractiveness of local authority districts in relation to migration. The approach calculates inter-zonal distances between origins and destinations based on flows between small administrative units nested within local authority boundaries by calculating the distance between a pair of districts weighted by the sum of the distances between the smaller units nested in the local authority. According to the authors, this provided a more accurate distance calculation approach than euclidean distance (Fotheringham *et al,* 2000:402). In addition, a relative intrinsic attractivity (RIA) score of each of the destinations for each origin was calculated by calibrating the model through ordinary least squares regression. The study reveals that the intrinsic attractivity of the London region and Britains' other major conurbations in the Midlands and the north of England is lower than previously thought. In contrast, some rural areas are generally more attractive to migrants than traditional measures would seem to suggest. The ordinary least square regression would seem to suggest that there is a relatively straightforward basis for the reasons underpinning the attractiveness of different areas measured through the RIA scores. Indeed, nine-tenths of the variance in the models was accounted for by just six variables. These included large populations, low occurrence of limiting long-term illness, a high proportion of people in social classes 1 and 2, strong attractiveness to migrants from overseas, and a relatively large proportion of people living in privately rented housing. The approach is significant to measuring housing and labour market interaction because potentially the attractivity of labour markets for particular housing markets could be calculated, and RIA scores calculated based on commuting concentration.

However, a number of recent studies that have criticised the use of gravity models for exploring spatial interaction. Significantly, Wong (2002) argues that in relation to housing and labour market interaction, traditional modelling approaches have failed to capture the complexity of the process, which has been compounded by the lack of quality statistical data to allow accurate models to be developed (Wong, 1998a). This is a criticism directed at gravity models and the econometric models outlined by Van der Laan *et al* (1998). Thorsen and Gitlesen (1998) also highlight that gravity models are prone to misspecifications and inaccuracies due to an inability to capture the spatial configuration of destinations, and whilst they show that competing-destinations models are superior to traditional gravity models, they highlight that these are still subject to variations depending on the specifications included in the models. Similar, issues have also been raised by Uboe (2004) who uses journey-to-work data to demonstrate that gravity models are prone to serious misspecification, particularly in aggregate flow systems.

The Commuting Flow Approach

The commuting flow approach moves away from the econometric and modelling approaches outlined above, and is based on the analysis and mapping of actual flow data from origin and destination matrices. The traditional econometric approaches have not been completely successful in providing a suitable approach for examining the interaction of housing and jobs (Turok *et al*, 1999; Wong, 2002), and thus an alternative approach is required. The methods explored in the commuting flow approach have been applied in a number of classic studies, although these are not necessarily related to commuting (e.g. Berry, 1964; Berry, 1966; Goddard, 1970).

The approach tends to have three main components, although this can be subject to variation. The first component involves the creation of an origin and destination matrix (Figure 2.6). Actual flows are represented as a value in a cell in a matrix where rows are related to the locations of origins, and columns related to locations of destinations. In the matrix, the sum of a row (*Ti*) represents the total outputs of a location (flows originating from a place), while the sum of a column (*Tj*) represents the total inputs of a location (flows bound to a place). The sum of inputs is always equal to the sum of outputs, unless flows originating from or terminating in other areas not included in the origin and destination matrix are present. The sum of inputs or outputs gives the total flows taking place within the system (*T*). Christaldi (2005) provides a recent example of the application of origin and destination matrices. She uses a nationally complied origin and destination matrix in Italy to examine the process of commuting. The study explored the impact of gender differences on commuting, and revealed that variations in commuting behaviour are related to socio-economic characteristics of commuters, and the economic structure and geographical context of different labour markets.

Figure 2.6: Hypothetical Example of an Origin and Destination Matrix

Origin/Destination	Destinations				
		A	B	C	Total
Origins	A				***Ti***
	B				
	C				
	Total	***Tj***			***T***

As a result of the complicated nature of spatial interaction, the second stage of the approach seeks to simplify the patterns of commuting in order to aid interpretation, and permit the measurement of flow patterns between origins and destinations. The corollary of this has been the development and application of a number of alternative methods with the aim of reducing the complexity of origin and destination matrices. Berry (1966) uses factor analysis to explore the structure of commodity flows between different places in India, in which a 12-factor structure was shown to describe the spatial dimensions of Indian commodity flows in which each factor represents a specific group of commodities based on characteristic origin and destinations. Factor scores with a value greater than three were then mapped to highlight the dominant structures of the flows. Similarly, Goddard (1970) employs principal component analysis and identifies 6 principal components of taxi flows in London. The component loadings were used to identify each group of destinations and component scores were used to identify the respective set of origins for each destination. These were then mapped and sub-patterns within the main flow structure were identified.

An alternative approach is the Nystuen-Dacey (1961) method, which is used to identify the hierarchal structure of flow movements. The approach is based on calculating the in-degree of flows by summing all flows terminating at each destination. Ranking these inflows gives an indication of the relative attractiveness of each destination. Using this ranking as a base, the Nystuen and Dacey then noted the largest outflow for each location, and identified the destination of these flows. The final stage of the procedure is to note whether the destination of the largest outflow is ranked higher in terms of in-degree than its origin. If the destination has a higher ranking, the flow is considered a dominant flow.

Another method that has been applied to simplify flow patterns is transaction flow analysis and the subsequent identification of salience scores. These are flows that have a greater than expected magnitude than general regional flow trends (Lowe and Moryadas, 1975). The initial starting point is the calculation of the in-degree value (column total) of each destination as a proportion of the regional total (*T* in Figure 2.6). For example, in Figure 2.6, if *Tj* for destination

A is 20 per cent of *T*, it is assumed that each inflow to destination A equates to 20 per cent. On this basis, the expected flow from each origin to destination A can be determined by multiplying the out-degree value of the respective origin (origin/row total) by the in-degree value of the respective destination (destination/column total) and dividing this value by the regional total (*T*). These expected flows are then compared with observed flows and where expected flows are higher than observed flows these represent flows that are above average intensity. The relative importance of each link is indicated by the calculation of salience scores. These are obtained by dividing the actual flow value (*F*) by the expected flow value (*F'*) and subtracting one from the outcome (Lowe and Moryaclas, 1975). This can be written as:

$$\text{Salience score } \frac{F}{F'}-1 \qquad (13)$$

If the actual flow equals the expected flow, the salience score will be zero. Therefore, salience scores above zero indicate a higher than expected level of movement, while scores below zero indicate a lower than expected level of movement.

An alternative approach to simplifying flow patterns is to convert actual flows into proportions. Johnson *et al* (1974) adopt this approach in relation to migration data. The appeal of the approach is the simplicity and universal interpretability of the values obtained. Indeed, the authors subjected the migration flow matrix to factor analysis to identify principle flows and compared the results of the factor analysis with the results obtained by expressing the flows as proportions of the total in-movement and total out-movement from the areas. They found little difference between the flows identified using factor analysis and the simpler proportional technique.

However, the major disadvantage of all the approaches outlined is that the analysis of the final values and overall trends is reliant on subjective interpretation. Indeed, the overriding question is how large a flow should be before it is considered a dominant flow, a second order, or a third order flow. For example, Berry (1966) adopts an arbitrary value of factor scores above three as a dominant flow, and the use of salience scores and proportions are subject to the same arbitrary decision-making process. Although the Nystuen-Dacey (1961) method identifies dominant flows, the determination of second or third order flows is subject to the same constraint.

The third stage of the approach involves mapping the actual commuting flows through a geovisualisation technique (see Berry, 1966; Goddard, 1970; Johnson *et al*, 1974). Indeed, Moss *et al* (2004) illustrate the connectivity of different urban and rural areas using a mapping approach, whilst Wong *et al* (2006) use mapping techniques to analyse the spatial structure of the UK. Such an approach is particularly relevant to spatial planning analysis, and is practical in that visualisation facilitates the identification and interpretation of spatial patterns and relationships in complex data (Kwan, 2000:187). This spatial data can be organised and visualised using GIS packages (Kwan, 2000; Batty, 2003), or alternative software packages such as Flowmap, which is dedicated to analysing and visualising interaction flow data (Van der Zwan *et al*, 2005).

The Influence of 'People' and 'Place' Factors on Commuting

The previous section outlines the issues and processes inherent in the commuting process and the approaches that might be applied to examine and analyse the nature of housing and labour market interaction through commuting. However, the interaction of housing and labour markets is influenced by 'people factors' and 'place factors', and these are explored in this section.

'People Factors' and Commuting

The nature of the commute is influenced by the nature and characteristics of workers, their household and family responsibilities and their lifestyles. These factors include social, demographic and economic factors (Hanson and Hanson, 1981), which are important factors in the interaction of housing and labour markets. Indeed, Kipnis and Mansfeld (1986:160) comment 'a meaningful commuting pattern analysis should incorporate socioeconomic and demographic elements'.

Demographic and Socio-Economic Factors

Gender

The nature of the journey-to-work is characterised by gender differences. Women tend to have shorter and more concentrated journeys to work than men (Madden, 1981; Dex *et al*, 1995; Camstra, 1996; Wyly, 1998). Women tend to assume or are assigned a dual-worker rôle in which household responsibilities fall alongside employment responsibilities (Johnston-Anumonwo, 1992; Allan and Crow, 2001). This is reflected in the growth of increased female part-time employment, which do not allow for longer commutes because the financial and familial costs, such as childcare responsibilities are considered too important to justify a longer journey-to-work. However, there has also been a growth in the incidence of dual career households which has meant that the optimisation of the commute has proven increasingly difficult as the balance between the journey-to-work and the potential journey-to-school has meant, particularly for female workers, that a longer commute is difficult to achieve (McQuaid, 2003). Indeed, MacDonald (1999) highlights four key factors that can be attributed to the differences between male and female commutes. First, is because women command lower wages than men. Second, is due to the dual role women adopt as wage earners and main keepers of the household. Third, is due to the more even spatial distribution of jobs that traditionally hire women; fourth, is due to the spatial entrapment of women in highly localised labour markets.

In relation to gender differences, Sermons and Koppelman (2001) found that differences in male and female commuters are more pronounced in households with children, which lends support to the household responsibility theory (see Hanson and Pratt, 1995; Turner and Niemeier, 1997; Song and MacDonald, 2003). In addition, Singell and Lillydahl (1986) found that in two earner-households residential location decision-making tends to be made with reference to the male head of households' job location, which disadvantages women in the labour market. Howe and O'Connor (1982) suggest that women tend to work locally in city centre locations whereas men have a much higher propensity to commute to a range of alternative locations often in non-local labour markets. As a result, female labour market commuting is concentrated on a relatively small area and their participation in the labour market is dependent on the availability of suitable local jobs.

Age

In relation to age, McQuaid (2003) suggests that the relationship might be bi-modal, in that the youngest and oldest workers have the lowest propensity to commute whilst there is a peak in between which would contribute to a decline in commuting times and distances as the population ages. Similarly, Levinson (1998) found younger and older workers have the shortest commutes and the lowest propensity to commute, and middle-aged workers have the longest commutes and highest propensity to commute. Indeed, Romani *et al* (2003) found that workers in Spain less than 25 years of age have a lower propensity to commute when compared to workers aged 35-40 years of age. The authors attribute this to the fact that many younger workers hold low paid, part-time jobs, and therefore commuting is not a desirable option. In contrast, workers between 45 and 50 years of age have the highest propensity to commute. However, Vandersmissen *et al* (2003) found there to be a weak association between age structure and commuting, whilst Turner and Niemeier (1997) found that, as age increases commuting times tend to decrease, which they attributed to the unwillingness of older workers to commute for long periods or distances.

Ethnicity

A number of studies, notably those related to the spatial mismatch hypothesis, have explored the affect of ethnicity on commuting. Kain (1968) examines the spatial mismatch between housing and employment locations for African-Americans in the Chicago and Detroit metropolitan areas and found that housing market segregation affects the distribution of African-American employment. The study suggests that housing market segregation reduces the level of African-American employment and contributes to the high levels of unemployment experienced by African-Americans in US cities because of their inability to commute to decentralised job locations. Holzer (1991) examines residential segregation, residential suburbanisation and employment suburbanisation and the impact these have on commuting for different racial groups. The study suggests that there are differences in commuting trends and employment accessibility between black and white workers, but concedes that the magnitude of the differences is unclear.

Gordon *et al* (1989) found little support for ethnic differences when examining commuting times and distances. The study suggests that neither minority groups nor low-income workers have longer commutes than other workers. In addition, Taylor and Ong (1995) examine commuting patterns of black, white, and Hispanic groups in US metropolitan areas and suggest that commuting times for black and white workers appeared to be converging, even among low-skilled workers. In an investigation of the propensity to commute, Thomas (1998) found that workers of ethnic minority groups in Britain were less willing to commute over 10 miles to work. However, Coombes and Raybould (2001:118) suggest that the influence of ethnicity on commuting in the UK is likely to be less extreme than in the US, but concede that '...the white-non-white distinction needs to be empirically explored'.

Employment Status

It is suggested that full-time workers have longer commutes and a higher propensity to commute than part-time workers (Hanson and Pratt, 1995; MacDonald, 1999; Benito and Oswald, 2000). Van der Laan (1998) found that part-time workers have a more limited spatial range when compared to full-time workers. He attributes this to the fact that if a worker seeks a part-time job it would preferably be close to home. However, there is also the fact that full-time workers are able to afford the costs associated with commuting longer distances and longer times (Gordon *et al*, 1989; Green *et al*, 1999).

Household Type

Rouwendal and Rietveld (1994), in a study of commuting and low-income household types in the Netherlands, highlight the differences in commuting trips between different types of households. They found that heads of two or more person households with a partner tend to have the greatest propensity to commute and tend to make the longest commuting trips. If their partners have a job, they have a shortest average commuting trip of all categories. These partners often have a part-time job. One-person households and heads of two or more person households without a partner tend to have an intermediate position (Rouwendal and Rietveld, 1994:1549).

Aaronsson and Brannas (1996) found that the two-person households with dependent children had longer commuting times for both partners. The authors suggest that this was related to the housing needs of families with children due to the need for larger houses as household size increases and because larger houses are located in suburban neighbourhoods this led to increases in corresponding commuting times. In addition, Vandersmissen *et al* (2003) suggest that single person households are less constrained by family responsibilities, which might account for single-person households locating closer to their place of work, contributing to shorter commutes, especially when compared to larger households who require more space often in the suburbs. In contrast, Romani *et al* (2003) found that workers with dependent children have a lower propensity to commute, which the authors attributed to time constraints and household responsibilities. Singell and Lillydahl (1986) suggest that in two-earner households with no dependent children, commuting trends, notably times and distances, are relatively similar, and that the presence of children has the effect of increasing disparities in commuting behaviour, particularly for women. However, Gordon *et al* (1989) found little evidence to support the contention that household responsibility and the presence of children in a household affects commuting behaviour.

Green (1997) examines the nature of commuting for dual career households and found that in most cases significant time and care is expended in balancing the needs of both workers. Consequently, this results in a complex trade-off, notably in the length of the commute and in residential locations, the most prized location being semi-rural locations. In relation to the length of the commute, dual-career households have a greater propensity for long distance commuting as opposed to migration, which was seen as a 'price worth paying' (Green, 1997:653) to allow both partners to balance work and home life. Thus, most of the dual-career households interviewed acknowledged the benefits of locating near to large metropolitan labour markets and to accessible transport networks, particularly motorways.

Housing Tenure

It is generally considered that homeowners have longer commuting times and longer commuting distances than other tenure groups (Benito and Oswald, 2000). Buck *et al* (2002) found that homeowners are likely to live in more 'pleasant' areas outside the city and prefer to commute into the city for work. Furthermore, it has also been suggested that homeownership contributes to increased levels of permanent worker immobility due to the higher costs associated with moving house which increases the propensity to commute (Owen and Green, 1989; Oswald, 1999). However, this has been refuted by other commentators, most notably Barlow (1990) and Coulson and Fisher (2002).

Education

Rouwendal and Rietveld (1994) found that higher levels of academic training increased the length of the journey-to-work, which is supported by McQuaid and Greig (2001). Schwanen *et al* (2002) highlight that well educated workers are likely to spend longer commuting to work, particularly by car. In contrast, Van Ham *et al* (2001) suggest that it can be difficult for workers with no qualifications or low qualifications to find work because their investment in skills and education has been poor. This has the effect of discouraging workers with no qualifications from searching for work, particularly in labour markets where employment opportunities are scarce (Van Ham *et al*, 2001). As a result, people without qualifications are likely to have a lower propensity to commute when compared to people with qualifications. Indeed, McQuaid (2003) suggests that lower level qualifications, particularly associated with part-time and temporary work, results in shorter commuting distances, and a lower propensity to commute. However, Izrael and McCarthy (1985) found the relationship between education attainment and commuting to be relatively weak.

Socio-Economic Status

The significance of socio-economic status on commuting has been exacerbated by major structural changes in the UK economy in recent decades, which have severely affected major UK cities particularly because of deindustrialisation and the decline of the manufacturing sector (see Bailey and Turok, 2000). The changes in the UK economy have resulted in a spatial skills mismatch with demand for certain types of workers, particularly higher skilled workers, exceeding supply in many areas (Haughton, 1990; Buck *et al*, 2002; Green and Owen, 2003). This has resulted in extensive cross-commuting (Wong *et al*, 2000). The significant proportion of cross-commuting can be attributed to the commuting behaviour of higher status workers, particularly professional and managerial workers who tend to have a higher propensity to commute over longer distances when compared to lower status workers (Hanson and Pratt, 1995). Indeed, Green *et al* (1986) suggest that higher status workers often have access to a car and are paid relatively high wages increasing their ability to commute longer distances. In contrast, lower status workers are likely to commute shorter distances to work (Coombes *et al*, 1988). Turok (1999) suggests that lower skilled and manual workers commute shorter distances because they are less likely to own a car and are less able to offset the costs associated with commuting longer distances.

Ong and Blumenberg (1998) suggest a further reason for the diversity in commuting between groups. They highlight that higher skilled and higher paid jobs can be fewer in number in certain labour markets when compared to less skilled jobs, which means that competition for a fewer number of higher skilled and higher paid jobs is likely to increase the size of search areas for higher status jobs. This results in complex commuting behaviour of higher status workers as they search for jobs over wider areas.

Wage Rates and Income

In relation to income, Turner and Niemeier (1997) find that higher wages increased the propensity to commute and increases commuting times. Ong and Blumenberg (1998) suggest that higher incomes lead to higher levels of conspicuous consumption and so increases demand for larger houses, often located in suburban neighbourhoods, which has the effect of lengthening the journey-to-work. Johnston-Anumonwo (1992) highlights that women consistently travel shorter distances than men who are in the same income bracket. The only exception being higher income suburban residents in which differences in commuting distances for men and women are not statistically significant. In contrast, Benito and Oswald (2000) find that there is a negative relationship between commuting time and wage rate, and they suggest that paying an individual a higher wage will increase their engagement in work and/or leisure and reduce the time spent commuting. However, Halvorson (1973) found little evidence to support the contention that income influences commuting.

Access to a Car

Coombes and Raybould (2001) suggest that car ownership is a key factor in widening job search areas allowing people to access labour markets at a greater distance from their place of residence. Indeed, Clark and Kuijpers-Linde (1994) highlight that car ownership has grown in both the Randstad and Southern California and so, the propensity to commute by car has increased, as has the propensity to commute longer distances because of the improved accessibility benefits associated with owning a car (Lu and Pas, 1999). However, although car ownership is important in influencing the commute, Schwanen *et al* (2002) highlight that car ownership only has an indirect effect on travel, and therefore it is perhaps more appropriate to explore the implications of *access* to a car or other modes of travel as determinants of commuting.

'Place Factors' and Commuting

Having established the importance of 'people factors' on commuting, it is necessary to consider the affect of 'place factors'. The following discussion explores the implications of spatial structure, employment and population decentralisation, and the balance of jobs and housing on commuting.

The Process of Decentralisation

Population Decentralisation

The process of population decentralisation is linked to the process of migration and fundamentally to the process of people leaving residential locations in the city to live in suburban and other non-urban areas (Robert and Randolph, 1983; Champion, 1987; 1989; 1992; Harper, 1991; Champion *et al*, 1998; Champion and Fisher, 2004; Allinson, 2005; Champion *et al*, 2007). O'Sullivan (1999) provides a number of possible reasons as to why population decentralisation has been occurring. First, the financial costs of separating work and home have been reduced through better transport links. Second, urban areas are plagued by the social, economic, and environmental dereliction of previous generations and out-migration represents the only alternative to the problems of inner-city and central city living. Third, as household income increased in real terms, households were better able to afford both the costs of living in the suburbs and the costs of commuting to the CBD to work. Fourth, employment decentralisation has partially resulted in the movement of population to the suburbs in order to access employment, which was originally located in the CBD.

The understanding of the process of counterurbanisation has been plagued by problems of definition and conceptualisation, as well as defining an appropriate scale at which to measure the issue. However, the decentralisation process has been recognised as occurring in the UK since the 1960s (see Robert and Randolph, 1983; Gordon, 1988; Champion, 1989; Spencer, 1995; Champion *et al*, 1998; Gillespie, 1999) and has provided a compositional change in the nature and population of urban and non-urban locations (Lewis, 1998; Champion, 2001; Champion and Fisher, 2004). However, the 1980s witnessed a 'return to the city', which was believed to be halting the process of counterurbanisation (Champion, 1988; Frey, 1988). Indeed, Champion (2003) highlights that between the 1970s and 1980s larger conurbations experienced an increase in population, particularly London. In contrast, between 1971 and 1991, Local Labour Market Areas (LLMAs) classified as Rural Areas experienced a decline in population growth rates from 9.6 per cent to 6.0 per cent, and LLMAs classified as Towns experienced a decline in population growth rates from 7.0 per cent to 4.7 per cent. The trends at least suggest a slowing of deconcentration between the 1970s and 1990s.

However, recent studies have recognised that counterurbanisation remains a dominant process in many metropolitan areas (Champion and Fisher, 2004). This was evident in the urban exodus study (Champion *et al*, 1998), which examines migration between metropolitan and non-metropolitan England[12], and Breheny (1999c) argues that the study dispels the myth that a return to the city is underway. Indeed, Champion *et al* (1998) highlight a number of processes and characteristics, which have been occurring and contributing to urban-rural

[12] The definition of metropolitan in this study refers to Greater London and the six other metropolitan areas in England (Breheny, 1999b)

migration. Districts close to the edge of metropolitan areas have high out-migration rates. Middle-aged people experience low rates of migration to non-metropolitan areas. People in high status areas tend to be more mobile. This is exacerbated by the fact that metropolitan areas of higher density tend to produce relatively high out-migration rates and many of these are skilled and high status workers (Champion *et al*, 1998; Breheny, 1999c; Ford and Champion, 2000). Consequently, population deconcentration to non-urban locations appears set to continue (Champion and Fisher, 2004).

Employment Decentralisation

It has been suggested that the deconcentration of population has resulted in the decentralisation of jobs from metropolitan city centres to the suburbs (Steinnes, 1982; Owen *et al*, 1986). The assumptions of the traditional monocentric urban model have been challenged as metropolitan areas become increasingly suburbanised and the process of metropolitan decentralisation has resulted in a decline in the proportion of jobs in the CBD, which have been gained by the suburbs, small towns, and rural locations (Breheny, 1999b).

Ingram (1997) highlights that CBD employment is in decline because of decentralisation. Manufacturing firms are most likely to decentralise which are replaced by service sector jobs. This finding is echoed in the work of O'Sullivan (1999) in which manufacturing is found to have decentralised from the CBD at an increased rate in the US post-1948, but retail and wholesale employment decentralised at a greater rate than that of manufacturing. The onset of the car has contributed to the decentralisation of retail, particularly to small towns, in order that retailers are accessible to their customers (Gillespie, 1999; O'Sullivan, 1999).

In contrast, the decentralisation of office employment occurred at a much slower rate in the US and only began occurring post-1970 (O'Sullivan, 1999). Although the CBD retains much of the office employment, decentralisation has been occurring through technological advancement particularly in communications, which means that distance then becomes less of a problem for communication (Gillespie, 1999; Warf, 2003). Haywood (1996), in a study of Manchester highlights that office decentralisation has been a long-standing phenomenon in British cities. The author suggests that prior to the 1980s office decentralisation had been controlled in Britain but was undermined when the Use Class Orders (UCO) were relaxed allowing offices to move to suburban locations in addition to town centres and the CBD. In addition, Hughes (1991) draws attention to the case of northern New Jersey, which experienced a surge in development during the 1980s, which extended the metropolitan periphery and dispersed employment across a wider range of locations.

Population and Employment Decentralisation and Commuting

A consequence of the process of population and employment decentralisation is the emergence of the question of whether decentralised population and employment affects commuting. It is assumed that population will tend to cluster around employment centres, and therefore it is assumed that commuting will tend to be focused on the nearest employment location (Anas *et al*, 1998). Newman and Kenworthy (1992) suggest that from a theoretical perspective, the decentralisation of jobs and population could result in either an increase or a decrease in average travel distances, depending on the match between employment centres and residential centres and the accessibility between the two. However, the decentralisation process and the suburbanisation of population and employment have been shown to result in dispersed commuting patterns and extensive cross-commuting (Clark and Kuijpers-Linde, 1994; Van der Laan, 1998), whilst commuting times and distances have been shown to remain stable or to decline (Gordon *et al*, 1986; Naess, 1995; Lee *et al*, 2006).

In contrast, Artis *et al* (2000) find that the process of decentralisation has increased commuting distance, particularly around Barcelona and surrounding cities, and created complex commuting patterns, which corresponds with findings from work in other cities (e.g. see Crampton, 1990; Merriman and Hellerstein, 1994). Similarly, Cervero and Wu (1998) find that decentralisation in the San Francisco Bay Area resulted in a lengthening of the journey-to-work and extensive cross-commuting. The authors attribute this to the growth of the region, and to the frictions created by a lack of integration between employment and housing locations. However, it has also been suggested that workers living in rural locations have longer commuting times and distances than workers living in suburban and urban locations, and that these longer commutes are accompanied by cross-commuting (Coombes *et al*, 1996; Wong *et al*, 1999). This has been challenged, however, by Banister and Gallent (1998) who suggest that rural areas tend to have high levels of short distance commuting as a result of high levels of self-containment (Wong *et al*, 2000). Thus, there does appear to be a high degree of uncertainty as to the effect of decentralisation on commuting.

Spatial Structure

The nature of commuting and the associated patterns and trends in the commuting process are dependent on the spatial distribution of housing and jobs (Ma and Banister, 2006). As Sohn (2005:306) comments, 'to understand commuting... one must understand...spatial structure'. In the US and increasingly in Europe, spatial structure is acknowledged as being a key factor in determining the nature of commuting (Schwanen, 2002). Traditionally, research into spatial structure has tended to focus on the impact of urban form on commuting (Anas *et al*, 1998; Horner, 2004). The monocentric form is the traditional urban structure, and contains a dominating core (CBD) in which the majority of employment opportunities are concentrated. The location of the CBD in the monocentric city has traditionally meant that the centre has benefited from greater accessibility than surrounding areas (see Warnes, 1975). The concentration of employment in the CBD and the distribution of population in urban and suburban locations mean that commuting patterns tend to be focused towards the urban centre from a wide range of residential locations surrounding the CBD (Wingo, 1961; Alonso, 1964; Muth 1969, Mills, 1972; Evans, 1973; Boarnet, 1994; Anas *et al*, 1998; Tammaru, 2005).

In contrast, a polycentric area is an area, in which more than one employment centre exists, which has developed due to the increasing dominance of the car and the process of decentralisation (O'Sullivan, 1999). The impact of this is that in polycentric areas commuting will tend to be directed towards a wider range of locations, including the CBD, but also to suburban and other non-central locations (Gordon *et al*, 1986; Levine, 1992; Van der Laan, 1998; Bertaud, 2002; Aguilera, 2005). The result of this is increasingly complex commuting patterns resulting from an increase in incidence of cross-commuting (Clark and Kuijpers-Linde, 1994; Van der Laan, 1998).

The impact of spatial structure is also reflected in the length of the commute. It is suggested that commuting in monocentric areas are longer than they are in polycentric areas (Gordon and Wong, 1985; Gordon *et al*, 1989; Giuliano and Small, 1993). The shorter commuting times and distances in polycentric areas reflects the process of employment and population decentralisation (Naess, 1995). Gordon *et al* (1986) were initially uncertain as to the effect of polycentricity on average commutes. They suggest that average commutes might decline in polycentric areas if there is a tendency for workers to locate near to their place of work. However, the likely increase in cross-commuting as a result might in fact lengthen average commutes. They subsequently explored the issue in Los Angeles and found that shorter work trips are associated with polycentricity, whilst monocentric areas are associated with longer work trips, particularly when cities expand and the distance between CBD and suburbs increases. Thus, the spatial distribution of housing and jobs within different residential and workplace locations is likely to have significant implications for commuting between home and work.

In an analysis of commuting in different sized cities in the US between 1977 and 1983, Gordon *et al* (1989) found that commuting distances were predominantly shorter for urban residents than non-urban residents. In addition, Cervero and Wu (1997) highlight that in the San Francisco Bay area workers living in suburbs endure shorter commutes than those living in urban locations. However, they highlight that commuting lengths increased during the 1980s in the region and that people working in suburban employment centres were particularly affected by lengthening commuting times. The authors suggest that this was a result of a lack of coordination in housing production and job growth in outer areas of the Bay Area.

In contrast, Cervero and Wu (1998) suggest that the decentralisation of employment and population to suburbs does not necessarily result in short distance commuting. Gordon *et al* (1991) suggest that whilst decentralisation results in jobs and residencies moving to suburban locations, it does not mean that workers living in suburban locations will take up jobs in suburbs. Indeed, workers might continue to work in the same location as they did before they decentralised (Gordon, 1988).

In an analysis of commuting based on the 1991 UK Census, Coombes *et al* (1996) highlight that around three quarters of the population in most urban wards commute less than 5 kilometres a day. However, in some rural and outer suburban wards, this figure drops to around a quarter. This suggests that for residents of some remote rural and outer-city areas, access to employment opportunities requires a significantly lengthened commute when compared to less remote areas.

In a study of commuting distances in three French polycentric metropolitan areas – Paris, Lyon, and Marseille – Aguilera (2005) did not find support for the assumption that the location of housing and jobs in employment subcentres outside of the CBD in urban and suburban locations reduced commuting distances. Indeed, the author found that the majority of people living in a subcentre, urban or suburban, commuted outside of the subcentre to work, and jobs in subcentres tended to be held by non-local residents leading to longer commuting journeys in urban and suburban areas as a result of cross-commuting. This is also supported by work undertaken in Paris in which it was found that commuting distances from suburban locations have been unaffected by changes in the spatial distribution of jobs to suburban and other non-central locations (Baccaini, 1997).

In examining the influence of spatial structure on commuting, population density has been identified as a key factor in the relationship. Steiner (1994) found that residents of high-density areas travel shorter distances when compared to residents living in lower density areas. However, Levinson and Kumar (1997) found that higher density areas, which they suggest is an indicator of city size, tend to lead to greater use of the car. They attribute this to the fact that despite larger urban areas providing more facilities, services and greater access to job opportunities for residents, the fact that the city is spread over a larger area than smaller urban areas means that workers will tend to use their car to travel. As a result, commuting in larger urban areas has been found to be longer than in smaller and less dense urban areas (Gordon *et al*, 1989). However, Banister *et al* (1997) found that commuting in higher density areas tends to be shorter than in lower density areas, which they suggest is due to fewer public transport facilities and the need to travel longer distances to access more employment opportunities and services. Indeed, Naess (1995) suggests in relation to Swedish commuting regions, that higher densities are needed in order to offer residents an acceptable level of services and jobs and where density is lower and opportunities fewer, commuting time and distance tend to increase.

The Balance of Jobs and Housing

The jobs-housing balance has emerged as a central planning focus in the US where decentralisation, urban sprawl, and congestion in the large metropolitan regions have necessitated a greater awareness of the relationship between where people live and where people work. The concept refers to the level of heterogeneity between workers' residencies and employment locations in a specified area within which a balanced mix of jobs and housing is regarded as positive (Giuliano and Small, 1993; Horner and Murray, 2003). An imbalance is understood to occur where certain areas are jobs-rich and housing-poor whilst others are housing-rich and jobs-poor (Cervero, 1989; Gober *et al*, 1993), and this imbalance results in commuting. However, the jobs-housing balance extends beyond the idea of numerical equality between number of jobs and number of homes (quantitative balance). To develop a balance and a greater self-contained community, the jobs available in an area need to match the skills of the labour force (qualitative balance). In addition, housing must be available at prices, sizes, locations and quality to attract workers to the area in which they work (ARC, 2002).

In an analysis of the jobs-housing balance, Cervero (1989) constructs a gravity model in which the relationship between the jobs and housing ratio and regional mobility in the US is simulated. The findings suggest that jobs-housing imbalance largely relates to congestion on the connecting road arteries between the two arenas and that residential location decisions and commuting times are largely determined by house prices and housing availability near to workplaces.

Nowlan and Stewart (1991) suggest that serious traffic problems were avoided in Toronto's CBD despite an office boom in the 1970s and 1980s though increased housing construction in downtown locations. It was found that downtown workers were living in the new housing and could therefore walk or use public transport to get to work.

However, Giuliano and Small (1993) find little evidence to support the assumption that the jobs-housing balance significantly affects commuting times, arguing that commuting related to jobs-housing interaction is far less than actual commuting totals. Also Wachs *et al* (1993) examine a sample of 30,000 hospital system workers in California over a six-year period and find little evidence to support the assumption that jobs-housing imbalance increases commuting distance and time.

Although it is suggested that balancing housing and jobs is important because a relationship between jobs and housing and commuting inevitably exists (see Giuliano and Small, 1993; Levinson, 1998; Horner, 2002), the relevance of the jobs-housing balance is debatable (Giuliano, 1991). Indeed, a number of criticisms have been directed towards the relevance of the jobs-housing balance. The notion of 'balance' is arbitrary and is resistant to measurement (Cervero, 1989), which makes the identification and quantification of a jobs-housing balance or imbalance problematic. There is also the fact that there is not an accepted scale at which the balance should be measured, which means that by adjusting study area boundaries any desired outcome can be readily generated (Levine, 1998). Coombes and Raybould (2001) highlight that calculating the jobs-housing balance is acutely dependent on the boundaries of the areas used to measure the balance. In addition, they highlight that the assumption that people will live and work in the same bounded area fails to recognise the balancing mechanism for housing or job shortages provided through commuting, particularly in relatively localised areas. These issues are particularly acute when the balance is calculated for small areas. They highlight that measuring the balance using UK wards only reflects peculiarities in the boundaries of wards because job opportunities available in contiguous wards are relatively accessible for the majority of people. The authors recommend using an alternative measure, the employment accessibility measure, which calculates the fit of the potential workforce to jobs within a specified distance threshold. Owen and Green (2005) use the measure in an analysis of the factors underpinning commuting behaviour in the 2001 census. However, the ward level analysis indicates that the employment accessibility measure is inefficient at explaining commuting behaviour, reflecting the findings of other jobs-housing balance measures.

It has also been suggested that the implicit assumption of the jobs-housing balance is that residential choice is made with reference to a long-term workplace and single-worker household, which is a rapidly deteriorating picture of reality as a result of increased job-mobility and dual-worker households (Hanson and Pratt, 1988; Giuliano, 1991). In addition, people will tend to locate in a residential location that suites the individual or household, which suggests that no form of balance between jobs and housing would be useful in reducing commuting (Gordon, 1999). Indeed, Cervero (1995) suggests that policies designed to reduce job-housing imbalances are relatively ineffective, and are unlikely to alter commuting choices among workers. He argues that other policies such as coordinated transport systems are likely to be more effective at altering commuting practices.

Conclusion

This chapter has established the theoretical context for the research and has attempted to integrate the different strands of previously unconsolidated literature in order to develop a cohesive account of housing and labour markets, and the factors that serve to shape their interaction. Despite obvious inadequacies, and competition from radical, and segregation approaches, the neoclassical framework has come to dominate conceptualisations of housing and labour market operations at the micro-level. In relation to housing markets, the access-space model has traditionally dominated the neoclassical research agenda but has been shown to oversimplify the nature of the housing commodity, whilst the development of polycentric urban structures has reduced the relevance of applying the original access-space model.

Further development of the neoclassical housing market framework has occurred. The hedonic approach breaks from the traditional notion of homogeneous housing to incorporate the heterogeneity of housing into a framework. However, the choice of variables in the hedonic approach is subjective. A further development of the neoclassical position is the HMA framework, and although it is undervalued in the UK context, the approach offers a number of positive functions, particularly as a tool for delineating functional boundaries at different spatial scales. The submarket framework challenges the established neoclassical assumption that markets tend towards equilibrium and suggests that markets are in a state of disequilibrium. Whilst the submarket framework contains a number of relevant assumptions, the framework appears to be in a state of uncertainty, particularly in the development of a universally accepted submarket identification technique.

In relation to the labour market, the neoclassical approach remains dominant despite the emergence of the segmentation approach and criticisms from the radical approach. As a result, local labour market research tends to draw on TTWAs, and policy-makers have adopted TTWA boundaries to implement labour market policy measures. Indeed, the dominance of TTWAs is illustrated by the fact that alternative conceptualisations of local labour markets, such as the ERA and the Killian-Tolbert approach, are simply adaptations of the TTWA framework.

A number of methods have been considered which might be applied to measure the interaction of housing and labour markets through commuting. Van der Laan *et al* (1998) document the changing nature of commuting and urban structure based on three conceptual models. Arguably, of the three models outlined, the cross-traffic model is the more realistic illustration of home and workplace interaction. However, it is still relatively inefficient at explaining the commuting process. Similarly, the excess commuting measure is subject to criticism. The excess commute and the methodological foundations of the measure remain at present debated. The calculation of the transportation problem is complex and there is significant difference between the results of the original excess commuting studies of Hamilton (1982) and White (1988) which illustrate the problematic nature of applying excess commuting. Similarly, the gravity modelling tradition has been subject to similar criticisms (Thorsen and Gitlesen, 1998; Uboe, 2004). In contrast, the commuting flow approach provides an alternative to the econometric measures by analysing commuting flows and patterns and analysing the nature and characteristics of the commuters. The adoption of statistical analysis and geovisualisation as a tool for exploring flows allows greater exploration of the data than the previous approaches and as such is an approach which appears more in tune with the requirements of this research and applicable in a policy orientated environment. The final aspect of the literature explored 'people' and 'place' factors, and their influence on the commute. This included a review of the influence of demographic and socio-economic characteristics on the commute, and a review of the influence of three dominant physical factors on the nature of commuting.

The review reveals the nature of the current fragmentation of the housing and labour market research agenda. Spatial labour market research is dominated in the UK by TTWAs. However, despite the development of housing market delineation techniques from the 1940s and 1950s in the US (see Fisher and Fisher, 1954; Rapkin and Grigsby, 1960), the delineation and application of housing markets has been limited in the UK by the assumption that local authority administrative boundaries represent a decent approximation to local housing markets (Jones, 2002). As a result, housing market research has been constrained and empirical analysis restricted by the lack of application of housing market definitions in research and policy agendas. In addition, the application of spatial housing and labour market definitions in the same context has also been limited even in the most comprehensive review of housing and labour market interaction (Allen and Hamnett, 1991a). Although commuting as a process has been the focus of considerable empirical reflection, in the context of housing and labour market interaction, the process has been under-researched. In addition, the problems associated with commuting models reflect and exacerbate the current gap in research associated with understanding processes of interaction (Turok *et al*, 1999), including housing and labour market interaction, and the lack of available data to develop, test and refine such models (Wong, 2002). However, the identification of alternative techniques for exploring commuting, the consolidation of commuting-related research, and access to complete Census records, including Special Workplace Statistics, and Special Migration Statistics through the 2001 Census, provides a significant opportunity to improve our understanding of the interaction of housing and labour markets.

CHAPTER 3

HOUSING AND LABOUR MARKET INTERACTION: THE POLICY CONTEXT

Introduction

The purpose of this chapter is to examine the policy context surrounding housing and labour market interaction. The first section attempts to situate the interaction of housing and labour markets within the context of policy relevant issues. The debates considered include housing and labour mobility; residential and workplace locations and commuting; and employment opportunities, housing market conditions and migration. The second section identifies the spatial implications of the interaction of housing and labour markets, and focuses on three major spatial consequences: the North-South divide and differential regional development; cross-boundary spatial implications; and the decentralisation of population and employment from urban areas. The third section locates housing and labour market interaction in the context of the current policy framework and key policy delivery mechanisms.

Housing and Labour Market Interaction and the Current Policy Issues

The interaction of housing and labour markets is a complicated process to conceptualise and, surprisingly, our understanding of the issue is not well developed. Allen and Hamnett (1991b:4) suggest that this is the case because 'sometimes the most significant issues to focus upon are among the more obvious or seemingly transparent concerns (hence they are commonly overlooked)'. In addition, many complex multi-agent and multi-sector interactions have not been adequately captured by traditional approaches for measuring interaction (Wong *et al*, 2000; Wong, 2002), and the advancement of current understanding of housing and labour market interaction has been hindered by a paucity of basic intelligence of the changing spatial patterns of people and jobs over the last two decades. It was this basic lack of intelligence, which prompted a number of studies exploring the relationship between jobs and housing in the UK (Breheny and Hall, 1996; Champion *et al*, 1998; Breheny, 1999a; Turok and Edge, 1999) and the call for a more integrated policy framework to tackle the issues surrounding planning for housing and employment (Wong *et al*, 2000). Indeed, it was this latter Royal Town Planning Institute (RTPI) study which elucidated the significance of housing and labour market interaction and its policy relevance. This section explores the key issues which are considered significant in structuring the interaction of housing and labour markets and which are central to current policy debates.

Housing and Labour Mobility

The traditional understanding of the relationship between housing and labour markets is that rigidities in the housing market serve to hinder the mobility of labour (Champion *et al*, 1988; Owen and Green, 1989; Barlow, 1990: Coombes *et al*, 1991; Forrest and Murrie, 1992). Owen and Green (1989) suggest that housing market functioning has a significant impact on the interaction of housing and labour markets. Indeed, low housing supply in many job growth areas reduces the ability of workers to access certain housing markets because of shortfalls in housing units. Thus, high demand and low supply have the effect of bidding up house prices and excluding workers, particularly lower-paid workers, from accessing certain housing markets (Thorns, 1982; Hamnett, 1992). In addition, sharp differentials in regional house prices have the effect of discouraging homeowners in the higher priced south from moving out of the region because they run the risk of missing out on the benefits gained from inflation (Forrest *et al*, 1990). However, this also means that migrants from lower priced regions, particularly in the north, will need to increase their housing costs to access housing markets in the south, which is a constraint on the movement and retention of workers (Wong *et al*, 2000; Morrison, 2003). In addition, the boom or bust economic cycle of the housing market, as witnessed in the 1990s, led to a significant downturn in the housing market, which resulted in many homeowners, particularly in the South East, acquiring negative equity (Wilcox, 1995). As a result, those homeowners in negative equity became immobile. The functioning of the housing market and the constraints imposed on migration by high house prices means that in some areas businesses face problems of recruitment (Owen and Green, 1989). This observation is supported by Morrison (2003) who examines the problem of housing affordability for key-workers in Cambridgeshire. The author suggests that the problem of high demand for housing coupled with low supply means that many areas across the South East have experienced substantial increases in house prices and rents as well as construction and land prices in the last decade. As a result, it has been suggested that inflated house prices have had the effect of reducing the retention and recruitment of workers in both the public and private sectors (Morrison, 2003; Wilcox, 2003; Morrison and Monk, 2006).

The government's understanding of the relationship between housing and labour markets is built on this long-standing belief that rigidities in the housing market constrain labour mobility. The position reflects the government's commitment to sustaining long-term national economic growth (HM Treasury, 2003) and the belief that overheated housing markets in the south and under-performing housing markets in the north will, in the long-term, impact on economic development by constraining labour mobility (Ermisch, 1990). An outcome of the concern surrounding housing market functioning on labour mobility was the commissioning of the *Review of Housing Supply* (Barker, 2004). Barker (2004) suggests that there is a chronic undersupply of housing in the UK, as a result of the narrowly focused housing supply policy adopted during the 1990s (Malpass and Murie, 1999; Bramley, 2004). The review argues that if the issue of housing supply were left unaddressed, then the current problem of people buying properties with the expectation of acquiring almost instantaneous capital would continue to exacerbate the problem of interest rate fluctuations resulting in increasingly unstable and volatile housing markets. As such, it is suggested in the review that there is a requirement for 140,000 homes per annum across the UK, of which 120,000 of these would need to be private homes in order to bring UK house price rises in line with the European average of 1.1 per cent. The assumption is that by increasing the supply of housing units to meet demand, house price rises, particularly in overheated housing markets, will be reduced, thus improving the stability of the housing market and removing the constraints imposed on labour mobility by volatile housing markets.

However, the government's understanding of the relationship between housing and labour markets is borne from a crude macroeconomic perspective in which efficient housing and labour market interaction is seen as a mechanism for enhancing and sustaining economic competitiveness. The consequence of the overly macroeconomic stance adopted by the government is the contention that housing policy should encourage development in areas with good access to jobs (ODPM, 2003). This is clearly reflected in the key messages emerging from the Barker review, the sustainable communities agenda, and significantly for the supply of housing, *Planning Policy Statement 3: Housing* (ODPM, 2005a).

However, the broad-brush macroeconomic stance has been challenged as partial and unhelpful in fully explaining the relationship between housing and labour markets (Munro, 1992; Jarvis, 1999; Baker and Wong, 2006). The fact is that labour mobility does not simply entail the movement of individuals between two residential locations, but is dependent on the willingness of entire households to relocate. This trend has become increasingly significant since the 1980s as a result of economic restructuring, the subsequent decline of manufacturing industries and the rise of the service sector. These changes have translated through the spatial economy to the household level, leading to the recognition that household types have become much more diverse, particularly with increases in single-person and dual-earner households complementing traditional male-bread winner households. As a result, economic restructuring has affected the traditional form of division of labour within households and residential location decision-making has become much more complicated.

Indeed, in a recent study, Jarvis (1999) highlights that labour mobility tends to be constrained by the presence of an additional household earner and due to the practicalities associated with daily life, households with more than one earner tend to locate in a residential location in close proximity to local kin and social networks. Traditional households with a single full-time male earner were found to be the most likely to move, whilst the flexible, one-full time, one part-time earner households were found to be least mobile. Although dual-career households were found to be more likely to move longer distances, dual-earner, non-professional households were found to be least likely to move long distances. In addition, Green (2004) found evidence that as a household strategy, relocation is of less importance to households than it once was. The author suggests that due to the difficulties in balancing the needs of all household members, particularly household members in employment, alternative coping strategies such as long distance commuting are often adopted. As such, it appears that the government's conception of the relationship between housing and labour mobility is rather narrowly focused and overly simplistic, and does not consider wider issues relating to labour market change and access to transport.

Residential and Workplace Locations and Commuting

A further issue related to the interaction of housing and labour markets is the spatial relationship between residential and workplace locations. In spite of the reciprocity that exists between housing and labour markets, over the last few decades there has been a trend of disintegration between where people live and work (Breheny, 1999b; Breheny, 1999c). Spence and Frost (1995:359) comment, 'over time the relative distribution of homes and jobs is slowly changing. Workplaces are becoming increasingly separated from residencies and travel trips are becoming somewhat longer'. The process of decentralisation has been evident in the UK since the 1960s and despite the assumption that a 'return to the city' was underway during the 1980s (Breheny, 1999c), the 'urban exodus' study highlights that decentralisation has continued through the 1980s and 1990s (Champion *et al*, 1998). In addition, Allinson (2005) found that between 1991 and 2000 the major conurbations in England experienced a net-outflow of migrants to non-metropolitan areas.

Thus, the process of employment and population decentralisation has the effect of complicating the interaction of housing and labour markets. Commuting patterns between residential and workplace locations have become increasingly complex, characterised by traditional commuting to the CBD, but also non-traditional commuting patterns that do not necessarily include the CBD as a destination (Van der Laan, 1998; Van der Laan *et al*, 1998; Wong, 2002).

However, the complication of the interaction of housing and labour markets has been intensified with an increase in accessibility to private transport, namely the car. Banister and Gallent (1998) highlight that the proportion of trips made by car to work between 1981 and 1991 increased by 20.6 per cent. Indeed, Wong (2002) attributes higher car ownership and increasingly complex commuting patterns to the decline in the number of TTWAs from the original 642 to 308 in

1991. The increase in car usage has led to an increase in the distance that people are able and willing to commute. Gordon (1999) highlights that people do not necessarily live and work in the same place. He suggests that people with preferences for space over accessibility are likely to live further from their workplace and that people with specialist skills and professional workers are likely to seek and find work from within a relatively wide search area. This is coupled with a concurrent trend of 'roots' effect in which households increasingly choose a fixed residential location and develop a coping strategy for employment change which involves substituting long distance migration with commuting (Green *et al*, 1999; Green, 2004). This means that businesses are able to draw on a wider supply of labour than is offered through the local labour market, which has the effect of creating substantial amounts of cross-commuting. Indeed, a recent study undertaken on behalf of the RTPI identified a commuter ring, which stretches outwards from central London to the surrounding South East, within which between 10 and 20 per cent of workers commute over 60 miles to work (Wong *et al*, 2006). In addition, Wong *et al* (2000) highlight that a significant number of districts in the North West experience balancing cross-commuting whereby in and out commuting per day was almost equal. The districts experiencing balancing cross-commuting tend to be the more affluent districts experiencing growth in both employment and population, which suggests that the phenomenon of cross-commuting epitomises the increasing trend of decoupled home and employment locations (Wong *et al*, 2000:26).

The disintegration of residences and workplaces, the need to accommodate new households (4.4million in 1996 and 4.8million in 2006), and concerns over the sustainability of travel patterns (DETR, 1998a), have resulted in the emergence of the urban renaissance agenda to promote cities as drivers of economic growth and places to live and work (DETR, 1999a; 2000b). The Urban White Paper *Our Towns and Cities - the future* (DETR, 2000b:1), suggests that the issue of decentralisation must be reversed by encouraging 'people to remain in, and move back into, our major towns and cities, both for the benefit of our urban areas and to relieve the pressure for development in the countryside'. As such, the Urban White Paper introduces a 60 per cent brownfield target for new housing development in urban areas. The policy is based on the assumption that by locating housing in close proximity to employment locations people will be encouraged to live and work locally, which will help to create more sustainable travel patterns and balanced communities.

However, once again, the government's understanding of housing and labour market interaction is embedded in an overly macroeconomic framework. Although development pressure on the urban fringe is a key concern for government, the driving factor underpinning the government's promotion of brownfield development is the perceived economic benefits gained by integrating housing with employment locations. However, the macroeconomic framework adopted by the government fails to consider the fact that current residential and employment location trends are driven by residential preferences on the part of households and economic concerns on the part of businesses. In a recent examination of local economic development (LED), Wong (1998b) examines the perceptions of key public and private sector actors working in LED in the North West and North East of England concerning the relative importance of different factors in determining the location of local investment. It was found that traditional considerations of land, labour, capital, infrastructure, and location were key elements for investment decisions and it was after these factors that more intangible issues such as image, quality of life, and good residential locations featured in relation to business location decisions. The issue of quality of life for the workforce was regarded as secondary to traditional factors and was considered a positive outcome of good economic development rather than a contributor to it. This was because it was assumed that good quality of life for the workforce could be obtained through commuting from residential locations in surrounding areas, the effect of which is the creation of a complex commuting culture (Wong, 2001).

Indications are that because traditional factors are significant in determining business location decisions, businesses will continue to locate in areas where the potential for profitability is greatest and non-urban locations feature heavily in this respect (Boon, 2003). Above all non-urban locations suit the knowledge-based service economy in that they have a large number of consumers, a well-educated and skilled workforce, good infrastructure, and space for growth and it is these factors, which contribute to value creation and the success of business clusters (Boon, 2003:148). Significantly, Boon (2003) goes on to suggest that government understanding of modern business location decision-making is underdeveloped, and guidance for local authorities concerning business location processes is poor. Thus, the idea that the tide of decentralisation can be stemmed by simply providing more housing near to employment opportunities in urban areas is far too simplistic and does not acknowledge the fact that employment opportunities are likely to continue to decentralise as a result of business location preferences and changing working practices (Butt, 1999; Gillespie, 1999).

In addition, decentralisation is also influenced by changing residential location decision-making. Research highlights that the needs of the individual or household are often considered more important than employment prospects or commuting times (Wong *et al*, 2000) when making residential location decisions. Filion *et al* (1999) highlight that dispersed residential locations are proving to be attractive and demanded places to live, particularly for high-income households and families with children because they offer better quality of life. Senior *et al* (2004) found that the traditional factor of residential space continues to drive residential location decision-making in addition to the quality of life concerns (see Rogerson *et al*, 1989; Rogerson, 1999; Wong, 2001). As Senior *et al* (2004:354) comment, 'residential preferences...are weighted towards the consumption of more rather than less space in terms of the dwelling itself and the external space within its property boundaries. Additionally, locational preferences favour suburban areas and neighbourhoods that are perceived to be safe or low risk in terms of social behaviour'.

Thus, research suggests that people will live in a residential location that suits their personal needs and that employment and commuting issues tend to be less significant in the residential location process, which runs against the grain of current government understanding of housing and labour market interaction. In addition, the government's perception that people will live close to their workplace location seems to be underplaying the complexities associated with residential and workplace location decision-making, business location decision-making, and the market forces underpinning the allocation of jobs, which cannot guarantee that workers living locally will take up local jobs (Immergluck, 1998; Shuttleworth *et al*, 2000).

Employment Opportunities, Housing and Migration

A further issue to recognise as influencing the interaction of housing and labour markets is the relationship between employment, housing and migration (Champion and Fielding, 1992). The process of inter-regional migration is an issue of concern for policymakers and has been well documented in relation to the South East (see Fielding, 1995; Fielding, 1996). The region has long been the destination of choice for young professionals due to the availability of high value jobs whilst the northern regions tend to be the origins of such migratory movements. The process of inter-regional migration is linked to the business cycle (Wong, 2002) and the condition of the national economy, and following the recession of the early 1990s, the South East witnessed a rapid re-emergence of job opportunities (Wong *et al*, 2000), particularly new service sector jobs, which has resulted in continuous inflows of migrants from northern regions.

As a result, the process of inter-regional migration has contributed over-time to housing stress in the south and low demand and abandonment in the north (Webster, 1998). Bramley and Pawson (2002) suggest that the causes of low demand and abandonment are related to wider regional and sub-regional processes, such as demographic trends, migration, and the decline of employment in northern cities (Bailey and Turok, 2000). The response to labour market decline and excessive loss of employment has been for people to migrate out of declining areas (Turok and Edge, 1999). However, whilst higher income workers are able to take advantage of new or alternative employment opportunities, the same cannot be said for lower income or unemployed workers who are often unwilling or unable to migrate speculatively in search of employment. Indeed, lower income groups are often unable to move from areas of economic decline to growth areas due to restrictions imposed by competition for housing and higher priced housing markets around growth areas (Salt, 1991; Kearns and Parkes, 2003). Thus, the concentration of low income and unemployed individuals is problematic when out-commuting from areas of decline does not represent a sufficient response to loss of employment (Turok, 1999). In contrast, the buoyancy of the South East economy and the availability of high value job opportunities have resulted in the overheating of housing markets in the region, which has created significant problems of affordability and is exacerbating current trends of cross-commuting (Gordon, 1999).

In addition, migration propensity and the availability of different employment opportunities in different regions has the potential to alter the socio-economic composition of the labour force in an area (Green, 1992), which has the knock-on effect of exacerbating spatial skills mismatches between regions. This is likely to reinforce uneven spatial development as areas gain skilled workers at the expense of other areas, thus widening the gap between the economic performances of different regions and creating uneven skill profiles (Green and Owen, 2003). Champion and Ford (1999) highlight that recent migration patterns are serving to reinforce established trends in inter-regional migration and skills distribution. Their analysis found that most economic migrants tend to be higher skilled and professional managerial workers. Significantly, Wong *et al* (2000) highlight that inter-regional migration has resulted in a concentration of professional, managerial and technical workers in southern England, whilst northern regions have below national average levels of high skilled labour and above average proportions of semi-skilled and unskilled workers.

The government's response to such issues has been characteristic of their understanding of the interaction of housing and labour markets. Recent UK planning policy has exhibited a pre-occupation with the heterogeneity of housing markets, notably the dichotomy between the over-heated housing markets in the South East and London (see Morrison, 2003; ODPM, 2003; Morrison and Monk, 2006), and the problems of low demand and abandonment in northern regions (DETR, 2000a; ODPM, 2003). This has seen the emergence of the sustainable communities agenda (ODPM, 2003) and the *Northern Way* framework[13] (ODPM, 2004; NWSG, 2004), which are charged with addressing the issues of differential housing market performance, and the effects that housing market functioning has on employment opportunities and labour mobility. Thus, the government's macroeconomic view of the interaction of

[13] For a review, see Goodchild and Hickman (2006).

housing and labour markets is evident in the message emerging from the sustainable communities agenda. This is that the performance of low demand and overheated housing markets are constraining labour migration, and affecting economic competitiveness. However, the current agenda does not recognise that improving housing market performance will not necessarily lead to a mobile labour force or that people with highly demanded skills will move to where they are needed. Indeed, research highlights that relocation decisions are dependent on a range of factors such as household type and structure (Jarvis, 1999), tenure (Forrest and Murrie, 1992), life cycle (Warnes, 1992), age, education, and income (Clark and Huang, 2004) to name but a few. It is likely that the macroeconomic agenda will simply reinforce current inter-regional migration trends associated with higher managerial and professional workers.

Spatial Implications of the Interaction of Housing and Labour Markets

The interaction of housing and labour markets has contributed to the development of three significant spatial processes: the North-South divide and differential regional development; cross-boundary spatial implications; and the decentralisation of population and employment from urban areas (Wong, 2002:286). These issues are explored in this section.

North-South Divide

Debates surrounding the North-South divide and differential regional development are long-standing in the UK (Green, 1988). In particular, increased social and residential mobility has exacerbated the North-South divide in relation to workforce skills, economic performance, and competitiveness, which have created a sharp differentiation between the South East, London, and the East, and the rest of the UK. Table 3.1 highlights that these three regions outperformed the national average in terms of GVA per head and gross weekly income. In contrast, the North East, Wales, and Northern Ireland have the lowest levels GVA per head and lowest gross weekly income.

In relation to the skills of the workforce, there is a consensus that high skilled workers have tended to flow south to take up employment in higher paid jobs in the South East and London. When exploring the education performance of the future workforce, Scotland and Northern Ireland outperformed all other regions in the UK in terms of GCSE attainment followed by the South East, South West, and East. In contrast, London performed relatively poorly in comparison and also had the highest unemployment rate of any region. Interestingly, this points to the entrenched process in which northern regions develop skilled workforces only to loose workers to the higher paid jobs in London and the South East, whilst the South East, London, and the East are better equipped to retain the workers they produce by offering higher paid employment.

Table 3.1: Socio-Economic Performance Indicators

	GVA Per Head Index 2001	**Gross Weekly Household Income Per Head 2002 (£)**	**% with Five GCSE Passes 2002**	**ILO Unemployment Rate 2002**	**Total Direct Inward Investment in Manufacturing 2002***	**Total Direct Inward Investment in Non-Manufacturing 2002***
UK	100	510	52.5	5.1	1344	2462
North East	76.1	406	45.6	6.6	133	102
North West	89.8	444	49.7	5.1	122	156
Yorkshire and Humber	86.4	444	45.6	5.5	164	74
East Midlands	91.9	480	50.8	4.3	60	56
West Midlands	90.4	476	49.7	5.9	199	224
East	110.1	538	55.3	4.2	50	180
London	133.3	676	50.6	7.1	49	766
South East	120.1	630	56	3.9	116	503
South West	89.3	483	56	3.9	65	117
Wales	78.9	407	50.5	4.6	182	73
Scotland	94.7	446	60.4	5.7	143	167
Northern Ireland	78.4	399	58.7	5.4	58	40

Source: ONS (Regional Trends), 2004
** Figures relate to the absolute number of businesses investing in UK.*

The indicators in Table 3.1 suggest that there are wide variations in regional performance between the northern and southern regions. Although there is fluidity in the definition of north and south, illustrated by the fact that the South West and East Midlands shift between the two, and that London has high economic growth coupled with deprivation, there appears to be a ripple effect in which regions further away from the South East tend to perform less well than those closer. London and the South East attract by far the highest levels of investment in non-manufacturing projects whilst the highest levels of investment in manufacturing projects are in Wales, Scotland, and traditional industrial regions. However, the West Midlands have relatively high levels of investment in both manufacturing and non-manufacturing projects suggesting an attempt to diversify the regional economy and support manufacturing and non-manufacturing sectors.

In addition to attracting investment, the southern regions have also been successful at attracting and retaining population (Table 3.2). Indeed, the East Midlands, East, London, South East, and South West have experienced above national average levels of population growth between 1991 and 2001. In contrast, the northern regions have tended to experience either much lower levels of growth or decline in population. The only non-southern region to experience growth in population above the national average is Northern Ireland, which matched the growth experienced by the South East. The growth in population in the southern regions seems likely to continue according to the 2006-based household projections. However, a buoyant economy coupled with growth in households mean that there is enormous pressure on the southern regions to handle and sustain such growth, which will lead to longer commuting flows and increasing pressures on environmental capacity (Gordon, 1999). The problem, however, is that finding sustainable locations to accommodate new households has been a source of contention, particularly following the publication of the sustainable communities agenda (DEFRA, 2004; Gallent, 2005). This has been exacerbated by the fact that housing stock has increased at a faster rate in the growth regions than anywhere else in the UK with the exception of Northern Ireland (Table 3.2). The issue of unequal spatial development and the North-South divide is no longer simply about improving quality of life and economic performance in peripheral regions but is also about supporting buoyant regions to cope with population and economic pressures without damaging environmental quality of these areas (Wong *et al*, 2000:37).

Table 3.2: Population Growth and Household Projections

	% Population Growth 1991-2001	**% Projected Household Growth**	**% Increase in Housing Stock 1992-2002**
UK	2.8	England 209,000	7.8
North East	-2.6	5,300	3.8
North West	-1.1	21,900	5.2
Yorkshire and Humber	0.7	17,700	6.4
East Midlands	4.3	19,500	9.8
West Midlands	1	17,800	6.8
East	5.5	27,800	9.8
London	7	36,200	5.9
South East	5.1	36,300	9.1
South West	5.3	26,400	10.4
Wales	1.2		7.4
Scotland	-0.4		8.6
Northern Ireland	5.1		15.2

Source: ONS (Regional Trends), 2004; DCLG (2006)

Cross-Boundary Spatial Implications for Housing and Labour Market Interaction

The complexity of housing and labour market interaction illustrates that housing and employment issues cannot be effectively addressed through tightly defined regional or local administrative frameworks. In relation to the East of England, Townroe and Moore (1999) find that a range of employment opportunities are available to local workers through extended commuting, which has resulted in the enlargement of TTWAs in the region. The buoyancy of the region owes much to the high level of in-migration in the last three decades following company relocations, retired homeowners moving from the South East, and younger commuters forced to settle in the region as a result of high house prices in the South East.

Similarly, Green (1999) identifies cross-regional employment linkages between the southern parts of the Midlands (Warwickshire and Northamptonshire), and the South East; the northern parts of the Midlands and Manchester and Sheffield; and eastern parts of the Midlands (Lincolnshire and Northamptonshire) with the Eastern region. As such, green suggests that it is important to consider employment interactions beyond the regional boundary.

What is clear is that tightly defined administrative boundaries are unlikely to capture the complexities of the interaction of housing and labour markets. The fact that TTWAs do not respect administrative boundaries (with the exception of national boundaries) illustrates the fact that activity flows are increasingly found to be moving beyond spatial borders (Wong, 2002). However, the complexity of such movements are unlikely to be completely captured by a single sophisticated statistical method, including the derivation of TTWAs, which have in the past been used as approximations to both housing and labour markets (Jones, 2002). As such, what is needed is a more sensitive administrative framework to address housing and labour market interaction along with other cross-boundary spatial processes.

The regionalisation agenda proposed by New Labour in the White Paper *Your Region Your Choice* (Cabinet Office/DTLR, 2002) provided such an opportunity through the creation of elected Regional Assemblies. However, the rejection of the elected assemblies has meant that an alternative framework is required. The emerging sub-regional agenda and city-region framework provides an opportunity to address such cross-boundary spatial issues. Indeed, the focus on the sub-regional level provides a significant opportunity to move beyond the current fragmentation of policy at regional level to an arrangement, which emphasises the coordination and integration of specific policy issues (Roberts and Baker, 2004) organised around the city-region concept (Parr, 2005). This is an attractive option because it is proposed that the specific city-regions would be delineated based on functionality, including travel-to-work patterns and the consideration of the location of employment and residential areas (catchments) serving the city-region node, as opposed to traditional administrative boundaries (Harding and Marvin, 2006; Robson *et al*, 2006).

Decentralisation of Population and Employment from Urban Areas

Arguably, two of the most significant processes to have structured housing and labour market interaction in the post-war period have been population and employment decentralisation from urban areas. However, significantly it seems that such processes have become entrenched in the UK and are likely to continue despite government attempts though the urban renaissance agenda to stem the tide of decentralisation. The TCPA study (Breheny, 1999a) hinted that the consensus of policymakers was that any attempts to stem the tide of decentralisation is likely to be met with only marginal gains and more likely failure. As Breheny (1999d:214) comments, 'the problem in trying to reverse this picture is that the decentralised service sector now seems to be embedded in its new home'. He goes on to argue 'the processes that have driven counterurbanisation are still in place, and it is not obvious that they can be reversed' (Breheny, 1999d:218).

The supporting evidence is provided in Table 3.3, which outlines employment change in different types of localities and Table 3.4, which outlines migration trends between metropolitan and non-metropolitan areas. Growth in employment terms has tended to be concentrated in non-metropolitan areas, particularly new towns, mixed urban-rural and remote rural areas whilst decline has been concentrated in principle cities and London.

Table 3.3: Employment Change: 1981-1996 by OPCS Areas

OPCS Area	1981 Jobs	1996 Jobs	Change	% Change
Inner London	2,023,741	1,915,496	-108,245	-5.3
Outer London	1,536,947	1,432,754	-104,193	-6.8
Principal Cities	1,761,424	1,555,039	-183,272	-10.4
Other Metropolitan Authorities	3,389,918	3,256,844	-28,769	-0.8
Non-Metropolitan Cities	2,758,206	2,821,178	62,972	2.3
Industrial Areas	2,650,284	2,673,372	23,088	0.9
New Towns	1,012,799	1,219,585	206,786	20.4
Resorts	1,050,562	1,126,562	76,000	7.2
Mixed Urban-Rural	3,216,695	3,849,955	633,260	19.7
Remote Rural	1,893,335	2,178,486	285,151	15.1
Total	21,293,911	22,029,271	735,360	3.4

Source: Breheny (1999b:4)

It is clear that there have also been significant outflows of population from metropolitan areas to non-metropolitan areas. Greater London has experienced the highest growth in population reflecting its status as a global city, which contrasts with other large cities, which experienced population decline (Fielding, 1996). However, the study by Champion *et al* (1998) suggests that counterurbanisation is still a significant issue in London, reflected in the fact that population is also moving away from the capital towards non-metropolitan areas in the South East. Thus, the interaction of housing and labour markets is likely to continue to be structured by decentralisation in the future; however, current government policy appears to be ill equipped and too fragmented to address the decentralisation issue effectively.

Table 3.4: Migration Flows to and from Non-Metropolitan England and Wales, 1990-91

	Net Out-Migration		Gross Out-Migration		Gross In-Migration	
	Number	Rate	Number	Rate	Number	Rate
Metropolitan England	77,460	4.4	243,890	13.9	166,430	9.5
Greater London	51,127	7.7	130,493	19.6	79,366	11.9
Other Metropolitan Areas	26,333	2.4	113,397	10.5	87,064	8.0

Source: Champion et al (1998:16) (Calculated from 1991 Census SMS)

Housing and Labour Market Interaction and the Current Policy Framework

The purpose of this section is to explore the issue of housing and labour market interaction in the context of the current policy framework, and to explore the capacity of the policy mechanisms currently in place to guide their spatial development patterns.

Existing Institutional and Spatial Framework at National and Regional Levels

At national level, there is a clear departmental distinction in the way that housing and labour market policy agendas are governed. Housing policy is the remit of the Department for Communities and Local Government (formerly ODPM) whilst employment and labour market policy is the remit of the Department for Work and Pensions (DWP), complimented by the Department for Trade and Industry (DTI). Similarly, at regional level, there is an institutional division in the way that the two policy arenas are governed. Labour market issues are the remit of Regional Development Agencies (RDA objectives include enhancing employment and skill levels of workers). In contrast, housing is the responsibility of a number of regional actors. The housing corporation controls funding for Registered Social Landlords (RSLs) whilst the Government Offices for the Regions (GORs) control the funding for local authority housing investment, which reflects the fact that the GORs are central government's 'right hand' in the regions. However, the Regional Assemblies are significant actors in the regional housing agenda because of the responsibility they have for RPG/RSS, which is the tool through which the spatial components of the housing agenda are delivered.

Prior to 2004, the housing development framework was established through *Planning Policy Guidance 3 (Housing)* (DETR, 2000d), *Planning Policy Guidance 11 (Regional Planning)* (DETR, 2000e) and the White Paper *Planning for the Communities of the Future* (DETR, 1998b). The delivery of housing was achieved through a well-defined hierarchal structure, translated from the PPGs to local plans and RPGs. Wong *et al* (2000) highlight that because housing is a key concern of land use planning, the RPG provides the principal mechanism through which the spatial component of the housing sector is delivered at regional level and provides a broad framework for the identification of the scale and distribution of housing development (Baker, 1998). Despite changes to the planning system in 2004, very little in terms of the delivery of housing has changed. *Planning Policy Statement 3 (Housing)* has replaced PPG 3 and

Planning Policy Statement 11 (Regional Planning) has replaced PPG 11, but many of the issues that were addressed in PPG 3 and PPG 11 are now addressed in PPS 3 and PPS 11. The key change is that the Regional Spatial Strategies are now statutory plans while Regional Planning Guidance documents were non-statutory, the result of which is the creation of statutory status for spatial planning in the English regions.

The employment framework at regional level is established through the RES. The RES targets demand-side issues by allocating land to new business developments, which are likely to contribute to the generation of employment opportunities. This has been facilitated by the RDAs assuming responsibility for regeneration practice and funding, which is often used to improve employment locations. In addition, they have the authority to acquire and develop land and premises and are able to offer grants and loans to firms, which are important for supporting business investment and infrastructural development. The RES also targets supply-side issues such as training and skills, which has resulted in RDAs developing strong associations with local employment and training agencies, particularly Learning and Skills Councils.

Whist the RES is *the* sectoral strategy targeting employment issues at regional level, the spatial development of the employment sector is somewhat less developed. Indeed, Wong (2002:289) comments that 'in comparison [to the housing sector], the guidance for the spatial development of the employment sector is somewhat fuzzier'. The RPG/RSS influences the spatial distribution of employment, but the RPG/RSS can only influence the supply-side through the allocation of sites for employment development. The demand-side aspect lies solely with the RES. In addition, the RPG/RSS is inefficient at determining the spatial distribution of different *types* of employment this is the remit of the RES and is dependent on RDA economic objectives.

A Fragmented Policy Agenda at National Level

The current institutional framework governing housing and labour market policy is fragmented. At the national level, there is a lack of *horizontal linkages* between different policy agendas, which has resulted in a lack of consideration of the connections between housing and employment issues in national planning documents.

Although the integration of housing and employment locations is important, PPS 3 (ODPM, 2005a) makes little mention of the interaction of housing and employment locations except for the acknowledgement that housing should not constrain labour mobility and this is in spite of PPS 3 being underpinned by PPS 1 (*Delivering Sustainable Development*) (ODPM, 2005b). In addition, PPS 11 does not mention the interaction of housing and employment locations; rather housing and labour markets are considered in isolation from one another. Furthermore, there is a heavy skew towards housing issues in PPS 11, which suggests that PPS 11 and the RSSs will continue to dominate the provision of housing whilst employment will remain a sectoral issue through the RES. The problem with this is that the PPSs and RSSs are emerging as the delivery mechanisms for much of the physical development, regeneration, and economic development objectives at national and regional levels. The fact that there is a lack of consideration of housing and labour market interaction in the physical delivery mechanisms suggests that policymakers will continue to be restricted in their ability to develop integrated strategies that target the interaction of housing and labour markets.

This lack of consideration of housing and labour market interaction reflects the narrow definitions applied to housing and labour markets. Housing markets are acknowledged as being a social construction and a significant element of the social, regeneration, and transport policy agendas whilst labour markets are seen to be the concern of the economic development agenda. This division between housing and labour markets is a result of the division, which exists universally, between the economic agenda on the one hand and the social agenda on the other (Evans, 1985; 2003). Wong (2002) suggests that economic issues have not been sufficiently linked to the social agenda and, in particular, housing because economic factors are defined in an unduly narrow way from which housing is excluded. This is in spite of findings which suggest that housing is a key element in fostering economic competitiveness (Bramley and Morgan, 2003; Meen and Andrew, 2004). This lack of integration of economic and social issues means that policy agendas are unable to capture the full complexity of the relationship between housing and labour markets.

Inadequate Integration of Housing and Labour Market Issues at Regional Level

The fragmentation of housing and labour market issues in national policy agendas is also evident in regional policy agendas. A review of the RESs and RSSs for the English regions was undertaken to determine the extent of the current integration of housing and labour markets issues in current regional policy delivery mechanisms[14].

The current RESs all mention housing, which is certainly an advancement on the previous edition of the strategies were three (North East, Yorkshire and the Humber and South West) did not mention housing at all (Wong *et al*, 2000). Indeed, housing is mentioned continually throughout all of the strategies except for the East of England strategy where housing is mentioned just twice. Housing tends to be incorporated into the RESs on the basis that housing has significant implications for the performance and productivity of the economy. Four of the RESs (North East, North West, West Midlands and Yorkshire and the Humber) recognise that failing housing markets need to be tackled in order that economic development is not constrained by poorly performing housing markets. Indeed, the four strategies recognise that by improving the quality and diversity of the housing stock in failing housing markets, economic productivity would be enhanced by attracting and retaining businesses and workers. In addition, all of the strategies and, in particular, the East of England, South West, and South East strategies recognise that housing affordability needs to be tackled in order that affordability problems do not constrain economic development by reducing labour mobility. This is especially relevant in the South East where the role of housing in the economic strategy is dominant due to the emphasis placed on providing high quality and affordable housing in growth areas in order to reduce the pressures on the regional economy (Whitehead, 2002; Barker, 2004; Morrison and Monk, 2006).

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[14] At the time of writing, the RESs and RSSs reviewed were in draft format and were subject to approval by central government.

However, despite the recognition in some of the RESs that housing has a role to play in the economy, the divide between the economic and employment issues and the social and housing issues appears to remain. Indeed, all of the RESs retain the traditional economic development foci such as employment, skills, business development, and infrastructure at their cores, for which the RDAs through the RESs are responsible. However, housing was not included in the RESs as a driver of economic development but was generally considered a sector, along with transport, that needed to be included in the strategy through integration with complimentary regional strategies such as the RSS and Regional Housing Strategy, in order that the economic growth achieved through the RES is sustainable. This is illustrated by the fact that the phrases 'employment and housing', 'housing and employment', labour and housing' and 'housing and labour' appeared in just three of the strategies, twice in the North West and East Midlands strategies and once in the South East strategy. Indeed, Cole (2003) highlights that some RDA policymakers had little appreciation of housing market strategies, particularly Regional Housing Strategies. This suggests that the interaction of housing and labour markets has received little attention in the RES policymaking process (Cole and Nevin, 2004) except for the recognition that housing market performance should not constrain labour mobility.

The (draft) RSSs all incorporate employment issues in the document. There is recognition in the documents that the RSSs have a key role to play in enhancing and maintaining employment by providing opportunities for employment by tailoring development to the needs of specific locations. Due to the fact that the RSSs have been produced using guidance provided through PPS 11, all the RSSs are very similar in focus. In relation to employment, there is a consensus that whilst demand and supply-side issues are significant, the role of the RSS in relation to employment is to ensure the provision of land for employment creation, particularly in relation to existing brownfield land. This is illustrated by the use of terms such as 'key employment sites', 'prestige employment sites', and 'strategic employment sites'. This reflects one of the constraints of the RSSs in that it is predominantly a document to support the supply-side of the employment agenda. Thus, issues such as skills promotion and training continue to be the remit of the RDAs through the RES and this lack of integration of supply and demand-side issues suggests that the potential conflict exists between the two sides of the process (Wong *et al*, 2000).

However, in relation to housing and labour market interaction there is greater use of the phrases 'employment and housing', 'housing and employment', labour and housing' and 'housing and labour' than in the RESs, which suggests that the spatial integration of housing and jobs has been given more consideration in the RSSs than in the RESs. Two of the RSSs (North West and South East) mentioned housing and employment as an issue once, West Midlands considered it twice, North East and Yorkshire and the Humber three times, East Midlands four times, South West nine times and East of England twenty times. In addition, the South West RSS explicitly acknowledges that new investment in housing and employment sites needs to be attracted to urban areas to address the imbalances that exist between housing and employment and to reduce cross-commuting, particularly into Bristol. However, whilst there has been acknowledgement of the interaction of housing and labour markets in the RSSs there is still a significant policy vacuum in the RSSs regarding the integration of housing and labour market issues. Where the issue is addressed the traditional perspective of housing and labour market interaction, housing market performance constraining labour mobility, is reflected in the RSSs, suggesting national perspectives are filtering through to regional level policy agendas.

Conclusion

This chapter has established the current policy context surrounding housing and labour market interaction. Despite the fact that the changing relationship between housing and labour markets has altered the spatial structure of cities and regions in the UK, housing and labour market interaction has acquired a relatively narrow and fragmented focus in UK policy at national and regional levels. However, the first section explored the key issues that have served to structure the interaction of housing and labour markets and which current policy agendas should seek to address.

The traditional understanding of housing and labour market interaction is embedded in the belief that rigidities in the housing market have the effect of constraining labour mobility. This is reflected throughout the debates surrounding housing and labour market interaction and is particularly evident in recent government policy, most notably in the key messages emerging from the Barker review, the sustainable communities agenda, PPS 3 *(Housing)*, and the urban renaissance agenda. Whilst the government's understanding of the nature of the interaction of housing and labour markets is valid, the debates explored in the first section highlight that important issues and processes are not captured by the traditional stance. In particular, changing working relationships as a result of economic restructuring means that residential mobility is much more complicated than the traditional view of housing and labour market interaction suggests. Indeed, residential relocation is complex and dependent on household type, career status, commuting requirements, quality of life issues, and life cycles (Winstanley *et al*, 2002; Green, 2004).

There is also an emerging trend of spatial disintegration between residential and workplace locations, which has resulted in increasingly complex commuting patterns between residential and workplace locations, increasing car ownership, and the diversification of commuting patterns away from traditional patterns of commuting to the CBD to non-traditional patterns that do not necessarily include the CBD as a destination. Emerging from the debates surrounding decentralisation is the traditional idea that housing markets need to be more efficient in order to reduce constraints on labour mobility, which is particularly apparent in the urban renaissance agenda. However, the government's understanding fails to recognise that decentralisation is dependent on residential and business location decision-making and not only on the availability of housing near to employment locations. Indeed, the problem is that such a view represents an overly simplistic conceptualisation of the interaction of housing and labour markets. In relation to residential location decision-making, preference for space over accessibility has encouraged longer commuting journeys especially among professionals and dual career households, and it is unlikely that such households will be convinced to move back into the city based on directive government policy (Breheny, 1999d). Furthermore, government understanding of business location decision-making processes is poor and guidance on the issue is underdeveloped (Boon, 2003).

The evidence emerging from the policy debates indicates that the interaction of housing and labour markets has contributed to the emergence of three major spatial consequences: the North-South divide and differential regional development; cross-boundary spatial implications; and the decentralisation of population and employment from urban areas. Indications are that all three processes are currently entrenched and are likely to continue to be structured by the interaction of housing and labour markets in the future (Wong *et al*, 2000).

In relation to the current policy framework, uncertainty and fragmentation are key characteristics of the interaction of housing and labour markets in national level and regional level policy agendas. The departmentalism that is characteristic of central government (Nathan and Morgan, 1999) has resulted in a policy divide between housing and labour market issues, the former being the responsibility of the DCLG and the latter being the responsibility of the DWP with the DTI. The departmentalism that characterises national level agendas has translated into institutional division at regional level. In relation to employment and labour market issues, the RDAs through the RESs have assumed responsibility for governing the sector at regional level. In contrast, Regional Assemblies, GORs, the Housing Corporation, and Regional Housing Boards have emerged to govern the housing sector at regional level though RPG/RSS and Regional Housing Statements/Strategies. The emergence of so many actors to govern the housing sector has been identified as contributing to the internal fragmentation of the housing sector (Cole, 2003; Slocombe, 2003) and has contributed to the lack of integration of housing with other sectors, services, and strategies (Cole and Nevin, 2004). Thus, with so much fragmentation within the housing sector and the division between institutions responsible for housing and labour market issues, it is hardly surprising that the interaction of housing and labour markets is underdeveloped in national and regional agendas. Indeed, a brief review of the current draft RSSs and RESs for the English regions illustrates that despite the promotion of integration between the two strategies, there was significant fragmentation between housing and employment issues in both documents. In addition, it was apparent across all the RSSs and RESs that the traditional understanding of housing and labour market interaction, specifically that housing market performance constrains labour mobility, is the underpinning philosophy when housing and labour market interaction is addressed in the regional documents. Coupled with the fact that key national policy documents also adopt such a perspective demonstrates that at national and regional levels housing and labour market interaction is embedded within a narrowly focused and overly macroeconomic policy framework.

CHAPTER 4

CONCEPTUAL FRAMEWORK AND RESEARCH METHODS

Introduction

This chapter is divided into two main sections. The first section is concerned with conceptualising the interaction of housing and labour markets by drawing upon the theoretical issues raised in Chapter 2. From this a conceptual framework is developed, which is founded on the basis that the daily interaction of housing markets and labour markets can only be understood holistically through an understanding of the spatial and structural elements of housing, labour markets, and the process of commuting. Thus, a three-step procedure for exploring the interaction of housing and labour markets is outlined. This procedure involves identifying sub-regional housing and labour markets in the region, an analysis of the nature of commuting between the markets, and the analysis of the impact of 'people' and 'place' factors on commuting. In addition, an agenda for examining housing and labour market interaction in the North West is outlined, highlighting the research aim and objectives, and associated research questions, which will guide the research.

The second section outlines the methodology of the research. First, the datasets used in the research are outlined in order to avoid repetition in future chapters, followed by a discussion of some problems with secondary data. Finally, the methods adopted during the course of the research, notably the literature review, methods for identifying the sub-regional housing and labour markets in the region, and the methods adopted in determining the interaction of the housing and labour markets are briefly considered.

Conceptual Framework

Allen and Hamnett (1991b) and Wong (2002) highlight the inefficiency of existing approaches in conceptualising and responding to the interaction of housing and labour markets. As such, a framework for examining the interaction of housing and labour markets is developed in the first section of this chapter. It draws on issues raised by Randolph (1991), Hanson and Pratt (1988), and Allen and Hamnett (1991a).

The Randolph Framework: Building the Connections between Housing and Labour Markets

Allen and Hamnett (1991a) provide the most thoroughly developed examination of housing and labour market interaction in their seminal contribution *Housing and Labour Markets: Building the Connections,* which builds on work undertaken by Hanson and Pratt (1988) and Hamnett and Randolph (1988). Randolph (1991:36-37) establishes the framework for the agenda and highlights five characteristics of the housing-labour market relationship that need to be considered when examining housing and labour market interaction:

(1) Labour and housing markets exist in a reciprocal relationship because the former constitutes a major element of the demand side of the latter and the latter represents the repository of the supply of individuals for the former.

(2) Despite the linkage, housing and labour markets are, to a large extent, relatively autonomously constituted processes. The mechanisms that generate and structure the two markets involve essentially distinct sets of processes. Consequently, there is therefore no necessary correspondence between the two markets. Instead the relationship is spatially, socially and historically contingent, which imparts a high degree of locational variety in the outcomes of the relationship. In essence, the relationship varies from place to place.

(3) The two markets are not only relatively autonomous, but also relatively non-synchronous in the sense that changes in one may bear little necessary relationship to changes in the other and indeed may be contradictory. Moreover, as housing is the more stable of the two, it exerts a frictional drag on labour market change. Pools of 'redundant' labour are liable to be left behind when employment opportunities collapse or move elsewhere.

(4) The two markets operate at different levels of spatial resolution. Crudely, labour markets operate more at the regional level, structuring the broad

pattern of housing demand, while the outcome of the housing market is much more locationally specific.

(5) Households are the mediating element in the relationship between housing and labour markets acting as consumers within the housing market and supplying labour to the labour market.

Constructing a Conceptual Framework for Exploring Housing and Labour Market Interaction

The consideration of housing and labour market interaction is a relatively recent development in a continuing academic and policy debate, which has traditionally considered home and work in isolation from one another. As Wong (2002:284) comments, 'the logistical relationship between the housing market and labour market is not that well conceptualised by existing theories'. The purpose of this section is to develop an *exploratory* conceptual framework for examining the interaction of housing markets and labour markets in this research, which is summarised in Figure 4.1.

The framework is developed on the basis that the interaction of housing and labour markets on a daily basis can only be understood holistically through an understanding of the spatial and structural elements of housing, labour markets, and the process of commuting. Based on this understanding a three-point procedure for examining housing and labour market interaction has been developed to compliment the conceptualisation presented in Figure 4.1.

<u>Step 1:</u> Identify spatial sub-regional housing and labour markets as a context for examining housing and labour market interaction at the sub-regional level.

The first aspect of the framework requires the identification of housing and labour markets at sub-regional level (Step 1 in Figure 4.1). Space cannot be divorced from the analysis of social and economic processes (Sack, 1980) and should be considered as central to conceptualising and theorising the interaction of housing and labour markets. From the review of the literature, the HMA approach provides an appropriate framework for delineating spatial housing markets at the sub-regional scale, and due to their long-term existence allow for significant policy application and study. The HMAs can be delineated through migration data to provide a self-contained and bounded market area, which can be derived through the grouping of census data units. The 2001 Census of Population provides a 100 per cent census of migration flows at output area, ward, local authority district, and GOR levels through the Special Migration Statistics (SMS) from origin (former home) to destination (new home) (the SMS data are discussed in detail in the methodology section of this chapter). The ability to delineate a system of sub-regional housing markets is significant in that it allows key housing market processes to be examined within a functional market area as opposed to relying on arbitrary or convenient administrative boundaries, which have little functional meaning in the housing market or in the determination of consumer behaviour (Jones, 2002; Meen and Meen, 2003). However, the theoretical and methodological aspects of the HMA framework are currently underdeveloped with the notable exception of the HMA approach developed by Jones (2002).

Therefore, a number of issues will need to be considered and synthesised in order to develop a system of HMAs for the North West. From a conceptual perspective, there is a need to provide a working definition of a HMA, there is a need to consider size and self-containment issues, and there is a need to distinguish between HMAs and submarkets. From a methodological perspective, a method is required to delineate HMAs, which allows the grouping of census data units, but which also incorporates local knowledge of housing market form and functioning (DTZ Pieda, 2004b).

In relation to labour market delineation, TTWAs are the most accepted and most utilised approach for delineating and studying local labour market processes, and their size and functionality mean that the TTWA framework can be applied at the sub-regional scale. Furthermore, although criticised by segmentation theorists (e.g. Peck, 1996), from a planning perspective, TTWAs provide a sound basis for labour market delineation. The boundaries of TTWAs are delineated using commuting flow data derived from the Census of Population, the most recent delineation being undertaken in 1998 based on the 1991 Census (see Coombes and ONS, 1998). The TTWA framework is based on the principle that a minimum of 75 per cent of the journey-to-work trips have both their origin and destination within the same area but for large TTWAs, with a resident workforce in excess of 20,000, the self-containment level is reduced to 70 per cent. In the same way that the delineation of sub-regional housing markets provide a means of examining housing market processes within a functional boundary, so the TTWA framework provides a means of examining labour market processes within a functional boundary.

However, the current TTWAs were delineated using a 10 per cent sample of commuting flow data derived from the 1991 Census of Population. Therefore, the 1991-based TTWAs are unlikely to be entirely accurate or unaffected by changes in the nature of the journey-to-work, which are likely to have occurred in the ten-years between the 1991 and 2001 Censuses and by changes, which have occurred in the administrative geography in the same period. As such, there is a need to assess the validity of the 1991-based TTWAs by examining the extent to which the existing 1991-based TTWAs conform to the criteria used to define TTWAs when related to 2001 commuting flow data and 2001 administrative (ward) geography before the 1991-based TTWAs can be adopted.

Step 2: Establish the nature of commuting between housing and labour markets.

The second aspect of the framework recognises that the interaction of housing and labour markets occurs on a daily basis through the process of commuting (Step 2 in Figure 4.1). Workers will tend to maximise utility in relation to the daily interaction of housing and labour markets. Thus, the majority of workers will tend to commute to labour markets that are relatively close to their residential location (Lowe, 1998) based on the rational commuters' desire to minimise commuting costs (Kain, 1962; Van der Laan *et al*, 1998). However, the commuting process is inherently stressful for the majority of workers. Thus, to improve the utility of the interaction (although not necessarily leading to maximised utility) the majority of workers will try to reconcile the stress inherent in commuting by either continuing the interaction as before or alternatively by altering the distance, time and/or mode of travel adopted in their journey-to-work. Where commuting stress cannot be reconciled by continuing the interaction as before or by altering distance, time, and/or mode of travel, more extensive responses are required, such as through migration, by changing jobs, or through a combination of both. The responses to the stress of the commuting process have the effect of altering the nature of the interaction of housing and labour markets. These responses have the effect of altering the spatial and structural interaction of housing and labour markets except for when the workers' response is to maintain the existing commuting regime and the existing interaction of residential and workplace locations because this provides a better alternative than changing house, job, or an aspect of the commute.

Thus, having delineated spatial housing and labour markets and established the structural characteristics of the markets it is important to analyse the commuting link between housing and labour markets. Commuting is important in relation to the interaction of housing and labour markets for a number of reasons. First, commuting is a function of the location of residential and workplace locations and is thus a compromise between the two localities. Second, the continued disintegration of residential and workplace locations means that commuting is becoming increasingly complex. Third, for some household types the need to balance the residential requirements of all members of the household and the employment location of the working household members can constrain migration and lead to a reliance on commuting (Green *et al*, 1999; Green, 2004). In relation to this research, spatial interaction occurs at the sub-regional level between housing and labour markets and the spatial interaction can be organised and visualised using GIS packages (Kwan, 2000; Batty, 2003), or alternative software packages such as Flowmap (Van der Zwan, 2005). In addition, issues such as the mode of travel adopted and the distance travelled to work by the commuter characterises the nature of the interaction of the housing and labour markets.

The 2001 Census of Population provides a 100 per cent census of commuting flows in the UK between origins (home) and destinations (work) based at output area, ward, local authority district, and GOR levels, through the Special Workplace Statistics (SWS) (the SWS data are discussed in detail in the methodology section of this chapter). It is possible to determine the spatial interaction of housing and labour markets using the SWS datasets. However, the interaction datasets are collected for administrative and census units and therefore aggregation to sub-regional level is required if use is to be made of the SWS dataset. In addition, the 2001 Census also provides data related to distance travelled to work and mode of travel adopted in relation to commuting, and these can be used to compliment the analysis of the spatial interaction of the housing and labour markets.

<u>Step 3:</u> Examine the 'people' and 'place' factors that influence the interaction of housing and labour markets.

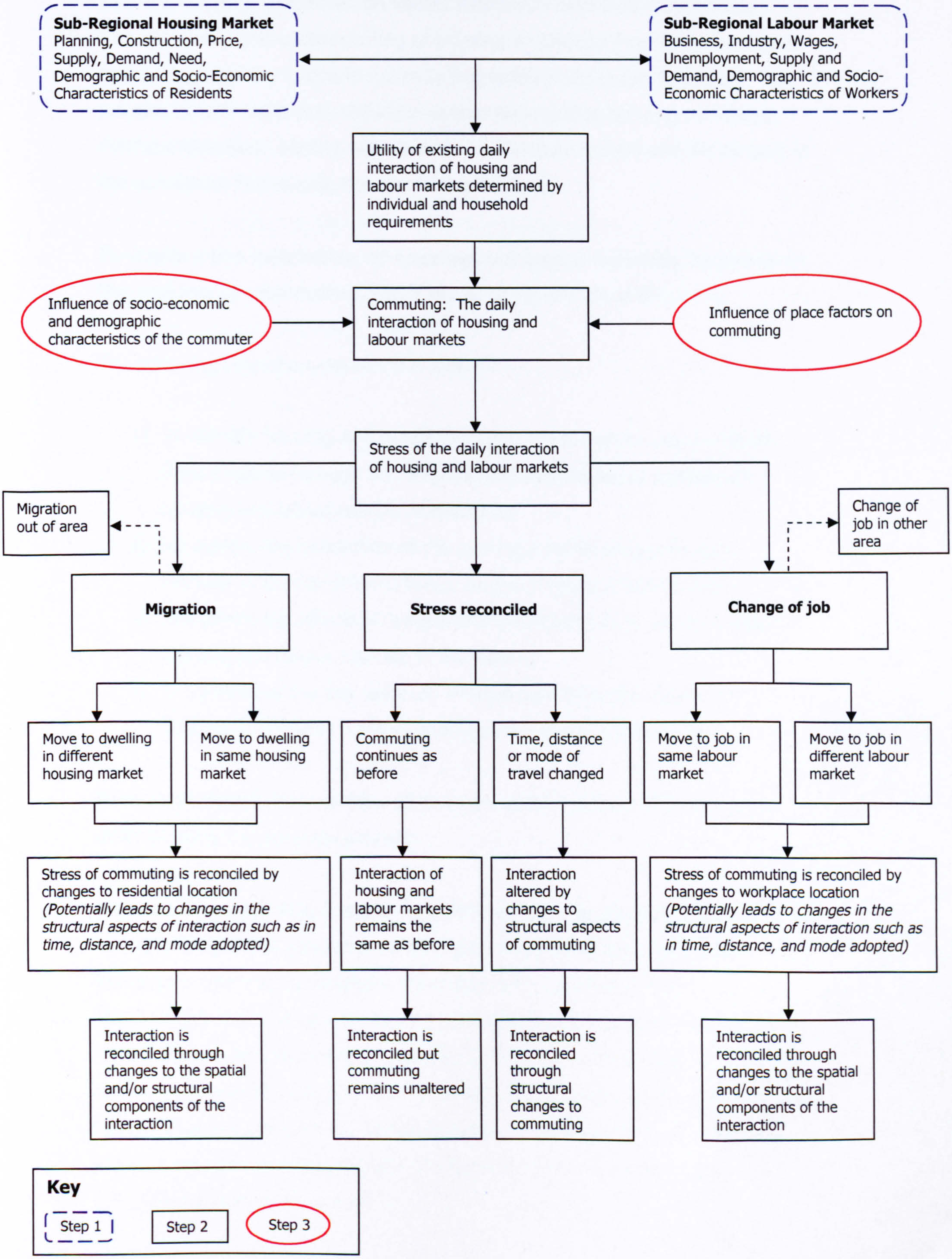
The third aspect of the framework recognises the importance of 'people' and 'place' factors (Coombes and Raybould, 2001; Owen and Green, 2005) in structuring the interaction of housing and labour markets (Step 3 in Figure 4.1). Commuting as a process is spatial in nature but it is also constituted through the structural characteristics of the commuters and by the supply and demand regimes operating between different housing and labour markets. Previous research has highlighted a number of demographic and socio-economic characteristics that influences the nature of commuting and these characteristics are termed 'people factors'.

Traditionally, an understanding of the process of commuting has been confined to the variables of male wage earners, full-time employment, and housing tenure (Randolph, 1991). However, this three-way relationship fails to take into consideration the different aspects of work which people perform, the rise of part-time employment, particularly women's employment and the casualisation of work all of which create different relationships between home and work. Tenure continues to be an important element in the nature of the commute particularly in the consideration that often homeowners have longer commuting times and distances than other tenure groups (see Buck *et al*, 2002). In addition, gender remains important for understanding the relationship between housing and labour markets as illustrated by Madden (1981) who highlights that the journey-to-work for women is predominantly shorter than that for men. However, other variables are also important. Higher earners are likely to be employed in full-time professional, managerial or technical occupations, and these socio-economic groups have been shown to experience increased commuting when compared to commuting for lower skilled and lower paid workers (Green *et al*, 1986; Hanson and Pratt, 1995). In addition, different household types are likely to have different commuting patterns particularly in relation to journey-to-work time and distance. Age has been shown to influence the distance workers will commute with younger and older workers commuting shorter distances than middle-aged workers (McQuaid, 2003). Ethnicity has also been highlighted as influencing the commute with ethnic minority groups commuting shorter distances than white workers (Thomas, 1998) and importantly, access to a car has been shown to increase employment search areas and lead to a lengthening of the commute (Coombes and Raybould, 2001). Therefore, commuting cannot be reduced to a three-way relationship but must be acknowledged as being multi-faceted and constituted by an array of demographic and socio-economic variables.

The SWS datasets from the 2001 Census of Population contain commuting flow data, which has been disaggregated based on a selection of demographic and socio-economic characteristics. The available datasets include gender, age, employment status, mode of travel, and socio-economic status. These can be used to explore the spatial interaction of the housing and labour markets based on a selection of demographic and socio-economic characteristics.

In addition, a range of 'place' related factors have also been identified as contributing to the nature of the interaction of the housing and labour markets. These are regarded as the locality based influences and include spatial structure (e.g. Gordon and Wong, 1985; Gordon *et al*, 1989; Giuliano and Small, 1993), employment and population decentralisation (e.g. Ingram, 1997; Champion *et al*, 1998; O'Sullivan, 1999), and the balance of jobs and housing (e.g. Giuliano and Small, 1993; Horner and Murray, 2003). The analysis of such processes would require a range of data and the adoption of a number of alternative methods in order to elucidate their influence on the interaction of housing and labour markets.

Figure 4.1: Conceptual Framework of Housing and Labour Market Interaction



An Agenda for Examining the Interaction of Housing Markets and Labour Markets in the North West: Research Aim and Objectives

The awareness and understanding of housing and labour market interaction in academic and policy circles is currently fragmented and underdeveloped. The purpose of this thesis is to stimulate debate surrounding housing and labour market interaction. Having reflected on the literature review and the content of the conceptual framework, the aim of the thesis is:

To explore the interaction of housing and labour markets, focusing on the process of commuting, via a study of North West England.

The following objectives support this aim:

1) To identify housing and labour markets at sub-regional level in North West England through the adoption and application of appropriate housing and labour market frameworks.
2) To explore the interaction of the sub-regional housing and labour markets in the North West based on the process of commuting.
3) To explore the effects of 'people and place factors' on the interaction of housing and labour markets in the region.
4) To synthesise the key research findings related to the interaction of housing and labour markets and draw out policy implications.

From these objectives, a number of research questions have been devised in order to guide the research process:

Objective one provides a spatial context in which to examine and construct an understanding of the processes operating to characterise the nature of the interaction, which is an important theoretical and empirical objective. Coombes (2000) highlights in relation to 'locality' definitions that a consistently defined locality (or market) boundary is desirable to avoid the problems of '...comparing apples with pears' (p.1500), which inevitably creates problems for both in-depth local studies and comparative spatial analysis. Thus, identifying housing and labour markets is vital to the study of housing and labour market interaction. This raises a number of questions:

- To what extent does the 1991-based TTWA framework provide a suitable conceptualisation of, and approximation to, current sub-regional labour markets in North West England?
- What factors are likely to underpin thè condition of the 1991-based TTWAs, and specifically TTWAs that fail the validity test?
- What approach should be adopted to identify and delineate housing markets at sub-regional level?
- What issues need to be considered in relation to the conceptual and methodological requirements of the sub-regional housing market approach and how might these requirements become operationalised to identify sub-regional housing markets?
- What is the nature and configuration of the identified housing markets in the North West?

Objective two seeks to explore the interaction of the identified sub-regional housing and labour markets in the North West through the process of commuting. This raises a number of research questions:

- To what extent do different sub-regional housing and labour markets intersect and what is the nature of the intersection of different housing and labour markets?
- To what extent is incoming commuting to TTWAs and outgoing commuting from HMAs concentrated within specific market areas?
- What trends and patterns are evident in the nature of commuting between sub-regional housing and labour markets in the North West?
- What trends are evident in the distance travelled to work in the North West?

Objective three seeks to explore the effect of 'people and place factors' on the interaction of housing and labour markets. The analysis of the trends in commuting patterns and distance travelled can be supplemented with an analysis of the underlying demographic and socio-economic characteristics of the commuters. In addition, previous research has highlighted the importance of place related factors on commuting, and it is assumed that such issues are also likely to affect the interaction of housing and labour markets at sub-regional level. These issues raise a number of research questions:

- What influence do the demographic characteristics of workers have on commuting between adjacent and non-adjacent housing and labour markets in the North West?
- What influence do socio-economic characteristics of workers have on commuting between adjacent and non-adjacent housing and labour markets in the North West?
- What effect does population and employment decentralisation have on the nature of commuting between different residential and workplace locations, and how does the process affect sub-regional housing and labour market interaction?
- What effect does spatial structure have on commuting, and how does spatial structure affect sub-regional housing and labour market interaction?

Objective four seeks to draw the research together through a synthesis of the key research findings. It then goes on to extract some key policy implications from the research findings. This raises a number of research questions:

- What are the key findings of the research?
- What are the policy implications of the research for housing, labour markets, and their interaction?
- What policy recommendations might be extracted from the research as a basis for informing future policy?

Methodology

Thus far, the thesis has suggested that housing and labour market interaction is a fragmented and neglected research and policy issue. The corollary of this is that there is no established conceptual framework or method that can be employed to explore the interaction of housing and labour markets. The first part of this chapter has sought to address the first issue and has developed an exploratory conceptual framework of the daily interaction of housing and labour markets. The purpose of this section is to compliment the conceptual framework by outlining the methods that are adopted during the course of the research as dictated by the aim and objectives of the study. The discussion of the methods is intended to foreground the research and provide a summary of the approaches adopted throughout the thesis. A detailed discussion of each of the methods is provided in the relevant chapters. However, prior to outlining the research methods that are adopted, the datasets that are used in the research are first outlined.

Data

This research relies almost exclusively on secondary data sources. In order to avoid duplication in future chapters, the secondary data sources used are detailed below.

Census Data

The primary source of data used in this research comes from the 2001 Census of Population. The UK Census is conducted every ten years and is the largest single authoritative household survey in the UK. One of the key advantages of the Census is that it is estimated to be 90-95 per cent accurate (Openshaw, 1995), and the population targeted is universal (Dale and Marsh, 1993). The importance of the 2001 Census for this research relates to the fact that the 2001 Census is the most recent Census survey, it is universal and comprehensively covers the study region with a range of relevant variables, and it incorporates a richer set of data than would be possible to obtain by primary data collection. In addition, the 2001 Census incorporates a richer set of data than the 1991 Census. For example, the 1991 Census asked 24 questions composed of 19 individual and 5 household questions whereas the 2001 Census asked 36 individual and 10 household questions (46 in total). In addition, where the 1991 Census data is presented as a large number of cross-tabulations, the 2001 Census data is in an easily downloadable format that allows each specific variable to be collected by the user across a range of spatial scales. Furthermore, the 1991 Census contains a number of questions which were considered 'hard to code' for practical and confidentiality reasons which meant that a sample of 10 per cent of households was coded and these questions included variables that were particularly relevant to this research such as those related to employment, occupation, industry, and socio-economic classification. In contrast, the 2001 Census is a 100 per cent census for each variable and uses small cell adjustment methodology (SCAM), a method for disguising very small data values, to ensure confidentiality. In that way, the

2001 Census is much more comprehensive and applicable to this research as all the variables are available in a more complete form.

In order for the Census results to be anonymised, the results of the individual Census records are aggregated into a set of output geographies (Rees and Martin, 2002). The basic geographical unit of the 1991 Census was the enumeration district (ED), which could be aggregated directly to form all higher statutory boundaries such as district and regional level geographies. In contrast, the 2001 Census adopts a new type of basic geographical unit, output areas (OAs), which again aggregate neatly to all higher statutory areas[15]. The OAs can be aggregated into wards and subsequently wards can be aggregated to local authority level and so on. Two key components of the 2001 Census are of particular relevance to this research: the Neighbourhood Statistics datasets, and the Special Migration Statistics (SMS) and Special Workplace Statistics (SWS). These two components are detailed below.

Neighbourhood Statistics

A notable advancement of the 2001 Census on the 1991 Census is the Neighbourhood Statistics system. One of the problems of the 1991 Census was the difficulty experienced by users in accessing small area statistics at a single point of access and this issue was made even more pronounced as calls increased for the collection of a more comprehensive set of 'neighbourhood' level (or smaller scale) statistics (Martin, 2002). Thus, the Office for National Statistics (ONS) created Neighbourhood Statistics to provide users with access to a range of small-scale 2001 Census data covering a range of topics. The Neighbourhood Statistics system allows users to search for data in four ways: as summary statistics for wards or local authorities; by subject; by area name; and by an interactive digital map. This gives the user a degree of flexibility in collecting the required data. The system covers a significant range of Census topics at small-scale including demographic and household variables, cultural topics (such as ethnicity and religion), health topics, educational qualification topics, labour market topics, and transport topics.

[15] For a review of OA geography, refer to Martin (2002).

Special Migration Statistics and Special Workplace Statistics

The Special Migration Statistics (SMS) and Special Workplace Statistics (SWS) are specialist datasets produced through the 2001 Census of Population and are downloaded using Web-based Interface for Census Interaction Data (WICID) in the form of origin-destination matrices (for a detailed overview see Stillwell and Duke-Williams, 2003). The SMS and SWS are interactive datasets in that they record the dynamics of spatial interaction between one place and another place.

The SMS records the origin and destination of migrants by recording the usual address of the respondent a year before the Census. This response represents the origin of the migrant and the address recorded as the respondents' current usual address represents the destination of the migrant. The SMS is available at local authority (district) level (Table MG101), ward (Table MG201), and OA levels (Table MG301). The SMS is available at aggregate level so that all migrants between each local authority, ward, or OA are recorded. However, in order to distinguish between sub-groups of the population, the SMS is available in the form of a number of demographic and socio-economic variables in matrix form at the different levels for a 100 per cent census.

At district level (level 1) there are 11 tables defined for this dataset level.

- Age by sex
- Family status of migrant
- Ethnic group by sex
- Whether suffering from limiting long-term illness
- Economic activity by sex
- Moving groups
- Moving groups by tenure
- Moving groups by economic activity by sex
- Moving groups by NS-SEC of group reference person

At ward level (level 2) there are 5 tables defined.

- Age by sex
- Moving groups
- Ethnic group by sex
- Moving groups by NS-SEC of group reference person

- Moving groups by tenure

At OA level (level 3) there is 1 table defined.

- Age by sex

As the spatial scale decreases, the numbers of variables available at that scale declines. However, one of the advantages of WICID is that the user is not restricted by the cross-tabulation of variables (such as migration by age *and* sex) because the interface allows individual variables (such as the age *or* sex of the migrant) to be extracted. Therefore, if the user is interested in the age of migrants but not the sex of the migrants then it is possible to extract the age variable without extracting the sex variable.

Similar to the SMS, the SWS records the origin and destination of commuters between their dominant place of work and their usual residential location. The questions in the Census that deal with SWS asks respondents to provide the address and postcode of their place of work, the type of work they do, the nature of the employer's activity and the mode of travel they use to get to work. The SWS is released at three levels: SWS1 records flows between local authorities, SWS2 records flows between wards, and SWS3 records flows between output areas. Unlike the 1991 SWS, the 2001 SWS dataset is based on a 100 per cent census, which improves the accuracy and reliance of the SWS when compared to 1991 SWS (Openshaw, 1995). An additional advantage of the 2001 SWS is that a 100 per cent census of a number of demographic and socio-economic variables is available for download in matrix form.

At district level (level 1) there are 8 tables defined for this dataset level.

- Age by sex
- Family status by sex
- Living arrangements by employment status by sex
- Method of travel to work
- NS-SEC by sex
- Industry by sex
- Ethnic group by sex
- Employment status by sex

At ward level (level 2) there are 5 tables defined.

- Age by sex
- Method of travel to work
- NS-SEC
- Occupation
- Employment status by sex

At OA level (level 3) there is 1 table defined.

- Method of travel to work

In addition, the variables can be extracted individually despite being compiled as cross-tabulated datasets, which is an advantage when exploring the socio-economic and demographic composition of commuting flows.

However, a methodological issue that needs to be considered in relation to SMS and SWS is the Small Cell Adjustment Methodology (SCAM) used in the 2001 Census to ensure confidentiality where there are small cell values. Small values are understood to be those cells that have a value that ranges from 0-3. Cells with an initial value of 1 are rounded to either 0 or 3, with 0 being the more likely result. Cells with an initial value of 2 have also been rounded to either 0 or 3, with 3 being the more likely result. Cells with an initial value of either 0 or 3 have retained these values which is intended so that it is impossible to distinguish between rounded values and 'genuine' 0s or 3s. All sub-totals have been recalculated based on the rounded cells. There are three significant effects of SCAM (Stillwell and Duke-Williams, 2005):

1. *Within-table modification*: For the majority of outputs, it will be apparent that a large proportion of cells within any table are either 0 or 3, and that sub-totals and totals within the table are multiples of 3.
2. *Between-table variation*: SMS and SWS levels 1 and 2 contain several output tables, with the result that a number of values (e.g. 'total migrants') can be found in more than one table, but due to SCAM, these values may be inconsistent.

3. *Between-level variation*: The three spatial levels for which the SMS are available were independently subject to SCAM. Thus, if a particular value (e.g. 'total migrants') is calculated by aggregating from one spatial scale to a higher spatial scale, and compared to the value found in the SMS data set for that higher scale, those values are unlikely to be consistent.

The Official Urban-Rural Classification

In 2001 the Office of the Deputy Prime Minister (ODPM) and the then Department of Transport, Local Government and the Regions (DTLR) commissioned a review of the definitions of urban and rural areas for use in policy purposes and statistical reporting (Bibby and Shepherd, 2004). The definition of 'urban' is based on the ODPM's 'physical settlements' definition of urban areas and a further criteria which dictates that settlements with a population of 10,000 of more be treated as 'urban areas'. Given this, all other settlements are treated as part of the 'rural domain' (Bibby and Shepherd, 2004). The identification of urban-rural areas is based on a method of classifying hectare grid squares, using postcode address data, and the hectare grid squares are aggregated to OA level, which are themselves aggregated to ward and super output area levels. Two measurement criteria were used in the categorisation of the hectare grid squares and thus in the development of the urban-rural definition; *Settlement Form* (dispersed dwellings, hamlet, village, small town, urban fringe and urban (>10k population)) and *Sparsity* (based on the number of households in surrounding area up to a distance of 30 km) (Bibby and Shepherd, 2004). Up to eight classes of output areas are distinguished; four settlement types (urban; town and fringe; village; hamlet and dispersed) in either a sparse or less-sparse regional setting. However, as a result of aggregation to create a classification for wards and super output areas, the settlement classification is condensed to three measures; urban; town and fringe; and village and dispersed with the sparse or less-sparse measures being retained.

The urban-rural definition is important in that it attempts to formulate potentially subjective ideas of rural and urban into a concise statement of urban-rural differentials and for providing a place-based context to the research (see Champion and Hugo, 2004). A key aspect of the classification is its flexibility and the fact that the differentiation between types of urban and rural areas can be elucidated by exploring key socioeconomic and demographic variables to highlight differences between different areas and different categories (The Countryside Agency *et al*, 2004). A further advantage is that the classification is developed at a number of spatial scales, which means that different levels of analysis are possible using the classification across a range of datasets.

The People and Places Geodemographic Classification

Geodemographics is an approach that seeks to classify residential areas based on demographic, socio-economic, and housing characteristics. The classifications are based on the use of cluster analysis to assign spatial units (e.g. output areas) to a distinct cluster or area type based on variables reflecting their demography, social, and economic composition, and housing type (Brown, 1991). However, Voas and Williamson (2001:74) argue that geodemographic classification '...produces 'clouds' rather than 'clusters' of areas where these clouds substantially intermingle'. In spite of such criticisms, the geodemographic approach provides an important tool for understanding spatial variation across a range of variables, which otherwise would be almost impossible to distinguish.

Following the 2001 Census, nine updated or newly devised geodemographic classifications were developed, one of which is the People and Places classification (Batey and Brown, 2004; Batey and Brown, 2005; Batey *et al*, 2006). The reason underpinning the adoption of the People and Places classification is that it was developed to serve private sector purposes and as a tool for policy research (Batey and Brown, 2004). The classification is based exclusively on 2001 Census data and has three levels of description. At the most detailed level is the *Leaves* cluster with 156 clusters, followed by the *Branches* cluster with 40 clusters, and the *Trees* cluster with 13 clusters at the lowest level of detail (Batey *et al*, 2006). The different cluster levels are labelled and presented in a sequence that reflects the affluence ranking of the area types. Details of the descriptors are provided in Batey and Brown (2004).

Some Problems and Errors with Secondary Data

There are a number of generic problems with secondary data that need to be highlighted (see Hakim, 1982; Robson, 2002). The first issue to highlight is that the collection of secondary data is usually informed by a set of definitions that are devised by the collector and which relate specifically to the collectors needs. One such example is illustrated in the definition of unemployment. The ILO definition differs from other forms of unemployment measures such as the division of total claimant count rate by the number of people who are economically active. The outcome of such differences in the definition of unemployment is a difference in the rate of unemployment for a particular area. The 2001 Census uses the ILO definition as the guiding definition of unemployment and this cannot be readily compared to unemployment rates calculated using alternative definitions. In addition, it cannot be used if the user does not consider the ILO definition to be appropriate. Therefore, the use of secondary data is governed and constrained by the definitions that have been used to inform the collection of the data.

The second issue to consider is the importance of ensuring that the data is accurate. Although primary quantitative data can be tested statistically using standard deviation or standard error, it is not always possible to measure the accuracy of secondary data, particularly in sources that do not provide the complete dataset. Ensuring that the data is accurate is significant for avoiding the 'GIGO' (garbage in, garbage out) problem (Field, 2005). This problem is also related to the knowledge, skills, and decision-making ability of the user/analyst. The accurate analysis of data can only be achieved with knowledge of data processing and analysis techniques and the principles and theories that underpin the subject under consideration. The accuracy of the data is also related to the third issue, source bias whereby the interests of the collector might bias the collection of the data and which will be translated into analyses of the data in a secondary context.

The fourth issue relates to the reliability of the data. The process by which data is collected can vary over time, which is likely to affect the users' ability to compare datasets over time. However, without knowledge of the changes that have taken place to the procedure for collecting data, it is likely that the user will continue to assume that trends in data are related to changes in trends, patterns and processes rather than because data collection methods have changed, which will lead to inaccurate assumptions and analyses. For example, from 1979-1983 the Labour Force Survey was carried out every two years but this changed in 1984 when it became annual and then in 1992 it became a continuous process with results published quarterly. In addition, since March 1997, the LFS has been subject to seasonal adjustments, which is likely to affect comparisons between data collected post-1997 and that collected pre-1997.

In addition to the generic problems associated with secondary data, there are a number of specific issues that need to be highlighted in relation to the datasets used in this research. The advantage of using small-scale data units such as OA and wards is that they can be aggregated to higher units. However, this benefit must be offset against the problem of the modifiable areal unit problem (MAUP) (Openshaw and Taylor, 1981). The MAUP is likely to be an issue when any datasets are aggregated to higher spatial scales, which in the case of this research relates to Census data, LFS data, and house price data. When aggregating areal units the scale of analysis alters because aggregation results in fewer and coarser areal units (Horner and Murray, 2002). It has been argued that such changes in the scale and unit definition of spatial units can alter the results of quantitative measures and statistical tests (Openshaw and Taylor, 1981; Flowerdew and Manley, 2006). A further issue related to aggregate data is the problem of ecological fallacy where assumptions are made that the relationships experienced by groups also hold true for individuals (Brown, 1991). An alternative to the ecological fallacy is the individual fallacy, which occurs when an assumption about a group is inferred from characteristics of an individual in that group (Landman, 2000). These issues are important if data are being aggregated and assumptions of cause and effect are being inferred from the data.

In relation to the use of Census data, there are a number of problems that need to be considered. The first issue is that the Census is collected every ten years and records the population at a specific point in time, which means that the Census provides only a 'snapshot' of the population at a given point in time. The Census also suffers from problems of data blurring, non-completion and the imputation of missing data, coding errors and the problems of individuals supplying incorrect answers. In addition, whilst the use of SCAM has enabled the release of a 100 per cent Census, it can be argued that SCAM distorts datasets with low values, particularly interaction datasets, and exacerbates the problem of data blurring (Stillwell and Duke-Williams, 2005). There are also problems with the SWS collected through the Census. The interaction of residence and workplace is a complicated process but because of the strict questioning procedure adopted in the Census to improve response rates by simplifying the process (Moss, 1999), the Census becomes inflexible at dealing with the complex reality of many respondents' lives (Cole *et al*, 2002). The Census assumes that respondents have one place of residence and one place of work, but the issue of multiple homeownership and multiple workplaces is not accommodated in the Census, which is likely to account for some unusually long work journeys, which are regularly recorded in travel tables (Cole *et al*, 2002). A further issue is the fact that whilst respondents are likely to record their home address accurately, the accuracy of the SWS is based on their ability to record the address of their workplace accurately, which is less straightforward than recording home addresses (Cole *et al*, 2002). In addition, Cole *et al* (2002) highlight that information on some forms is of such poor quality that it does not allow accurate data coding, particularly where postcode digits are missed out by the respondent.

In relation to the urban-rural definition, The Countryside Agency *et al* (2004) highlight two significant problems with the classification. First, the classification is derived from a set of decision rules. At an aggregate level, the exact specification of these rules is not that critical because a small change in the criteria will lead to a small change in the classification. However, locally such small changes can be significant. A particular OA might for example change from being a village to a small town because of a small change in the criteria. Second, the classification does not consider the 'look' or 'feel' of a locality. It is simply an objective measure of the settlement pattern and context. This can lead to local anomalies where the classification does not correspond with the perceptions that local residents have about their area. Taken together these limitations suggest that users should be cautious when using the classification to describe an individual local area (The Countryside Agency *et al*, 2004:6). A critical problem with the classification in relation to this research is that it does not identify city centres, urban centres, or suburbs, which are traditionally recognised as being key localities for understanding commuting flows.

Research Methods

The purpose of this section is to summarise the methods that are adopted during the course of the research. There are three main components. The first part consists of an in-depth literature review of the processes that characterise the interaction of housing and labour markets. The second part consists of the methods applied to identify and delineate housing and labour markets at the sub-regional level. The third part consists of the approaches used to examine the interaction of housing and labour markets at the sub-regional level.

Literature Review

The first part of the methodology, the literature review, has implications for all aspects of the research. The literature review is intended to explore and critically examine the issues and processes that characterise the interaction of housing and labour markets. The aim of the literature review is to bring together research related literature with the objective of developing a consolidated theoretical framework to provide a foundation for empirically exploring housing and labour market interaction in the region. The study of the interaction of housing and labour markets is dependent on being able to define housing and labour markets. As such, a substantial proportion of the literature review is expended on exploring housing and labour market theory and the methods through which the two markets can be empirically delineated with the restriction that the markets be constituted at the sub-regional level.

The second stage of the literature review explores the process of commuting in order to elucidate the processes that connect the identified housing and labour markets on a daily basis. A theoretical basis for understanding the function of commuting in the context of housing and labour market interaction is established along with the key components of the commuting process. The consideration of the theoretical factors associated with commuting is complimented with a critical examination of the methods that could be adopted to study the dynamics of the commuting process. In addition, the third aspect of the literature review is focused on exploring the variables that structure the commuting process and therefore the daily interaction of housing and labour markets. Indeed, the review highlights the importance of 'people' and 'place' factors as determinants of the commuting process (see Coombes and Raybould, 2001; Owen and Green, 2005). In particular, 'people' factors are the demographic and socio-economic variables that influence the propensity to commute, whilst 'place' factors are the contextual variables related to a specific place that influence the propensity to commute such as spatial structure, population and employment decentralisation and the jobs-housing balance. The majority of the literature review was conducted at an early stage of the research prior to any empirical work being undertaken in order to provide a solid conceptual foundation for exploring the interaction of the markets. However, the literature review process continues throughout the research in order that new and up-to-date research can be integrated into the study.

Methods for Identifying and Delineating Sub-Regional Housing and Labour Markets in the North West

Validating the 1991-Based TTWAs as Approximations to Local Labour Markets
The review of the literature identifies the TTWA framework as the most applicable definition of sub-regional labour markets in the UK, and because the TTWAs are defined nationally, it is assumed that the most recent TTWAs could be adopted in the research. However, it is apparent that the 1991-based TTWAs are unlikely to be unaffected by changes in commuting trends and patterns between the 1991 and 2001 Censuses. In addition, changes in ward level geography, in particular, ward boundary changes through the creation and dissolution of wards between 1991 and 2001 cast further doubt on the appropriateness of retaining the 1991-based TTWAs. As such, it is recognised that the validity of the 1991-based TTWAs needs to be established in relation to working population and self-containment criteria, which are fundamental aspects of the TTWA framework (Coombes and ONS, 1998), in order to justify the retention of the 1991-based TTWAs in this research. Prior to undertaking the validity test, it is necessary to determine which TTWAs constitute North West TTWAs and which are non-North West TTWAs, which is determined by whether the job-foci of the TTWA is in the North West or an adjacent region.

The validity test involves three stages. The first stage of the validity test involves examining the relationship between the 1991 TTWA boundaries in relation to the 2001 ward geography. This aspect of the validity test focuses on the changes that have occurred to ward level geography between 1991 and 2001 to ascertain whether 2001 wards provide a good fit to the 1991-based TTWA boundaries. If there are overlaps between 2001 wards and the boundaries of the 1991-based TTWA boundaries, the boundaries between 2001 wards and the 1991-based TTWAs will need to be optimised by allocating wards that cut-across TTWA boundaries to a specific TTWA in order that all the TTWAs are self-contained in terms of boundary geography. This is achieved by applying a function outlined by Coombes and ONS (1998), which measures the strength of commuting links between different areas and thus provides a tool for allocating wards to a relevant TTWA.

The second stage involves determining the working population of the TTWAs. The level of working population for each TTWA is calculated by first establishing the number of workers who have their commuting destination within each of the wards that comprise a TTWA, determined through the aggregate SWS (Level 2) origin and destination matrix. Second, the working population totals for the wards that comprise a specific TTWA can be summed to give an aggregated working population total for each of the TTWAs.

The third stage of the process involves calculating the self-containment levels of each TTWA in the region. The TTWA self-containment levels are determined by applying a function that assesses the self-containment level of an area (Coombes and ONS, 1998). This function is based on the total number of people who both live and work in each of the TTWAs, which can be established from the origin and destination matrix of commuting, the number of workers who live in the area and the total number of people who work in the area. Following the calculation of the working population and self-containment of the TTWAs, an assessment needs to be made of the extent to which the 1991-based TTWAs can be considered as decent approximations to local labour markets in the North West.

Identifying and Delineating HMAs in the North West

Due to the lack of theoretical and empirical consolidation of the HMA framework in current literature, the initial aspect of the delineation of HMAs in the North West began with a deep conceptualisation of the HMA process. This initial conceptualisation led to the identification of four criteria that needed to be incorporated into the HMA framework. First, the delineation of HMAs should be based on the adoption of a measure of supply and demand for housing, represented by the origin and destination flows of migrants. Second, market search needs to be considered to take account of the process through which potential buyers search the housing market for suitable housing units, informed through continuous consultation with local estate agents. Third, the HMAs should incorporate a supply and demand-side self-containment measure and both sides of the self-containment measure should exceed a 70 per cent threshold if an area is to be considered a viable HMA (DTZ Pieda, 2004b). Fourth, the HMAs should have a close association in terms of size and scale to TTWAs.

The intramax procedure is adopted as the functional regionalisation approach (Masser and Brown, 1975) to analyse the structure of the migration matrix and to delineate functional market boundaries. It is a modified version of Ward's (1963) hierarchical aggregation procedure, which searches through groups of basic data units (BDUs) for pairs that are mutually most similar and these BDUs then remain fused throughout the remaining aggregation to create bounded areas. However, the intramax procedure does not include an objective basis by which the number of market areas can be determined because it is at the discretion of the user. Therefore, having overcome the issue of which functional regionalisation method to adopt in delineating the HMAs the next stage is to determine the number of HMAs that should be delineated based on market search data gathered through continuous consultation with local estate agents. The third aspect of the framework suggests that the HMAs should have a supply and demand-side self-containment of 70 per cent. Therefore, the self-containment measure is used as an indicator of whether a group can be considered a HMA. However, the self-containment measure is only useful once the groups have been delineated. Therefore, an additional component is needed to guide the initial identification of the core settlements around which the delineation of the HMAs would take place.

In the delineation of housing submarkets, Palm (1978) uses estate agent knowledge and expertise to guide the identification process. This approach provides a method for reducing the subjectivity inherent in the intramax procedure by using local knowledge and expertise of housing market professionals to identify the settlements that constitute core settlements in the region and around which HMAs could to be delineated. Initially, a number of settlements are identified which were considered to be the dominant settlements across the region and these were broadly consistent with the core TTWA settlements based on the assumption that HMAs and TTWAs are geographically comparable, which reflects the third aspect of the framework. In these settlements, the branches of national estate agents are contacted by telephone with the intention of compiling a list of settlements that constitute local housing markets. The identified core settlements are identified in the intramax programme through a newly developed feature that allows base units to be 'flagged' and groups are created around these cores. Following the grouping process, the supply and demand-side self-containment measures, which the intramax programme calculates, are examined. However, it is recognised that the consultation process with the estate agents provides advantages in the delineation of the HMAs. Therefore, the delineation of the HMAs is based on an iterative process, which draws on the self-containment of the HMAs and consultation with estate agents throughout the delineation process.

Method for Exploring the Interaction of Housing and Labour Markets

The method for exploring the interaction of the housing and labour markets is comprised of a number of components. The first part of the analysis involves determining the spatial intersection of the sub-regional housing and labour markets, and this is achieved using a GIS based approach (ArcGIS 9). The process first involves mapping the HMA and TTWA boundaries. The buffer tool in the *proximity* utility in the GIS software is then used to create buffers around the TTWA boundaries to identify intersecting HMAs and TTWAs. A conceptual typology is developed describing the nature of the intersection of the HMAs and

TTWAs, and this is used to classify the intersection of specific housing and labour markets. The second part of the analysis explores the spatial interaction of the HMAs and TTWAs at sub-regional level. The starting point for the analysis is the aggregation of ward level commuting flow data derived from the 2001 SWS Census dataset (Table W201). The result of the aggregation process is the creation of a 25x23 origin and destination matrix that records the number of commuters travelling from each of the HMAs (origins) to each of the TTWAs (destinations). Following the aggregation procedure, the analysis explores the volume of commuting in the region by exploring the degree of concentration of incoming commuting to TTWAs and outgoing commuting from HMAs measured using the Gini coefficient and Lorenz curve. The commuting flow approach is adopted to explore the spatial interaction of the housing and labour markets by drawing on a newly developed method for simplifying flow data termed the flow standardisation method. The aggregate commuting flows are then mapped using the *Flow Data Model Tool for ArcGIS 9.*

The third part of the analysis explores the distance travelled to work for both the home-end (HMA resident population) and work-end (TTWA workplace population) of the home-work trip through 2001 Census data. The fourth part of the analysis explores the mode of travel adopted by commuters, which is provided through the 2001 Census and SWS at ward level. The ward level flows are aggregated to derive sub-regional flows for each mode of travel (train, bus, car, bicycle, and foot) between origin HMAs and destination TTWAs. The flow standardisation method is adopted to simplify and analyse the mode of travel flow matrices.

The fifth part of the analysis explores the influence of people factors on the interaction of housing and labour markets. The SWS datasets from the 2001 Census of Population contain commuting flow data, which has been disaggregated based on a selection of demographic and socio-economic characteristics. The commuting flows are aggregated from ward level to explore the interaction of the sub-regional housing and labour markets based on different demographic and socio-economic characteristics and these are subject to the flow standardisation procedure and mapped. The analysis explores whether there is a significant difference in the interaction of local and non-local housing and labour markets based on commuter characteristics through a sequence of paired comparisons. For local and non-local interaction, an independent samples t-test is used to test for the presence of a significant difference in the composition of the commuters.

The final part of the analysis explores the influence of 'place factors' on the interaction of housing and labour markets and specifically the influence of employment and population decentralisation, and spatial structure. In relation to decentralisation, the analysis draws on a six-way ward based urban-rural classification and uses it to analyse the distribution of employment in different types of employment locations and the process of migration between different types of residential locations through the 2001 SMS at ward level (Table MG201). The classification is then used to explore the effect of decentralisation on commuting and specifically on the daily interaction of different types of residential and workplace locations. In relation to spatial structure, the ward based urban-rural classification is used to explore the impact of spatial form on commuting. The relationship between different residential and workplace locations and commuting distance is explored using the Spearman Rank Correlation for both the home and work-end trips of the commuting process. The analysis goes on to explore the affect of population and employment density on commuting distance by also undertaking Spearman Rank Correlations at ward level and sub-regional level.

Conclusion

In the first section of the chapter, a conceptual framework was developed to guide the study of the interaction of housing and labour markets. The development of the conceptual framework proved necessary due to the inefficiency of existing approaches at conceptualising housing and labour market interaction (Hanson and Pratt, 1988; Allen and Hamnett, 1991b; Wong, 2002). Indeed, Hanson and Pratt (1988) argue that the understanding of housing and labour market interaction has suffered as a result of the underlying view that housing and labour markets are essentially two separate spheres; consideration of their interaction has thus been explored in a narrow and limiting way. The authors argue that the access-space model (Alonso, 1964; Muth, 1969) has tended to dominate the conceptualisation of housing and labour market interaction, the result of which is an overgeneralisation of the interaction of housing and labour markets. This is further compounded by the fact that the access-space model has been shown to be inefficient at explaining 'actual' commuting behaviour, as have the alternative models developed to take into account the processes shaping housing and labour market interaction (e.g. employment and population decentralisation) (Van der Laan *et al*, 1998). Thus, Hanson and Pratt (1998:302) comment, '...the Alonso-Muth type models of urban spatial structure have sought to rigidify our way of thinking...and reinforce the status quo'.

The purpose of the conceptual framework developed in this chapter was to move away from the traditional modelling based approaches used to conceptualise housing and labour market interaction towards a framework that facilitates evidence based research. The framework was founded on the basis that the daily interaction of housing and labour markets can only be understood holistically through an understanding of the spatial and structural elements of housing, labour markets, and the process of commuting. The conceptual framework that resulted consisted of three steps. The first step emphasised the importance of spatial context in understanding housing and labour market interaction by advocating the delineation of spatial sub-regional housing and labour markets. The second step recognises that the interaction of housing and labour markets occurs on a daily basis through the process of commuting, and thus advocates establishing the nature of commuting between housing and labour markets. The third step involves determining the influence of 'people' and 'place' factors on the nature of the interaction of the housing and labour markets. The intention was to provide an adaptable but theoretically rigorous framework (informed by the literature review) that could be used to guide the research and to address the objectives and research questions posed.

The second section of the chapter briefly details the research methodology used in the study with the purpose of complementing the conceptual framework. The research relies almost exclusively on secondary data sources, and those adopted in the study were explored in detail to avoid duplication in forthcoming chapters. Whilst the advantages of secondary data are obvious, there are a number of problems and errors associated with secondary data sources, which were also explored. Finally, the methods adopted during the research, specifically the literature review, methods for identifying sub-regional housing and labour markets, and the methods adopted in determining the interaction of the housing and labour markets were briefly considered to foreground more detailed methodological discussions in the relevant empirical chapters.

CHAPTER 5

SUB-REGIONAL LABOUR MARKETS IN NORTH WEST ENGLAND

Introduction

The aim of this chapter is to validate the 1991-based TTWAs as approximations to current labour markets in the North West. The validation exercise demonstrates that despite the fact that the 1991 Census of Population is now outdated, the current 1991-based TTWAs continue to provide decent approximations to local labour markets in the region in the absence of a 2001-based definition. It is far beyond the scope of this research to define a new system of 2001-based TTWAs, so the approach adopted in this chapter seeks to optimise the 1991-based TTWAs to provide an assessment of the condition of the region's labour markets in relation to 2001 administrative boundaries and commuting data. The analysis highlights that some of the TTWAs have a self-containment level below the critical supply and/or demand thresholds. In the light of this, the potential factors underpinning the failings of the TTWAs are explored. However, the analysis highlights that in spite of the failing of some of the TTWAs, they continue to exhibit strong statistical meaningfulness and policy relevance, which supports their adoption in this research.

The Identification and Delineation of Local Labour Markets

Basic Assumptions of the TTWA Framework

Chapter 2 identifies the approaches which have been developed to conceptualise and identify the operation of local labour markets. It is recognised that the size and functioning of local labour markets vary in time and space and the development of TTWAs was considered to represent the tool through which policymakers could undertake comparative assessments of particular local labour markets. Initially, TTWAs were developed to provide a means for calculating local unemployment rates in the UK within specific geographical areas (Smart, 1974), but this function has increasingly been extended to include a plethora of additional applications, including being regarded as the official approximation to local labour markets in the UK.

Conceptually, TTWAs are assumed to represent relatively self-contained and internally contiguous labour market areas, which have been delineated for the entire country (Coombes *et al*, 1985) based on the interaction value of commuting flows (Cladera and Bergada, 2005). Theoretically, according to Peck (1989), the notion of the TTWA shares a considerable amount of commonality with the traditional neoclassical conception of the labour market, in which workers and employers compete with one another freely and as individuals (Hicks, 1932). The TTWA approach incorporates data from a randomly selected 10 per cent of the population detailing both home and workplace addresses at ward level in order to determine commuting patterns and is based on a number of assumptions. First, the derived TTWAs were developed as close approximations to self-contained labour markets. Second, the boundaries of the TTWAs were determined so that a minimum of 75 per cent of the journey-to-work trips have both their origin and destination within the same area. Third, each TTWA was required to have a minimum resident workforce of 3,500. Fourth, a limited size/self-containment trade-off was permitted so that large areas with a resident workforce in excess of 20,000 could have a self-containment level of 70 per cent. Therefore, the algorithm adopted is considered to provide a meaningful and accurate depiction of local labour markets in the UK based on statistical robustness and geographical relevance. The basic assumptions of the TTWA framework conform to the requirements of a market as established in Chapter 2. A TTWA represents an area in which sellers and buyers (suppliers and demanders) of labour meet to agree on a wage at which they are willing to exchange a given volume of labour services (Bosworth *et al*, 1996) and the supply of and demand for labour is represented through the structures of commuting flows.

Method for Assessing the 1991-Based TTWAs for the North West

The TTWA approach is an established method for delineating local labour markets in the UK. However, the fact that the 2001 TTWAs are yet to be produced for the UK means that the 1991-based TTWAs updated in 1998, provide the most current and readily available approximation of local labour markets in the UK (see Coombes and ONS, 1998). In a recent report to ONS, undertones have been made concerning the derivation of TTWAs using 2001 Census data but the consultation and discussion process is still ongoing (see

Coombes, 2002; Coombes and Casado-Diaz, 2005)[16]. Hence, the 1991-based TTWAs continue to be applied in policy and research contexts.

There is, however, recognition that the 1991-based TTWAs are unlikely to be entirely accurate or unaffected by changes in the nature of travel-to-work, which is likely to have occurred in the ten-years between the 1991 and 2001 Censuses and by changes, which have occurred in the administrative geography in the same period. As such, this section is concerned with the methods adopted to validate the 1991-based TTWAs by examining the extent to which the existing 1991-based TTWAs conform to the criteria used to define TTWAs when related to 2001 commuting flow data and administrative geography[17]. Therefore, any problems with particular TTWAs can be factored into the examination of housing and labour market interaction.

The first stage of the validity test involved examining the relationship between the 1991 TTWA boundaries, internal ward geography of the 1991-based TTWAs, and 2001 ward geography. This aims to highlight how changes that have occurred to administrative boundary geographies since 1991 have affected the nature and form of the 1991-based TTWAs. This aspect of the validity test focuses on the changes that have occurred to ward level geography between 1991 and 2001 so that any issues associated with the application of the 1991-based TTWA boundaries can be identified. The first aspect of stage one involves examining whether 2001 wards provide a good fit to the 1991-based TTWA boundaries. This provides a simple indicator for highlighting whether the 1991-based TTWAs provide a decent approximation to local labour markets in their original form or whether some form of alteration to the 1991-based TTWA boundaries is required. If there are overlaps between 2001 wards and the boundaries of the 1991-based TTWA boundaries, there is a need to optimise the boundaries between 2001 wards and the 1991-based TTWAs by allocating any wards which cut-across TTWA boundaries to a specific TTWA. This procedure ensures that all the TTWAs are self-contained entities in terms of boundary geography. This can be achieved by applying a function outlined by Coombes

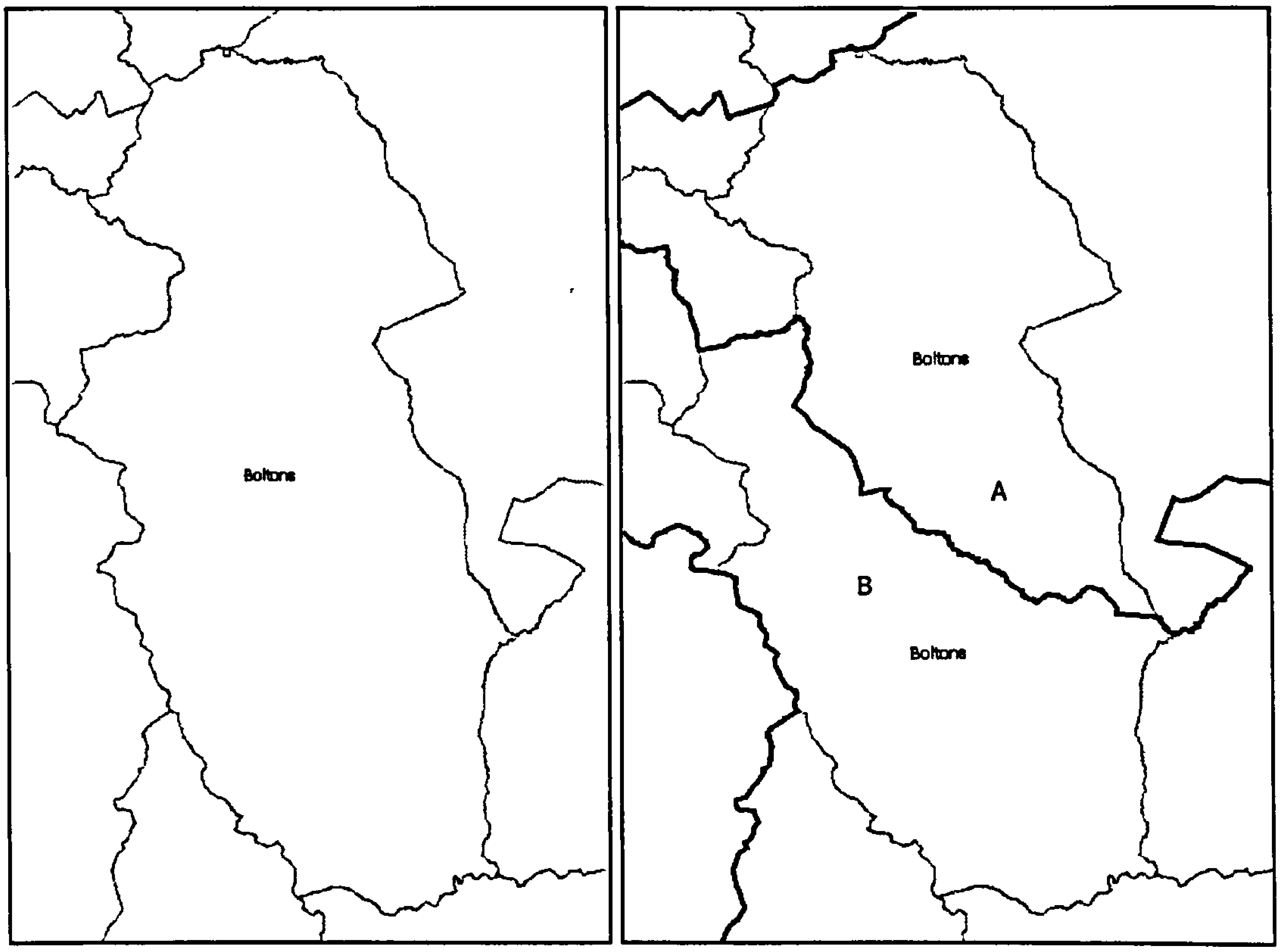
[16] At the time of finishing the research the draft 2001-based TTWAs were subject to approval by central government.
[17] The method used by Coombes and ONS (1998) in the delineation of the 1991-based TTWAs is outlined in Chapter 2.

and ONS (1998) which measures the strength of commuting links between different areas and thus provides a tool for allocating wards to a relevant TTWA.

Figure 5.1 illustrates the problem of TTWA boundaries cutting across 2001 ward boundaries through the example of the Boltons ward in the local authority district of Allerdale. Figure 5.1b highlights that the Carlisle (A) and Keswick TTWA boundaries (B) cut across the Boltons ward which means that the ward needs to be reallocated to a TTWA; this process is undertaken for all wards that are intersected by TTWA boundaries so that TTWA and 2001 ward boundaries correspond.

Figure 5.1: An Illustration of the Crosscutting of 1991-Based TTWA and 2001 Ward Boundaries

a) Boltons Ward in Allerdale b) 1991 TTWAs Cutting Across Boltons



The second stage of the test involved the examination of the working population as a cumulative total for the entire suite of TTWAs for the North West in order to highlight the extent to which TTWAs adhere to the 3,500 or 20,000 working population criteria. The level of working population for each TTWA was calculated by first establishing the number of workers who have their commuting destination within each of the wards that comprise a TTWA, determined through the aggregate SWS (Level 2) origin and destination matrix. Second, the calculated working population totals for the wards that comprise a specific TTWA are summed to give an aggregated working population total for each of the TTWAs.

The third stage of the process, which involved establishing the self-containment levels of each TTWA in the region, was achieved by applying a function that assessed the self-containment level of an area. This function is based on the total number of people who both live and work in each of the TTWAs, which can be established from the origin and destination matrix of commuting, the number of workers who live in the area and the total number of people who work in the area.

Definition of North West TTWAs

Prior to any test being undertaken to examine the validity of adopting the 1991-based TTWAs as approximations to local labour markets in the North West, it is important to highlight that no official definition of 'North West TTWAs' exists because administrative boundaries and TTWA boundaries do not necessarily correspond. As such, a number of TTWAs cut-across the North West GOR boundary, which means that a decision relating to the definition of which TTWAs constitute 'North West TTWAs' must be made. The definition of North West TTWAs was made based on the job-foci from which the TTWA was derived and 23 'North West TTWAs' are identified (Table 5.1). In addition to those North West TTWAs identified, Stoke (West Midlands), Haltwhistle (North East) and Settle (Yorkshire and the Humber) have some influence in the North West, but are predominantly confined to neighbouring regions. Whilst the Stoke, Haltwhistle, and Settle TTWAs (non-North West TTWAs) will be included to provide complete local labour market coverage for the region, they do not provide a focus for examination of 'North West TTWAs' in this study. The original 1991-based TTWAs, both North West and non-North West TTWAs, are illustrated in Figure 5.2.

Table 5.1: Identified 'North West TTWAs' and Their Core Sub-Regions[18]

TTWA Name	**TTWA Core Sub-Region(s)**
Appleby	Cumbria
Barrow-in-Furness	Cumbria
Blackburn	Lancashire
Blackpool	Lancashire
Bolton	Urban-Industrial Belt
Burnley	Lancashire
Carlisle	Cumbria
Crewe	Cheshire
Kendal	Cumbria
Keswick	Cumbria
Lancaster and Morecambe	Lancashire
Liverpool	Urban-Industrial Belt
Manchester	Urban-Industrial Belt
Nelson and Colne	Lancashire
Penrith	Cumbria
Preston	Lancashire
Rochdale	Urban-Industrial Belt
Warrington	Urban-Industrial Belt
Whitehaven	Cumbria
Wigan and St Helens	Urban-Industrial Belt
Windermere	Cumbria
Wirral and Chester	Cheshire
Workington	Cumbria

[18] Strictly speaking, the urban-industrial belt is not an official sub-region description; however, due to the significance of the urban-industrial belt for economic activity in the region it provides a useful generic description for the official Greater Manchester and Merseyside sub-regions, and was used in this way in the M62 Corridor Study (Nevin *et al*, 2001). The term urban-industrial belt has thus been adopted throughout the research and refers to the TTWAs of Bolton, Liverpool, Manchester, Rochdale, Warrington, and Wigan and St Helens.

Figure 5.2: 1991-Based North West TTWAs (after 1998 update)

Source: UK Borders (2003)

The Impact of Changing Boundaries on the Adoption of 1991-Based TTWAs

The first aspect of the validity test involved examining the extent to which changes have occurred to ward level geography between 1991 and 2001 to highlight any problems with current TTWA boundaries. Using GIS the 2001 wards that cut-across the boundaries of the 1991-based TTWAs were identified. This was important for isolating misfit wards that would need to be subjected to the reallocation process. A degree of caution was exercised in isolating the cross-cutting wards in this way because of human error associated with digitising ward and TTWA boundaries and the fact that inaccurate digitising of the two may account for some of the small discrepancies. The analysis reveals that 29 2001 wards were found not to fit perfectly within the 1991-based North West TTWAs. Of the 23 TTWAs in the region, 22 contain between 1 and 5 wards which overlap the boundaries of the TTWAs. As such, with the extent of the misfit of 2001 ward boundaries it is apparent that some reorganisation of the TTWAs is required in relation to 2001 ward and 1991 TTWA boundaries in order to improve the relationship between ward boundaries and TTWA boundaries.

Adjusting the 1991-Based TTWA Boundaries

It was necessary to adjust the boundaries of the original 1991-based TTWAs based on the current geography of the 2001 wards. In particular, ward reallocation is required in order to improve the degree of correspondence between 2001 wards and TTWA boundaries. The reallocation of wards is an important task when examining housing and labour market interaction because the flows of the commuters between the wards constituting the housing market areas (HMAs) and those constituting the TTWAs need to be attributed to a specific housing and labour market in order to assess the process of interaction. In the case of misfit wards, this is not possible because some flows will not be attributable to either one TTWA or another which detracts from the examination of housing and labour market interaction. The reallocation approach adopted here does not seek to delineate a completely new set of TTWAs based on the 2001 Census of Population. Rather, the approach retains the original 1991-based TTWAs and seeks to adjust the boundaries of the original TTWAs in order to reduce the issue of misfit wards to TTWA boundaries by identifying the TTWA with which the misfit ward had the closest commuting link. As such, the approach assumes that the foci identified in the 1998 method remain relevant. In addition, the allocation of misfit wards to the TTWA with which it had the closest commuting link reflects the fifth stage of the original method. This states, '...the area which was furthest from qualifying as a Travel-to-Work Area...was split into its component wards and *each of those wards allocated to the remaining area with which it had the closest commuting link*' (Coombes and ONS, 1998:4) (emphasis added).

Thus, the process of allocating wards to the TTWA with which it has the closest commuting link follows from the method used by Coombes and ONS (1998). The first stage of the process was to identify those wards that cut across 1991 TTWA boundaries as well as the TTWAs cutting across the ward. The next stage was to measure the strength of the commuting link between the ward and the TTWAs, so that the wards could be allocated to a particular TTWA. The commuting flows were derived from the 2001 Special Workplace Statistics (SWS) (Table W201), which recorded the origin and destination of travel-to-work flows between wards in the form of an origin-destination matrix. The approach adopted by Coombes and ONS acknowledges that the strength of the interaction between two areas cannot be determined by simply measuring in-flows of commuters. Rather, the decision was taken to attach a ward to a particular area based on the number of people who commute into the area from the ward concerned, but also based on the number who commute in the opposite direction. However, Coombes and ONS highlight that the allocation of a ward to a particular TTWA cannot be made through a simple comparison of the number of journeys involved because such an approach would favour larger areas that inherently attract larger volumes of flows in both directions (Coombes and ONS, 1998). Thus, it is not the measure of volume of flows on which the allocation process is based, but on the 'importance' of the flows between areas which is derived using the following formula:

$$\frac{Fa,b}{Ra} \bullet \frac{Fa,b}{Wb} + \frac{Fb,a}{Rb} \bullet \frac{Fb,a}{Wa} \qquad (1)$$

Where:

$F_{a,b}$ is the number of journeys to work from area A to area B.

R_a is the number of workers living in area A.

W_a is the working population of area A.

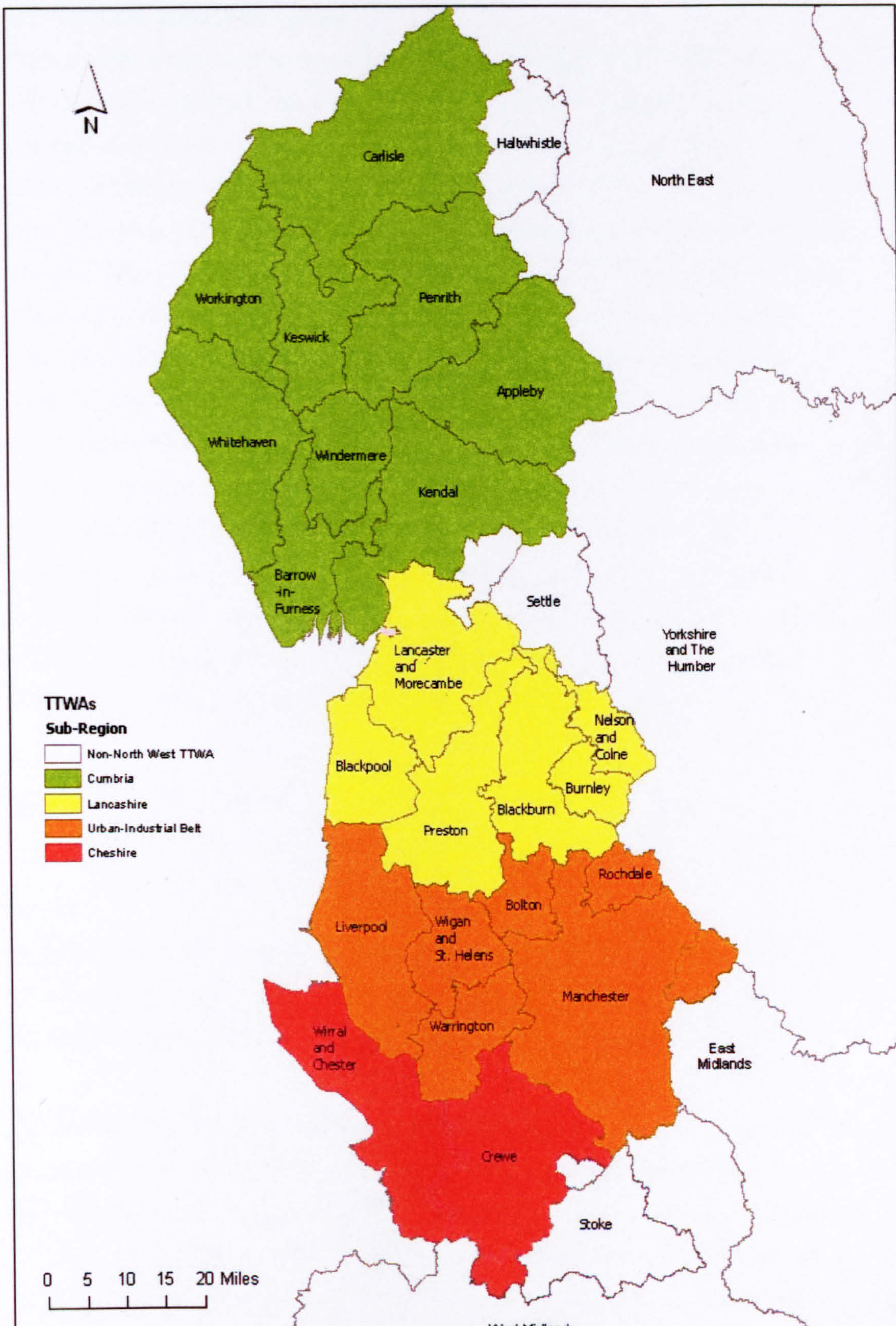
In calculating the formula, the commuting flow from area A to area B is measured as a proportion of the residents in area A and also as a proportion of the jobs in area B and these two proportions are multiplied together to give a measure of the 'importance' of that flow from the areas concerned and thus measures the 'importance' of the flows in each direction between areas A and B (Coombes and ONS, 1998:5). Thus, the 29 identified 2001 wards that cut across the 1991-based TTWA boundaries in the North West were subjected to the allocation process.

The first stage of the process was to calculate the number of flows between the ward in question (area A) and the TTWAs in question (area B) which were derived from the SWS origin and destination matrix of commuting for all North West wards. The second stage of the process involved calculating the number of workers who live in area A (ward) and the number of people who live in area B (TTWAs) which was again derived from the origin and destination matrix of commuters for all wards in the North West. The third stage involved calculating the number of people who worked in area A and area B. The difficulty is that workers who commute across the regional boundary from within the North West to other regions and from other regions into the North West are not accounted for in the origin and destination matrix of commuters in the North West. Therefore, the origin and destination matrix was extended outside of the North West to include the entire origin and destination matrix for England, Wales and Scotland. The results of the reallocation of the 29 wards are summarised in Table 5.2 and the adjusted TTWAs are mapped in Figure 5.3.

Table 5.2: The Allocation of Overlapping 2001 Wards to TTWAs

Area A (Ward)	Area B (TTWA 1)	Proportion	Area B (TTWA 2)	Proportion	Area B (TTWA 3)	Proportion	Allocation to TTWA
Long Marton	Appleby	0.00601	Penrith	0.00355	n/a	n/a	Appleby
Aighton, Bailey and Chaigley	Blackburn	0.0015	Preston	0.00018	n/a	n/a	Blackburn
North Turton with Tockholes	Bolton	0.00238	Blackburn	0.00062	n/a	n/a	Bolton
Waver	Carlisle	0.00471	Workington	0.00054	n/a	n/a	Carlisle
Lyth Valley	Kendal	0.00377	Windermere	0.00076	n/a	n/a	Kendal
Boltons	Carlisle	0.00048	Keswick	0.00288	n/a	n/a	Keswick
Kellet	Lancaster/Morecambe	0.00004	Settle	0.00385	n/a	n/a	Settle
Saddleworth West	Manchester	0.00337	Rochdale	0.00012	n/a	n/a	Manchester
Gisburn, Rimington	Blackburn	0.00066	Nelson & Colne	0.00087	n/a	n/a	Nelson & Colne
Higham and Pendleside	Nelson & Colne	0.00172	Burnley	0.00199	n/a	n/a	Burnley
Brierfield	Nelson & Colne	0.02379	Burnley	0.00825	n/a	n/a	Nelson & Colne
Ullswater	Penrith	0.00602	Keswick	0.00093	n/a	n/a	Penrith
Chipping	Blackburn	0.00001	Preston	0.0006	n/a	n/a	Preston
Lea	Blackpool	0.00062	Preston	0.006	n/a	n/a	Preston
Upper Lune Valley	Settle	0.00064	Lancaster/Morecambe	0.00201	n/a	n/a	Lancaster/Morecambe
Milton Weaver	Warrington	0.00102	Crewe	0.00045	n/a	n/a	Warrington
Seven Oaks & Marston	Warrington	0.00026	Crewe	0.0007	n/a	n/a	Crewe
Ditton	Liverpool	0.00039	Warrington	0.0121	n/a	n/a	Warrington
Culcheth, Glazebury and Croft	Warrington	0.00381	Wigan & St Helens	0.00136	n/a	n/a	Warrington
Farnworth	Warrington	0.00654	Wigan & St Helens	0.00004	n/a	n/a	Warrington
Windle	Wigan & St Helens	0.00665	Liverpool	0.00036	n/a	n/a	Wigan & St Helens
Hawkshead	Windermere	0.00248	Barrow-in-Furness	0.0013	n/a	n/a	Windermere
Coniston	Windermere	0.00242	Barrow-in-Furness	0.00072	n/a	n/a	Windermere
Staveley-in-Westmorland	Windermere	0.00544	Kendal	0.00568	n/a	n/a	Kendal
Staveley-in-Cartmel	Windermere	0.00143	Kendal	0.00063	Barrow-in-Furness	0.00166	Barrow-in-Furness
Crummock	Workington	0.00252	Keswick	0.00161	n/a	n/a	Workington
Wharrels	Keswick	0.00063	Workington	0.00163	Carlisle	0.00064	Workington
Aspatria	Workington	0.00686	Carlisle	0.00153	n/a	n/a	Workington
Distington	Workington	0.00725	Whitehaven	0.01203	n/a	n/a	Whitehaven

Figure 5.3: Adjusted TTWAs after the Reallocation Process and Core Sub-Regions



Determining the Viability of the Adjusted TTWAs: Working Population and Self-Containment Levels

Having applied the function developed by Coombes and ONS (1998) which allocates wards to the TTWA with which they have the strongest two-way commuting link, the next stage of the process was to assess an area's viability as a TTWA based on the working population and self-containment criteria outlined earlier. In the previous section, the working population was calculated from the origin and destination of commuting flows using the 2001 SWS (Table SWS2) for each of the TTWAs as part of the formula used to allocate wards to a particular TTWA based on the origin and destination matrix for England, Scotland, and Wales. This means that calculating the working population of the adjusted TTWAs involves adding the working population of the allocated wards to the working population of the TTWA concerned. The working population criteria could then be applied to determine which of the self-containment levels applies to each of the TTWAs. Further to this, Coombes and ONS (1998:6) outline the function used to assess the viability of an area as a TTWA, which is applied in this research to determine the self-containment levels of the adjusted TTWAs. The function applied is as follows:

$$\min\{ \frac{Fa,a}{Ra};\frac{Fa,a}{Wa};0.75\}x \qquad (2)$$

Where:

Fa,a is the number of people who both live and work in the area concerned.
Ra is the number of workers living in the area concerned (*demand side)*
Wa is the number of people who work in the area concerned (*supply side)*

The function applied by Coombes and ONS (1998) takes account of the issue of supply-side and demand-side self-containment. It also regards both sides of the self-containment criteria as being critical for assessing an area's viability as a TTWA, which contrasts with the approach applied by Smart (1974) in which, '...the lower [of the two figures] is regarded as the 'critical' self-containment level' (Smart, 1974:264). The results of the calculation of the working population and self-containment criteria are summarised in Table 5.3.

Table 5.3: Assessment of the Working Population and Self-Containment Criteria of the Altered TTWAs

TTWA Name	No of People Who Live and Work in TTWA (Fa,a)	Resident Workforce (Ra)	Working Population (Wa)	Self-Containment (Demand Side) (%)	Self-Containment (Supply Side) (%)	Pass/Fail on Working Population (Wa)	Pass/Fail (Demand-Side Self Containment)	TTWA Pass/Fail (Supply-Side Self-Containment)
Appleby	4,351	6,405	5,316	68	82	Pass	Fail	Pass
Barrow-in-Furness	33,063	38,569	37,202	86	89	Pass	Pass	Pass
Blackburn	100,495	139,605	126,616	72	79	Pass	Pass	Pass
Blackpool	117,848	147,248	127,718	80	92	Pass	Pass	Pass
Bolton	82,055	134,223	110,733	61	74	Pass	Fail	Pass
Burnley	28,251	44,319	42,396	64	67	Pass	Fail	Fail
Carlisle	47,475	53,027	54,621	90	87	Pass	Pass	Pass
Crewe	86,668	120,941	109,332	72	79	Pass	Pass	Pass
Kendal	21,905	29,935	27,507	73	80	Pass	Pass	Pass
Keswick	3,487	4,908	5,006	71	70	Pass	Fail*	Fail*
Lancaster and Morecambe	51,831	66,709	59,646	78	87	Pass	Pass	Pass
Liverpool	320,141	360,037	351,790	89	91	Pass	Pass	Pass
Manchester	785,659	864,003	937,638	91	84	Pass	Pass	Pass
Nelson and Colne	21,929	33,842	31,733	65	70	Pass	Fail	Pass
Penrith	12,834	16,293	17,209	79	75	Pass	Pass	Pass
Preston	128,145	170,461	164,203	75	78	Pass	Pass	Pass
Rochdale	45,626	71,450	64,163	64	71	Pass	Fail	Pass
Warrington	107,444	149,708	150,377	72	71	Pass	Pass	Pass
Whitehaven	24,344	30,354	31,251	80	79	Pass	Pass	Pass
Wigan and St Helens	121,844	178,092	168,812	70	72	Pass	Pass	Pass
Windermere	7,255	12,118	9,829	60	74	Pass	Fail	Fail*
Wirral and Chester	163,224	220,346	202,553	74	81	Pass	Pass	Pass
Workington	22,730	36,897	26,938	62	84	Pass	Fail	Pass

*Fall below the 75 per cent self-containment criteria required for an area with a working population below 20,000 workers.

Failed 1991-Based TTWAs: An Exploration of Some Contributing Factors

The most obvious factor, which has contributed to the failing of a number of the TTWAs, is changes in the pattern of commuting between the 1991 Census and 2001 Census. Commuting patterns have become increasingly complex which is illustrated by the continuation of the traditional pattern of commuting from residential areas in the suburbs to employment centres in the CBD and the more non-traditional commuting trends between urban residential locations and non-urban workplaces (see Van der Laan *et al*, 1998 Coombes and Casado-Diaz, 2005). In addition, the logistics of transport networks and increased car usage have seen the enlargement of TTWAs and the accelerated spatial disintegration between residential and employment locations (Wong, 2002).

There are a number of additional factors, which need to be explored in order to address the issues surrounding the failing of some of the TTWAs. Casado-Diaz (2000) applied an adapted version of the UK TTWA algorithm to Valencia and found that the supply and demand-side self-containment levels for the different base units used to derive the TTWAs were very similar which he attributed to the correlation between the number of jobs and the number of workers in the administrative units used to construct the TTWAs. However, when examining Table 5.3 it is obvious that the demand and supply-side self-containment measures are varied in the majority of the TTWAs, which is illustrative of the changing relationship in the TTWAs between the number of jobs in the area and the number of workers living in the area. Furthermore, there is likely to have been a significant change in the number of workers who both reside and work in each TTWA thus reducing the self-containment measure in conjunction with a change in the distribution of the number of resident workers living in the TTWA in question. It is likely that changing demographic and economic factors have been influential in extending commuting flows[19] (Coombes and Casado-Diaz, 2005).

[19] The reallocation of wards undertaken earlier, whilst necessary, might have contributed to the TTWAs failing the self-containment measure. As a test, the TTWA self-containment was recalculated without any of the overlapping wards included and it was found that Appleby, Keswick, Nelson and Colne and Windermere TTWAs all achieved the self-containment threshold, although Burnley, Bolton, Rochdale and Workington failed.

Interestingly, all of the TTWAs that failed did so in relation to the demand-side self-containment measure, which is indicative of changing demographic and economic circumstances in the TTWAs in question. Of the TTWAs that failed the self-containment criteria, an interesting pattern has emerged. Four of the failed TTWAs have job foci in Cumbria, whilst the other four have job foci in Lancashire and northern Manchester.

The failed TTWAs in Lancashire and northern Manchester have a close association with the housing market renewal pathfinders of East Lancashire, Oldham and Rochdale and Manchester/Salford, which have generally been characterised by population decline and have been significantly affected by economic restructuring. The Lancashire TTWAs failed the self-containment test on the demand-side measure which suggests that migration has affected the nature of the TTWAs by altering the resident working population composition and the internal commuting flow structure as people adjust to economic restructuring and associated social changes through migration and changes in commuting patterns (Turok, 1999; Bailey and Turok, 2000). The impact of population decline in the North West and thus changing patterns of commuting, including changes in East Lancashire and north Manchester, have been disguised by a lag between economic restructuring, which has been occurring over the last twenty years in the region (Wong *et al*, 1999), and changes in housing demand. As jobs have been lost and the nature of the national and regional economies have changed from traditional heavy industry to service sector employment, changes have occurred in housing demand, but these effects may not emerge immediately because those negatively affected by restructuring become economically inactive and remain in place rather than moving elsewhere. Indeed, Henley (1998) suggests that migration flows can be unresponsive to the state of the labour market and that owner-occupiers, in particular, do not appear to move from areas of high unemployment (see Chan, 2001). However, Turok (1999) suggests that out-commuting from areas of economic decline does not represent a sufficient or effective response to employment decline for lower skilled workers, in particular, who on average will tend to commute short distances to minimise transport costs or because of lower levels of access to private transport. This trend is problematic in that it exacerbates the incidence of social exclusion and fosters the cycle of decline and deprivation associated with localities affected by negative economic and social trends (see Brennan *et al*, 2000; Watt, 2003). This potentially forces people to move out of the housing market associated with the declining labour market, therefore, exacerbating the incidence of low demand and abandonment of housing (Keenan *et al*, 1999; Bramley and Pawson, 2002). Thus, the decline in demand for housing in many areas of East Lancashire and north Manchester reflects economic changes, which took place a decade or so earlier (Leather *et al*, 2003:49) and is likely to have contributed to the failing of some TTWAs.

Indeed, in a recent exploration of changing housing markets in Cheshire, Cumbria and Lancashire, Leather *et al* (2003) highlight that the area of Lancashire around which the failed TTWAs are focused has seen quite dramatic population movements, whilst Wong *et al* (1999) also identify East Lancashire as being an area where economic restructuring has been significant. The local authorities of Blackburn, Burnley, Oldham, Salford, and Trafford have all experienced net migration losses, whilst Bolton and Rochdale have also experienced out-migration across all age groups (Leather *et al*, 2003). Whilst TTWAs are not constrained by local authority boundaries, it is possible that differential migration rates, particularly losses, within the localities with which the failed TTWAs are focused have affected the self-containment of the TTWAs. It is likely that the cyclical cause for and consequence of the process of out-migration is housing market failure, changing tenure distributions (Watt, 2003), and changing economic characteristics of the TTWA. Burnley and Nelson and Colne have experienced net out-migration which is likely to have been influenced by housing market failure in areas within those TTWAs. An analysis of housing market trends in the North West, undertaken by Leather and Roberts (2004), highlights that a number of areas of East Lancashire, with which the Burnley and Nelson and Colne TTWAs are associated, are at risk from housing market failure and this problem is not only confined to the housing market renewal pathfinders. Leather and Roberts (2004) also highlight that the areas associated with the Nelson and Colne and Burnley TTWAs along with Blackburn form a low value housing zone which also includes the M62 Corridor within which lies the Bolton and Rochdale TTWAs[20]. The problem of out-migration and housing market failure in Burnley is also reflected in the fact that private sector

[20] The study uses house price data at postcode sector level between 1996 and 2003.

vacancy rates and housing association void rates increased significantly between 1996 and 2001 which is indicative of market weakness (Leather *et al*, 2003).

Interestingly, both Bolton and Rochdale TTWAs have experienced a net increase in population which contrasts with the net out-migration experienced by Rochdale and Bolton local authorities where housing market failure has been problematic, particularly in Rochdale but Bolton is also at risk from market failure (Leather *et al*, 2003). The increase in resident workers in the Bolton and Rochdale TTWAs from surrounding areas, despite housing market failure in some areas within the TTWAs, has meant that the supply-side self-containment measure has fallen below the 70 per cent threshold. This is likely to be because a high proportion of the workers who have moved into the TTWA have retained their original jobs and commute beyond the TTWA boundary within which they live (Gordon, 1988). Leather *et al* (2003) highlight that population decentralisation from metropolitan areas to towns and rural areas in East Lancashire is likely to have significantly altered travel patterns since the last TTWA delineation process and is likely to also have contributed to the changing levels of supply-side self-containment in the 1991-based TTWAs when related to 2001 data. Indeed, the semi-rural areas of both Rochdale and Bolton TTWAs contain stone-built houses that are particularly popular with upwardly mobile higher earner groups but these homes contrast significantly to the traditional terraced properties of the urban areas, which have been experiencing problems of low demand and abandonment. As such, the processes of population decentralisation, economic restructuring, changing commuting patterns, and housing market changes are the likely contributors to the failings of the Lancashire and north Manchester TTWAs.

Having examined the issues underpinning the failing of the Lancashire and north Manchester TTWAs it is important to account for the processes, which are likely to have contributed to the failing of the Cumbrian TTWAs. All of the failed TTWAs are rural focused except for Workington. As such, Workington has a number of similar problems to the urban focused TTWAs in Lancashire and interestingly the symptoms of low demand for housing are evident in the Workington and Whitehaven areas, which again is likely to have affected the nature of the TTWAs. Leather *et al* (2003) highlight that Allerdale and

Copeland, the dominant urban areas (with Carlisle) in Cumbria have been experiencing greater than projected decline in population. Furthermore, it is the west coast of Cumbria, running north from Barrow to Whitehaven and Workington, where the main concentrations of at risk housing are found and where concentrations of sales below £10,000 are prominent (in 2003). In addition, Allerdale has experienced a sharp increase in private sector vacancy rates and local authority void rates, which is a trend, which is similar to the areas in Lancashire where housing market changes have affected TTWA composition. Interestingly, the process of economic restructuring in Cumbria has affected West Cumbria in particular since the 1980s. The West Coast has experienced a significant decline in traditional industries and the emergence of central government promoted nuclear and defence industries, which meant that the industrial areas of West Cumbria became reliant on a limited number of employers, which proved problematic during the early-1990s when job reduction programmes were introduced by the major employers in the area (Knowles, 1999). Thus, the symptoms of housing market failure which seem to be increasing in the Workington area are likely to reflect the economic restructuring which has emerged in West Cumbria since the late 1980s and early 1990s and this economic decline is also responsible for high out-migration rates particularly of young people in the area (Leather *et al*, 2003).

In contrast to the processes, which have affected the urban focused Workington TTWA, Appleby, Keswick and Windermere are much more rural focused TTWAs. The processes that are affecting the three rural focused TTWAs contrast sharply with those that are affecting the Workington TTWA. The central Cumbrian belt, which roughly corresponds with the Lake District National Park and thus the Appleby, Windermere and Keswick TTWAs, is an area with high net migration gains and high property prices. The median house price in the local authorities (postcode level) with which the Appleby, Windermere and Keswick TTWAs are associated ranges from £85,000 in Appleby to £500,000 in Keswick and Windermere in 2003 (Leather and Roberts, 2004). A comparison of mean house prices at postcode level and mean income at postcode level in Appleby reveals that a ratio of between 4 and 5 is common, which highlights that affordability is a problem in the area[21].

The provision of affordable housing has been highlighted as a concern in Cumbria in the policy document *Making it Happen: the Northern Way* (ODPM, 2004). The problem of housing affordability can be related to the relatively lower wages available in agriculture and tourism compared with employment in other sectors such as in higher paid service sector jobs which may be accessed in larger urban areas but which are under represented in Cumbria. This means that the local population will find it difficult to access higher priced housing when earning comparatively lower wages in agriculture, tourism and manufacturing (Regional Economic Forecasting Panel, 2004) which is compounded by their lack of ability to compete with commuters moving into the area looking for a location which provides a good quality of life (Green, 1997). The issue of affordability is also a major issue in the Windermere and Keswick TTWAs where ratios of between 4 and 6 are common (Leather and Roberts, 2004). The inflated house prices in the areas concerned have been attributed to high population gains, second homeownership and holiday homes. The local authorities within and around the Lake District National Park, in particular South Lakeland and Eden and to a lesser extent Allerdale and Copeland and thus the TTWAs of Appleby, Keswick and Windermere have experienced rates of second homeownership of between 5 and 10 per cent which along with areas of North Lancashire is the highest in the region. As such, many local people, particularly young first time-buyers, do not have the financial means necessary to remain in the higher priced local authorities around the Lake District. This means that many are being forced to migrate to areas with lower priced property, which has the result of altering the composition of the associated TTWAs. This is also exacerbated by the fact that much of the in-migration and thus competition for properties can be attributed to retired individuals looking for a better quality of life which means that commuting to work is not a major factor for moving into the area. Thus, the failing of the Cumbrian TTWAs may be attributed to housing market failure in Workington, economic restructuring across the county

[21] The notion of what constitutes an 'affordable' property has been taken to be the traditional mortgage of 3.5 times as much as an individual's income (Morrison, 2003).

(and region), population mobility, and issues of housing affordability and second homeownership.

Finally, there are a number of technical issues that will have contributed to the failings of the TTWAs which must also be acknowledged. Measures of the sensitivity/stability of the 1991-based TTWAs are partly shaped by how comparable the 2001 data is to the 1991 data. As Coombes *et al* (2005:6) comment, '...if the new dataset [SWS dataset] has been collected in a very different way [from the 1991 SWS dataset], commuting patterns may seem to be very different even in areas where people's behaviour may have changed little'. Three key changes that might have contributed to the failing of the TTWAs in the North West have been identified. First, the 2001 data covers all in work, whereas the previous Census datasets were based on a 10 per cent sample. Second, in the 2001 Census, students were counted at their term-time address (Census day 2001 was during term-time) not at their parental homes unlike in 1991. Third, 2001 datasets were subject to Small Cell Adjustment Methodology (SCAM), which alters the many low values in commuting datasets. In addition, the 1991-based TTWAs delineation exercise sought to identify as many TTWAs as possible, which means that the inevitably some of the TTWAs had a final self-containment level only just above the critical threshold according to 1991 data. Consequently, changes in commuting behaviour and differences between 1991 and 2001 data are likely to have tipped existing TTWAs below the critical threshold according to 2001 data (Coombes *et al*, 2005).

Conclusion

This chapter addresses the sub-regional labour market dimension of the research by undertaking a validation exercise of the 1991-based travel-to-work areas in relation to 2001 Census data. In doing so, the analysis addresses two research questions posed in objective one. The first question is to what extent does the 1991-based TTWA framework provide a suitable conceptualisation of, and approximation to, current sub-regional labour markets in North West England?

The interaction between supply and demand for labour tends to operate predominantly at the local level. Indeed, local labour markets tend to reflect the process whereby the majority of people limit their journey-to-work, and as long as this process continues and job opportunities remain relatively clustered, then labour markets will continue to be localised (Coombes *et al*, 2005). A number of approaches have been developed to delineate local labour markets dominated by the functional regionalisation of commuting flow data from Census records. Although the TTWA approach has been criticised on a number of counts (e.g. see Ball, 1980; Green *et al*, 1986; Peck, 1989), the framework is internationally recognised as a robust and flexible approach for defining local labour market areas (Casado-Diaz, 2000). This is illustrated by the fact that the approach has been applied in Italy, New Zealand, and Spain in defining functional labour markets areas (Coombes *et al*, 2005). Thus, in a generic sense the TTWA framework offers a suitable and widely accepted approximation to local labour markets both in the UK and within a wider international context.

However, the key issue in relation to this research is the extent to which the 1991-based TTWAs provide a suitable approximation to *current* local labour markets in the North West. The analysis of the 1991-based TTWAs has revealed a number of important insights into the functioning and current condition of the North West TTWAs. All of the TTWAs contain a resident workforce greater than 3,500 workers, with 19 of the 23 TTWAs containing a resident population exceeding 20,000 workers. The TTWAs which have a resident workforce of less than 20,000 are predominantly rural focused or centred on smaller urban settlements and are largely confined to Cumbria whilst those, which have a resident workforce greater than 20,000, are predominantly urban focused TTWAs. Arguably, this reflects the fact that the North West has a high urban population, despite over half the region being rural. This means that areas surrounding urban settlements are closely connected to the urban area as people living in suburbs, semi-rural and rural areas commute on a daily basis into the larger urban settlements for employment (see Moss *et al*, 2004). However, an important factor, which may also have contributed to the dominance of urban focused TTWAs, is the method used to delineate the TTWAs. The first stage of the procedure identifies wards, which are likely to form part of the core to a TTWA, and the second stage combines those core wards, which have strong commuting links with each other to form areas of job foci. Therefore, due to urban areas containing a high proportion of employment when compared to rural areas, the dominance of the 'urban' in the TTWAs must be expected. Thus, the 1991-based TTWAs meet the working population criteria outlined in the TTWA algorithm and in this sense do provide decent approximations to local labour markets.

However, the analysis reveals that on the self-containment criteria a number of the TTWAs have failed. This reflects the findings of Coombes *et al* (1985) when the 1978-based TTWAs were compared with the then updated 1984 TTWAs (also see Coombes *et al*, 2005). Of the 23 North West defined TTWAs, 6 failed on one side of the self-containment function. They are Appleby, Bolton, Nelson and Colne, Rochdale, Windermere and Workington whilst 1 TTWA, Burnley, failed on both sides. In addition to the TTWAs that failed to meet either or both of the self-containment levels, Keswick failed on both counts of the self-containment function based on the trade-off criteria. Keswick has a resident workforce below 20,000, which means that a self-containment level of 75 per cent was required under the trade-off criteria; however, Keswick's demand-side (71%) and supply-side (70%) self-containment failed to meet these criteria[22]. Such problems can only be expected due to the changes that have occurred in commuting patterns between 1991 and 2001, which have resulted in a reduction of the self-containment level of some of the TTWAs to below the designated self-containment levels (Coombes *et al*, 1985). In addition, these TTWAs also tend to have smaller populations, which make them prone to experience extreme change in boundary definitions unlike some of the larger TTWAs such as Liverpool and Manchester, which tend to be more stable in this respect (Coombes *et al*, 2005).

In relation to making a decision on whether to adopt the 1991-based TTWAs in this research, two key criteria were considered: statistical meaningfulness and policy relevance. In relation to statistical meaningfulness, the analysis reveals that the majority of the TTWAs retain a relatively high level of self-containment including those that have failed the self-containment measure. Coombes *et al*

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[22] In relation to the calculation of the self-containment measure, it is important to highlight that the levels of self-containment for the TTWAs have been calculated without any kind of adjustment for different sub-group supply and demand-side self-containment which is an issue that some commentators have argued needs to be incorporated into the TTWA delineation process (see Green *et al*, 1986; Casado-Diaz, 2000).

(2005) reveal that the current North West TTWAs are the least prone of any region to have 2001 self-containment values below the critical threshold. This reflects the fact that the region was strongly affected by previous rounds of TTWA revision, which has resulted in the creation of some relatively large TTWAs, which are less likely to have low 2001 self-containment thresholds. Coupled with this, the 1991-based TTWAs are the official UK TTWA framework, which suggests that the 1991-based TTWAs continue to have relevance in relation to policy. On the basis that the 1991-based TTWAs in the region exhibit comparatively strong statistical meaningfulness and policy relevance, it is reasonable to assume that the 1991-based TTWAs can be considered approximations to local labour markets in the region. However, the inherent problems in retaining the 1991-based TTWAs need to be acknowledged. This leads on to the second research question, which asks what factors are likely to underpin the condition of the 1991-based TTWAs, and specifically TTWAs that fail the validity test?

The analysis highlighted that the most obvious factor underpinning the failing of the 8 TTWAs were the changes that have occurred in commuting between the 1991 Census and 2001 Census. Indeed, Coombes *et al* (2005) highlight that TTWA self-containment levels have tended to fall due to sustained growth in car use, fewer jobs in traditional sectors where local working was common, employment decentralisation, greater affluence to support longer distance commuting, and more dual-earner households who cannot live near both workplaces. In addition to changes in commuting, a number of additional factors were also identified. In particular, changing demographic and economic circumstances in the TTWAs in question are likely to have contributed to the failing of the 8 TTWAs. The 4 failed TTWAs in Lancashire and northern Manchester tend to include areas of low value housing and most notably the housing market renewal areas of East Lancashire, Oldham and Rochdale, and Manchester-Salford. In addition, economic restructuring, population decentralisation, and the subsequent changes in commuting patterns have been identified as contributing to the failing of the 4 Lancashire and northern Manchester TTWAs. The 4 failed TTWAs in Cumbria can be attributed to housing market failure (specifically in Workington), economic restructuring, population mobility, and issues of housing affordability and second homeownership (Leather *et al*, 2003).

Overall, the analysis supports the adoption of the 1991-based TTWAs based on the TTWAs retaining a high degree of statistical meaningfulness and policy relevance, which is supported by the analysis of Coombes *et al* (2005). However, the analysis also highlights the pressing need to improve the TTWA delineation process, particularly in relation to the time difference between the Census, the publishing of the interaction data, and the final publication of the updated TTWAs. However, in the mean time the validation exercise provides a methodology that can be used to assess the condition of the existing TTWAs and thus to overcome the cyclical time gap between the publishing of new census data and the availability of newly defined TTWAs.

CHAPTER 6

SUB-REGIONAL HOUSING MARKETS IN NORTH WEST ENGLAND

Introduction

Prior to the mid-1990s, the economic component of housing market research in the UK tended to focus on the role of housing in the national economy and on the regional structure of the national housing market (Ermisch, 1990; Clapham, 1996). Subsequently, Maclennan and Tu (1996) prompted the adoption of a research agenda that focuses on the structure and functioning of local housing markets in the UK. In recent years, national housing market research and policy has come to acknowledge that housing markets are heterogeneous and characterised by locally specific issues, which cannot be sufficiently engaged with through a narrow research and policy agenda that focuses predominantly on the national housing market (Robinson, 2003; Wallace, 2004). However, precisely how local housing markets should be defined and delineated has been subject to increasing debate (Maclennan *et al*, 1990; Forster *et al*, 1995).

Traditionally in the UK, local authorities are responsible for coordinating local housing provision and, in particular, for establishing the amount of land required for the provision of new housing. The centrality of local authorities in housing provision has had considerable impact on housing market analysis and policy development because of the acceptance of local authority administrative boundaries as approximations to local housing markets. However, recently there has been a more concerted effort to address the issues of identifying and analysing housing market functioning in the UK literature (see Watkins, 2001; Jones, 2002; Jones *et al*, 2003; Jones *et al*, 2004; Jones *et al*, 2005). Significantly, the Scottish context has provided the most advances in the sub-regional agenda through the housing market area approach (HMA) due to the requirement to identify HMAs in structure plans in Scotland (see Jones, 2002). In contrast, in England, with the exception of a limited number of instances (e.g. DTZ Pieda, 2004a; Bibby, 2005; Coombes and Champion, 2006; Coombes *et al*, 2006) the focus on HMAs at the sub-regional scale has been limited and lacking in empirical investigation.

However, the policy context and administrative landscape within which housing market analysis is undertaken was transformed in 2003 with the establishment of Regional Housing Boards (RHBs), charged with the delivery of policies outlined in the sustainable communities agenda (ODPM, 2003), and responsibility for preparing Regional Housing Strategies as a basis for strategic housing investment in England. In addition, the Barker review (2004) recognised that current methods of housing need assessment, particularly in relation to supplying housing, were inadequate and called for the integration of RHBs with Regional Planning Boards. This would provide the basis for overseeing the collection and aggregation of housing market data from the local, sub-regional, and regional levels, and would improve housing market governance and policy development in England.

The case for establishing HMAs can also be made in relation to the new RSS. PPS 11 *(Regional Spatial Strategies)* highlights the fact that the RSS for each of the English regions '...will need to provide housing figures for individual districts or appropriate *sub-regional housing market areas*' (ODPM, 2005c:2) (emphasis added) and this has been reinforced in the *Planning for Housing Provision* Consultation Paper (ODPM, 2005d). However, the task of understanding the functioning of housing markets has been aided through the *Housing Market Assessment Manual* (DTZ Pieda, 2004b), which offers guidance to local authorities and their partners in respect to '...developing a more strategic, long-term view of housing demand and need' (DTZ Pieda, 2004b:1). The manual describes how a housing market assessment might be undertaken in a 10-stage process, of which one stage is to determine the spatial extent of an area to be assessed. The manual suggests that '...partners need to try to determine which grouping of local authority boundaries operate as a housing market area and thus the boundary of the housing market assessment' (DTZ Pieda, 2004b:16). In addition, the manual comments, 'in establishing the housing market area, the team may make a pragmatic decision to align identified functional boundaries with administrative areas to simplify information collection (DTZ Pieda, 2004b:27). However, local authority boundaries have little functional meaning within the housing market system in terms of operation or economics and this is likely to undermine housing market analysis and policy development (Cullingworth, 1997). However, the manual does advise that in defining a HMA, consideration should also be given to patterns of relocation within a local area by homeowners and tenants; travel-to-work patterns, which analyse the relationship between residential and workplace locations; and the identification of core and periphery areas for the HMA (DTZ Pieda, 2004b:27). In addition, recent government sponsored research explores the potential offered by the HMA and TTWA approaches as methods for defining city-regions (e.g. Robson *et al*, 2006).

In response to the issues raised, there is a pressing need to adopt an approach to conceptualise and identify housing markets at the sub-regional level which does not rely on the use of convenient administrative boundaries and which incorporates economic reasoning (e.g. see Parr, 1995). As such, the aim of the chapter is to draw on recent theoretical and methodological debates surrounding HMA definition to develop a framework for delineating sub-regional HMAs. The chapter begins by developing a conceptual understanding of the HMA framework and by considering the concepts and practicalities associated with developing and delineating a system of HMAs. The methodology gives particular emphasis to the iterative use of the functional regionalisation of inter-ward migration flows to identify groupings that constitute HMAs, in a process that is informed by estate agent knowledge of local housing markets.

Conceptualising Housing Market Areas

Defining HMAs

The HMA approach provides a break from the traditional economic analyses of housing markets, which has generally focused on individual urban housing markets, housing markets at the regional scale or broad brush macroeconomic considerations of national housing market trends (see Maclennan, 1982; Ermisch, 1990; Clapham, 1996; Ermisch *et al*, 1996). Recent research has highlighted that the sub-regional scale has emerged as a central component of planning activity because of the acknowledgement that certain tasks and policies can be more appropriately managed and implemented at the sub-regional level than at either the regional or the local levels (Roberts and Baker, 2004). In relation to housing markets, there has been a limited amount of research into the nature, functioning, and form of housing markets at sub-regional level. However, a number of principles and concepts can be identified which should be accommodated in the delineation of HMAs. In this respect, government guidance provides a useful starting point. The *Housing Market Assessment Manual* identifies two important definitional criteria, which HMAs should satisfy. First, it suggests that HMAs are 'areas within which people are willing to search for housing', and second, that HMAs are 'geographical areas which contain both the origin and destination of the great majority of households who move' (DTZ Pieda, 2004b:26). A similar HMA definition is expressed as 'geographical areas within which there are clear links between where people live and work' (ODPM, 2005e:1). The overwhelming concern of these definitions is with commuting and migration patterns, which means that a further variant can also be imposed in which a HMA is defined as '...the geographical area within which most people both live and work and where most people moving home (without changing job) will have sought a house' (O'Sullivan *et al*, 2004:42).

The implications of the definitions are that the method for delineating HMAs should reflect the strong relationship between home and work location (commuting and migration), while acknowledging the role played by 'market search' within which prospective migrants seek to move. Local labour markets have been operationalised through identifying TTWAs (Coombes *et al*, 1979; Coombes and ONS, 1998) and the case for applying similar principles in the analysis of migration flows is strong (Maclennan and Banister, 1995). Indeed, TTWAs are defined on the basis that they achieve a high level of self-containment and it is recognised that HMAs should share this criteria (Jones, 2002; DTZ Pieda, 2004b). Due to the difficulties associated with examining migrants search behaviour over a wide geographical area, it is proposed, reflecting advice offered by DTZ Pieda (2004b), that HMA definitions should be undertaken through consultation with local estate agents. Having acknowledged some of the definitional issues associated with HMA delineation it is necessary to explore the concepts and practical issues in detail to better inform the methodological framework needed to delineate the HMAs. The purpose of the discussion is to outline some of the alternative approaches of conceptualising aspects of the HMA delineation that are identified in the literature, and to make explicit why certain aspects have been incorporated into the HMA framework.

Market Search Analysis

According to DTZ Pieda (2004b:26), 'a housing market area should be defined by reference to the patterns of household movement. A market exists whenever willing buyers and willing sellers are in contact with one another'. A housing market is created whenever an individual wishes to purchase a residential property, generally accompanied by a move from an occupied property to take up residence in another property, leading to a migration flow. Market search is the first stage in the household migration process within a heterogeneous housing market that offers incomplete information on prevailing house prices (Jones, 2002; Evans, 2004). In this instance, it is recognised that consumers do not have access to perfect knowledge of the market and it is unrealistic to assume that that consumers can engage in classical utility maximising behaviour (Simon, 1959). Indeed, Stigler (1961; 1962) suggests that consumers (and producers) search the market to find available alternatives. However, Stigler also highlights that the process of search incurs a number of costs and that the individual has to balance the cost of the search process with the acquisition of knowledge. Furthermore, the search process is influenced by market intermediaries (such as estate agents and mortgage lenders) who are able to provide individuals with *some* of the necessary information required to make a decision (Bassett and Short, 1980). This allows individuals to narrow a large sample of properties into a sub-sample of ideal properties for the household based on a number of criteria from location to property characteristics. This process informs demand for housing, and households in this last stage of the search process will ultimately alter their consumption by moving house. Thus, market search influences migration patterns and the development of HMAs.

The problem with market search as a definitional concept is the scale of the task required to gather a significant amount of information at a large geographical scale. To gather market search data, a qualitative data collection strategy would need to be adopted to understand how and where households have been searching and it would be almost impossible to realistically collect data from all households moving across a large geographical area. However, professional opinion, gathered from estate agents, is likely to increase understanding of search behaviour in influencing the development of HMAs.

Spatial Arbitrage

Spatial arbitrage relates to the process of buying and selling a good at a uniform price. For this to occur, in relation to the housing market, buyers can and do consider transactions at any point in a geographical area to be an appropriate substitute and that spatial arbitrage occurs (Jones, 2002:552). Indeed, Stigler and Sherwin (1985:555) suggest, 'The role of the market is to facilitate the making of exchanges between buyers and sellers'. A key feature of housing (and labour) markets is that while the product is immobile, the consumers are mobile. However, Jones (2002) suggests that the principles associated with market definitions, namely supply, demand, and price uniformity should be applied in the definition of a HMA. Thus, Jones' definition of HMAs draws on migration patterns and the measurement of market size, represented by transaction counts over a given period, to identify market areas within which house prices are determined.

The spatial arbitrage principle provides a basis for conceptualising and delineating HMAs. However, there is an obstacle, which reduces the applicability of spatial arbitrage as the definitional concept in *England*. Spatial arbitrage is a measure of transactions through space and whilst Jones (2002) delineates HMAs based on migration flows, the data used was taken from the Sasines database. The database records actual transactions and the characteristics of the property, the address, the sale price, the date of registration and the origin of the mover over a ten-year period in *Scotland*. It is also a long-term dataset, with a large sample, which records actual housing transactions (approximately 95% of transactions are recorded), which makes it an appropriate dataset for delineating HMAs based on the principle of arbitrage. However, a Sasines-style database does not currently exist for England. The closest database available is the Land Registry Sales data, which records housing transactions in England and Wales but does not contain the same detail as the Sasines database. The Land Registry sales data may be used to illustrate market size by determining the total number of transactions, once the market areas are delineated, but it cannot be used to illustrate spatial arbitrage because the origins and destinations of each specific move are unknown. Rather, the delineation of HMAs in England is likely to draw on migration origin and destination matrices from the Census of Population. However, as a source of individual property transactions, the Land Registry enables the estimation of a 'neighbourhood price', and areas of price uniformity for different categories of property, which has been used as an alternative approach for HMA delineation (Bibby, 2005).

The Supply and Demand Measure

The practical problems associated with the use of methods based on market search and spatial arbitrage prompt consideration of alternative primary guiding principles for HMA delineation in England. The approach adopted here is based on the notion that flows of migrants reflect interaction between the supply of, and effective demand for, housing within a defined market area. This originates in the observation that it is consumer behaviour, as opposed to administrative boundaries, that defines housing markets (Meen and Meen, 2003; DTZ Pieda, 2004b), based on the assumption that consumers and producers consider transactions at any point within an area to be a substitute for transactions at other points in the area (Stigler and Sherwin, 1985).

As such, consumers *demand* housing within a market area whilst producers (building companies and sellers) *supply* housing in the form of new stock, conversions or existing stock. In theory, movers will substitute their dwellings with other dwellings, having engaged in market search and the resulting migration patterns reflect the result of supply and demand regimes, albeit operating in different ways for different tenures and different socio-economic groups. Interestingly, this relationship has been explored in the work of Leishman and Bramley (2005) who used Scottish data to estimate a supply-demand model of a housing market system, with separate equations being calculated for inward and outward household migration.

Jones (2002) highlights that migration patterns are not a pure measure of demand and that they are unable to determine excess demand because unsuccessful movers are not included in migration statistics. In addition, migration flows relate to individuals rather than household to households and the demand for housing is more a function of household numbers and formation rates than the number of individual migrants. Further, such flows fail to take into consideration unrecorded demands represented by the homeless and inadequately housed (Coombes and Champion, 2006). Despite these concerns, Jones suggests that household migration patterns, while only measuring effective demand, provide an appropriate measure of the spatial extent of a HMA because they take account of the essential tenet of spatial arbitrage (Jones, 2002:554). The latter refers to the identification of areas within which spatial arbitrage occurs as a consequence of the establishment of a high degree of supply, demand, and price uniformity (Klein *et al*, 1985), which are key characteristics of a HMA.

HMA Size

The size of the housing market is a significant issue to consider when delineating HMAs. HMAs are by purpose, scale and definition sub-regional housing markets in the same way that TTWAs constitute the sub-regional definition of a labour market. Scottish Homes (1993:20) define HMAs as '...an area in which the majority of those moving house (migration), without changing jobs, would stay, and an area in which the employed population both reside and work'.

This definition is based on the assumption that the majority of people will move within a reasonable distance to their workplace in order to minimise the costs associated with commuting to work (Kain, 1962). Rouwendal (1999) has highlighted that households will adjust their residential location, and sometimes job location, in order to shorten the commute. Thus, jobs and housing locations are interrelated (Clark and Huang, 2004) both in space and in relation to the decision-making regimes adopted by the household for balancing home and workplace locations. In addition to commuting factors, a number of additional elements are also likely to be important in residential location decisions. In relation to housing markets, most people will seek to buy or rent a house within a geographically limited area, reflecting personal, social, and economic networks, such as access to family, friends, and education facilities (DTZ Pieda, 2004b). Clark and Huang (2004), drawing on the British Household Panel

Survey, highlight that of the 10 per cent of total migrating households each year (Green, 2004), only 3.4 per cent of all migrating households make a long-distance move. Green (2004) shows that, according to the 2001 Census of Population, three in five moves are less than 10 km and only one in eight are more than 200km. This supports the contention that migration for the majority of households is geographically constrained.

As HMAs and TTWAs represent sub-regional market areas, in principle HMAs and TTWAs might be expected to share a number of common features (Coombes and Champion, 2006; Coombes *et al*, 2006). These are likely to include a degree of similarity in their extent and boundaries, consistent with expectations that people will move home within their existing TTWA and that those people who are not moving within their TTWA are moving outside the TTWA because of a change in employment (Scottish Homes, 1993; Jones, 2002; DTZ Pieda, 2004a). In addition, Jones (2002) highlights that the access-space model for monocentric urban areas should be contained within a single HMA, equating more or less to a TTWA, and that the HMAs of polycentric urban areas are also likely to have a close association with TTWAs as the former are likely to be equivalent to, or embedded in, the latter. Therefore, it follows that within a given region, one would expect to find a similar number of sub-regional HMAs and TTWAs that share similar geographical coverage.

HMA Self-Containment

The definition put forward by DTZ Pieda (2004b) suggests that such areas have relatively closed migration patterns. This is consistent with the notion that a HMA should have internal coherence, implying a group of contiguous areas with a high degree of self-containment, with minimal inward migration from surrounding areas (Jones, 2002). In addition, it is also consistent with the more general definition of a spatial housing market, which is defined as a '...contiguous geographic area, more or less bounded, within which it is possible for a household to trade or substitute one dwelling unit for another without also altering its place of work or its pattern of social contacts' (Bourne, 1981:73).

However, an appropriate self-containment threshold needs to be established within the HMA framework which is low enough as to not unrealistically constrain the delineation of the HMAs but which is high enough to enable the identification of HMAs with relatively closed migration patterns. Jones adopts a 50 per cent self-containment threshold (which is then systematically varied) for a dataset over a ten-year period in the region related to the former Strathclyde Regional Council. However, when basing HMA delineation on a single-year migration flow dataset, DTZ Pieda (2004b) suggest that a HMA with a self-containment level below a 70 per cent threshold should not be regarded as a single market but as part of a wider HMA. The 70 per cent self-containment threshold is attractive in that it is consistent with the self-containment threshold adopted in the delineation of the TTWAs. The TTWA framework is based on the principle that a minimum of 75 per cent of the journey-to-work trips have both their origin and destination within the same area but large TTWAs, with a resident workforce in excess of 20,000, the self-containment level is reduced to 70 per cent. The provides a basis for justifying the adoption of the 70 per cent measure.

A further issue to consider is the form of self-containment that could be adopted. A supply-side measure is expressed in terms of moves to a dwelling within an area as a proportion of those moving out of an area with respect to migration flow origin, which was the approach adopted by Jones (2002). In contrast, the TTWA approach contains both a supply and demand-side self-containment measure, which takes account of those commuting within the TTWA and from other areas across the TTWA boundary. The adoption of a supply and a demand-side self-containment measure would increase the robustness of the HMA framework by considering the effect of migrants originating from within the HMA (supply-side) and those originating from outside the HMA (demand-side).

Distinguishing between HMAs and Submarkets

Since the 1970s, empirical research has sought to identify housing submarkets and, whilst the methodology used to delineate submarkets is problematic, the consensus is that submarkets exist (Jones *et al*, 2003). Submarkets are thought to occur because housing markets operate in a state of disequilibrium due to the existence of segmented demand and differential supply, as well as imperfections in consumer knowledge and market operations (Whitehead and Odling-Smee, 1975; Rothenberg *et al*, 1991; Maclennan and Tu, 1996). Indeed, it is these factors, which are thought to underpin the differential house prices within each submarket (Watkins, 2001).

The need to distinguish between HMAs and submarkets remains a problem in HMA identification. As already noted, HMAs should equate with either a single settlement, or a group of contiguous settlements, that can then be disaggregated into submarkets (Jones *et al*, 2005). This means that in sub-regional housing market terms, smaller settlements may best be characterised as an extension of a larger settlement's HMA and ultimately disaggregated into a submarket of a more dominant sub-regional HMA (Jones, 2002; DTZ Pieda, 2004a; Jones *et al*, 2005). However, the distinction between HMAs and submarkets is problematic because submarkets have been shown to have relatively high self-containment levels in relation to migration flows (Jones *et al*, 2004; Jones *et al*, 2005). Therefore, there is a practical requirement of deciding which settlements constitute markets in their own right and which settlements should be grouped with contiguous settlements as a submarket.

The identification of submarkets usually follows a three-step procedure (see Schnare and Struyk, 1976; Watkins, 2001; Jones *et al*, 2005), which is data intensive and impractical except for single studies on a small scale (Jones *et al*, 2005). This means that testing for submarkets on a large-scale, and using the definitions to inform HMA delineation, is unrealistic. Whilst submarkets are thought to exist because of market imperfections, which constrain the arbitrage process, HMAs are characterised by a high degree of internal arbitrage (Jones, 2002). Therefore, the test of a HMA should draw on the existence of high levels of internal spatial arbitrage or internal migration flows. However, it would also be useful to utilise the knowledge of local housing market professionals (estate agents) to inform the decision-making process in order to distinguish between HMAs and submarkets (DTZ Pieda, 2004b). The nature of the issues to be considered for adoption in the HMA delineation has been outlined. The next section considers how these might be incorporated into the proposed methodology.

A Housing Market Area Delineation Methodology

A difficulty in defining HMAs is that there is no consensus as to how the issues raised above should be reflected in a methodological framework for HMA delineation. The guidance offered in the *Housing Market Assessment Manual* (DTZ Pieda, 2004b) provides a number of valuable sources of data and provides advice on practicalities associated with HMA definition. However, the publication of the manual pre-dated the release of the 2001 SMS datasets, and could only offer generic advice on the anticipated use of the SMS datasets. The opportunity, nevertheless, exists to apply the SMS in the definition of HMA boundaries that draw directly on the functional regionalisation approach, which is the established method for delineating TTWAs (Coombes *et al*, 1979; Coombes and ONS, 1998; Coombes, 2002). The iterative algorithm developed by Jones (2002) features the analysis of migration flows between neighbouring settlements and the progressive fusion of pairs of settlements that satisfy flows scale criteria. In practice, there is a wider choice of methods for use in the functional regionalisation of areas based on their aggregation using criteria derived from inter-area flow matrix properties. Masser and Scheurwater (1980) and David Simmonds Consultancy (2005) review three principle functional regionalisation procedures, which is summarised in Table 6.1.

The review highlights that intramax has a number of advantages over the alternatives in the form of the computationally more complex functional distance and iterative proportional fitting procedures. Intramax is the only procedure that explicitly identifies regions, which have more direct interaction with each other than with other areas at each stage of the grouping process. This means that it avoids most of the criticisms that have been raised regarding the interpretation of results obtained through the functional distance approach. Intramax also avoids the criticisms directed towards the alleged weaknesses of the iterative proportional fitting based procedures in that intramax explicitly considers the cumulative effects of fusions at each stage of the grouping process. The intramax procedure also involves only a series of direct comparisons between the observed and expected values after the manipulation of the row and column totals. Therefore, the approach avoids the complicated set of matrix calculations that are necessary for the calculation of the mean first passage time in the functional distance algorithm and the recurring iterations of the whole interaction matrix that are required for the iterative proportional fitting method (David Simmonds Consultancy, 2005). By avoiding matrix manipulation, the intramax procedure can be more readily applied to large datasets than either of the other two approaches and can be adapted to deal with sparse matrices containing a large number of zero elements (Masser and Scheurwater, 1980).

Table 6.1: A Summary of the Main Features of Three Methods for Functional Regionalisation

Functional Distance	Iterative Proportional Fitting	Intramax
Objectives		
Delimitation of functional and nodal regions: that is regions, which have more interaction with each other than with other regions using direct and indirect flows.	Hierarchical regionalisation: that is, fitting a hierarchical structure to an asymmetric matrix of linkages. This approach tests the interaction between origin/destination. A strong interaction is one where there is interaction between A-B and B-A.	Delimitation of functional regions: that is regions, which have more interaction with each other than with other regions. It aims to maximise the proportion of total interaction that comprise the diagonal elements of the matrix.
Data Transformation Method		
Estimation of mean first passage time matrix (the number of Markov Chain 'steps' to get from state *A* to state *B* both directly and indirectly).	Estimation of matrix of relative interaction. It is a hierarchal clustering algorithm based on two way flows. A group of origins and destinations are strongly connected if there is a link between all origins and destinations.	Estimation of a matrix of differences between expected and observed values. Aggregates zones together where the diagonals proportion of the matrix is maximised.
Comments		
Summarises indirect as well as direct flows. Assumption that flows are sequentially directional in nature (forward and backwards).	Distortions likely to occur when large differences in size between zones. These problems will be accentuated when sparse matrices are involved.	Estimation procedure repeated at each step of the grouping process. Bounding problems imply bias towards small zones in practice.
Aggregation Procedure Method		
Choice left open but stepwise cluster analysis of standardised matrix for functional regionalisation.	Explicit aggregation method. Strong components of directed graphs (strong interaction between a collection of points) identified sequentially.	Explicit aggregation method. Stepwise cluster analysis for functional regionalisation.
Comments		
Can results be interpreted in terms of initial objective? Inherently suboptimality of procedure. Procedure can also be used for delimitation of nodal regions.	Modified version of single linkage cluster analysis. Divisive method based on critical links between individual zones, not groups of zones.	Results can be directly interpreted in terms of original objective once the effect of size differentials taken into account. Inherent suboptimality of procedure.
Relevant Studies		
Brown and Horton (1970); Brown *et al* (1970); Brown and Holmes (1971)	Slater (1976)	Masser and Brown (1975); Brown and Pitfield (1990); David Simmonds Consultancy (2005)

Source: Adapted from Masser and Scheurwater (1980:1362) and David Simmonds Consultancy (2005:17-18)

The Intramax Procedure

The intramax procedure was developed by Masser and Brown (1975) to analyse flow structures in an interaction matrix. The procedure strives '...to maximise the proportion of the total interaction which takes place within the aggregations of basic data units that form the diagonal elements of the matrix, and thereby to minimise the proportion of cross-boundary movements in the system as a whole' (Masser and Brown, 1975:510).

The intramax procedure is a modified version of Ward's (1963) hierarchical aggregation procedure, and focuses on the relative strength of interactions, once the effects of size variation in row and column totals are removed. These are taken into account in the specification of the objective function, to be maximised, as the difference between the observed values of flows and the expected values that are derived from the manipulation of the row and column totals, when the matrix is standardised to sum to unity. An observed value exceeding an expected value represents a relatively high or 'higher than expected' level of interaction. The pair of areas for which the difference between observed and expected values is greatest is combined at each stage of the grouping process. After the fusion, row and column totals are re-estimated before the search begins for the next pair of areas for which the objective function is maximised. The objective function, which is to be optimised during the aggregation procedure, was originally expressed as (Masser and Brown, 1975):

$$Max\, z = (a(i,j) - (a((i,j)^*) + (a(j,i) - a(j,i)^*) \qquad (1)$$

Where:

$a(i,j)$ is the observed value of the cell entry in the ith row and the jth column of the interaction matrix, after it has been standardised so that:

$$\sum_i \sum_j a(i,j) = 1 \qquad (2)$$

$$a(i,j)^* = \sum_p a(p,j) \quad \sum_q a(i,q) \qquad (3)$$

$$a(j,i)^* = \sum_p a(p,i) \quad \sum_q a(j,q) \qquad (4)$$

Where:

p is the product of the observed strength of the interaction of *i* and *j*

q is the product of the relative strength of the interaction of *i* and *j*

Subject to the contiguity constraint:

c(*i,j*) = 1 (BDUs *i* and *j* are contiguous, c(*i,j*) = 0 otherwise) (5)

Aggregation therefore proceeds in a stepwise manner, with the interaction between two joining areas becoming the intra-zonal interaction of the new area (Feldman *et al*, 2005). The fusion of nonadjacent units is minimised with the incorporation, in the grouping process, of a contiguity constraint to identify areas that share a common boundary as specified in (5) above (Masser and Brown, 1975), which is a standard component of most functional regionalisation procedures (Coombes, 2000). Thus, a contiguity matrix is specified, which identifies pairs of base units that are contiguous with the effect that the intramax program will only combine those units that satisfy this condition.

However, Hirst (1977) criticised the original intramax procedure for not taking sufficient account of variations in the size of the row and column totals of the interaction matrix during the grouping procedure because the original procedure does not eliminate the influence of unequal marginal distributions which define the expected values. Hirst (1977) highlights that since the objective function is recalculated at each stage of the grouping procedure, the bias inherent in the calculation of the expected frequencies will be cumulative. Thus, Hirst suggested a reformulation of the objective function, which has since been incorporated in place of the original function, as outlined by Brown and Pitfield (1990:62), as follows:

$$Max \underset{i \neq j}{Z} = \frac{(a(i,j) - a(i,j)^*)}{a(i,j)^*} + \frac{(a(j,i) - a(j,i)^*)}{a(j,i)^*} \quad (6)$$

The function specified above can be expressed more simply as:

$$Max \underset{i \neq j}{Z} = \frac{a(i,j)}{a(i,j)^*} + \frac{a(j,i)}{a(j,i)^*} \quad (7)$$

Where:
*denotes the expected value

Estate Agent Knowledge as a Basis for Guiding HMA Delineation

The intramax procedure does not include an objective basis by which the number of market areas can be determined. Rather, the process of defining the appropriate number of markets is at the discretion of the user. Brown and Pitfield (1990) suggest that the optimum number of markets will be a compromise between the retention of essential detail and the achievement of appropriate representation. However, the problem with this contention is in establishing where that balance should fall. While this flexibility may be viewed as a virtue, it introduces a degree of choice or arbitrary specification of the outcome. In an application concerned with HMA delineation, it is argued above that there should be a degree of similarity with TTWA geography in terms of size, and number of market areas. In addition, benchmarks or further criteria may be incorporated into the intramax area-pair fusion decision-making process to increase the utility of the final groups depending upon purpose (Coombes *et al*, 1979). This feature has been exploited here in the specification of 'core areas' to define 'seed points' around which HMA groupings can be formed.

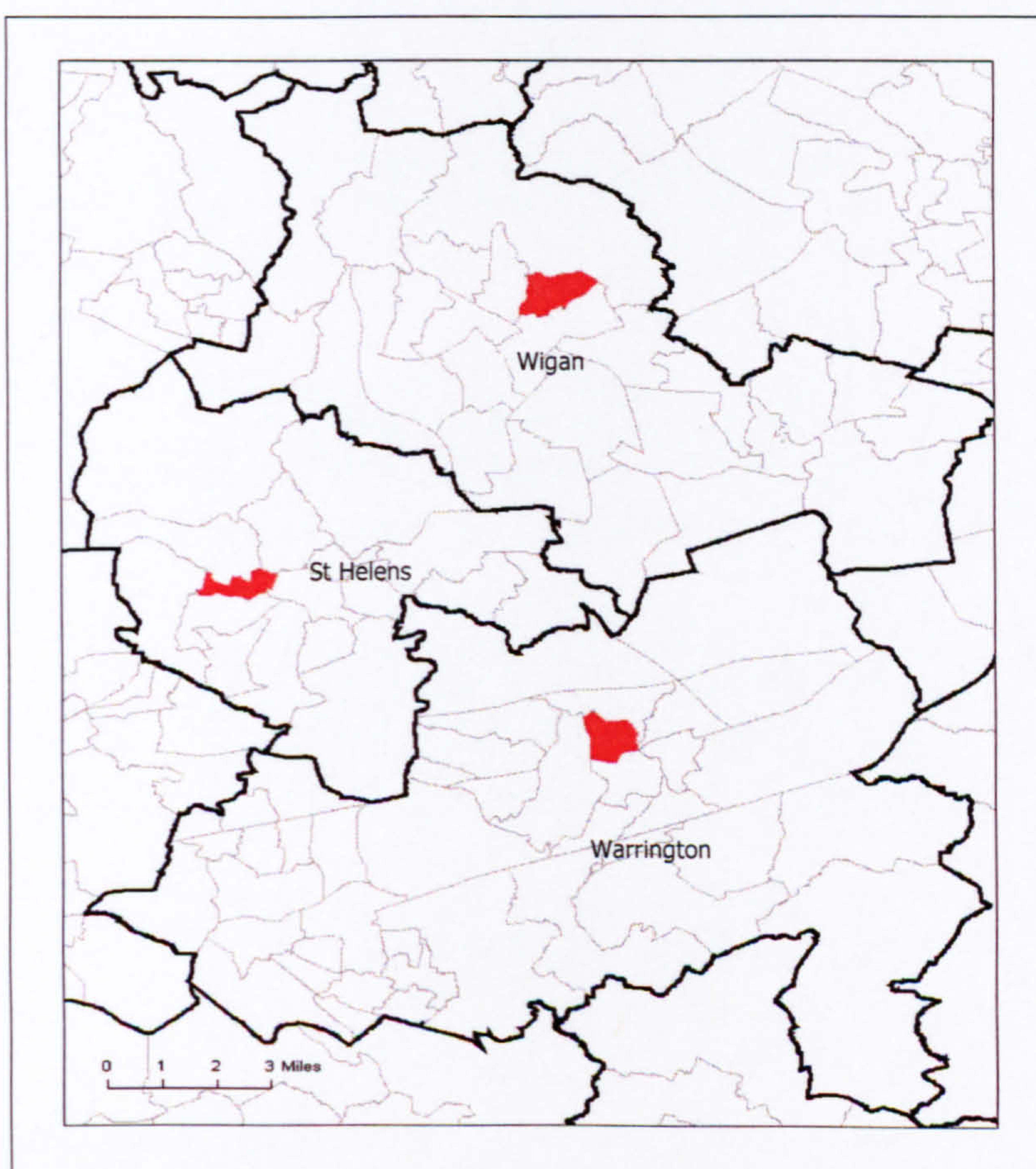
At the outset, it was difficult to know which settlements should constitute the core of the HMAs and which are extensions of larger HMAs. This issue was resolved by utilising estate agent knowledge of local housing markets to guide the delineation process, reflecting the advice given by DTZ Pieda (2004b). Estate agent knowledge and expertise has been used by Palm (1978) to guide the delineation of housing submarkets. However, it was recognised, from the outset, that estate agents are active 'players' in the functioning of the housing market and that their influence is both positive and negative. Indeed, McDowell (1982:86) suggests that the estate agents' operations can be viewed as a '...continuum ranging from passive co-ordination to active manipulation of market processes'. However, DTZ Pieda (2004b:28) comments:

'The analysis of a housing market area is not a precise science, hence an approach, which seeks to refine the HMA boundary area based on a variety of measures, is recommended. It is also important to stress the need to incorporate *local knowledge and expertise* in the process. Purely statistical approaches may fail to reflect particular issues, which are front of mind either for the HMA team or partners, or indeed *housing and planning practitioners whose day-to-day activities provide insight into the operation of the housing market*' (emphasis added). This is supported in the work of Smith *et al* (2006) who explore market functioning from a conceptual standpoint more closely aligned to cultural economy and economic sociology than pure economics. In their analysis of housing market performance in Edinburgh the authors suggest that although economic processes, notably prices being determined by supply and demand regimes, are central to market functioning, they argue that housing markets function because of non-economic processes based on a complex interplay of cultural, legal, political, and institutional arrangements, processes, and actors. Initially, a number of settlements were identified which were considered to be the dominant settlements across the region and these were broadly consistent with the core TTWA settlements reflecting the assumption that HMAs and TTWAs are geographically comparable. In these settlements, the branches of national estate agents were contacted by telephone with the intention of compiling a list of settlements judged by them to constitute local markets that could be drawn upon in guiding the delineation of North West HMAs. In areas where national estate agent coverage was low, local estate agents were used and this approach proved necessary in parts of Cheshire and Cumbria.

The aims of the research were described and the HMA approach was outlined to each of the estate agents. The estate agents were asked to assess whether the settlements they serve constitute the core of a HMA and to determine whether surrounding settlements constituted a HMA in their own right or formed part of the HMA of the principle settlement. From the initial correspondence with the estate agents, a number of additional settlements were identified. Estate agents from these settlements were contacted, the nature of the research was described, and the HMA approach was outlined. The estate agents of newly identified settlements were asked to assess whether the settlement they served constituted a HMA in its own right or formed part of a wider HMA. They were also asked to make a judgement as to whether surrounding settlements constituted the cores of additional HMAs or formed part of a wider HMA. In the same way, estate agents in newly identified settlements were contacted and the process was repeated.

In total, 51 less structured telephone interviews were conducted. From the correspondence with the estate agents, 43 potential core HMA settlements were identified. Within these potential core HMA settlements, a core ward was identified in each and these wards were 'flagged' in the intramax program. The core wards were identified based on population density, with the densest populated ward forming the core of the HMA. A programme file was created known as the 'seed file', and within the seed file each of the core wards were identified with a 1, and the non-core wards were identified with a 0 to create a binary dataset. The intramax procedure was then programmed so that each of the groups could only contain a single ward identified with a 1 around which non-core wards identified with a 0 would be grouped (Figure 6 1).

Figure 6.1: Illustration of Seed Wards in the St Helens, Wigan, and Warrington HMAs

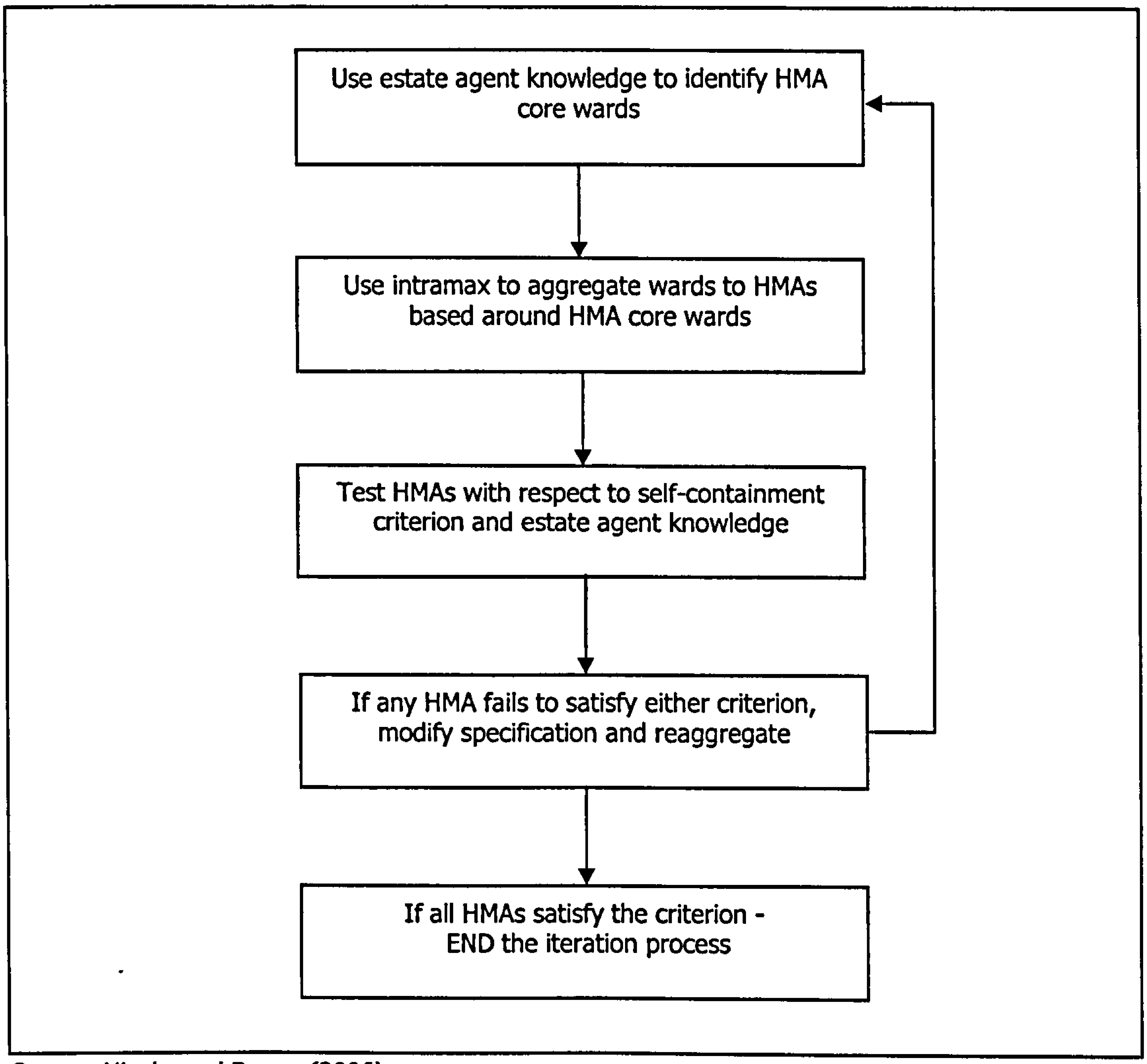


NB: Wards in red denote 'core wards', which are equivalent to wards labelled 1 in the seed file. Wards in white denote non-core wards, which are equivalent to wards labelled 0 in the seed file.

The Iterative Process

The methodology that emerges from consideration of the above issues is combined within an iterative process, which is summarised in Figure 6.2. This indicates that the HMA cores, which are initially defined, using information supplied by estate agents, act as constraints on the process of aggregating inter-area migration flows using the intramax procedure. The self-containment of the resulting HMAs is examined to identify potential candidate HMAs for which core re-specification might be necessary in the light of a further round of estate agent consultation. This iteration continues until the HMA self-containment, and estate agent criterion are satisfied. In the identification of the North West HMAs, this was achieved after four cycles of iteration.

Figure 6.2: Outline of the HMA Delineation Methodology



Source: Hincks and Brown (2006)

Data and Unit Scale

The delineation of the HMAs is based on aggregate migration patterns in the region. The data used were derived from the 2001 Census of Population Special Migration Statistics (SMS) (Table MG201) which recorded the origin and destination of migrants (see Rees *et al*, 2002). The Office for National Statistics (ONS), through the Census, collects data relating to the origin and destination of migrants within a one-year period of the Census date and the results are recorded in an origin and destination matrix. A 100 per cent Census of Special Workplace and Special Migration Statistics was released following the 2001 Census with the privacy and anonymity of individuals and households being protected through SCAM.

The data is based on aggregate migration patterns and does not distinguish between different population sub-groups, and represents only a snapshot of migration at a specific point in time. However, the data are accessible and share a similar composition to that used to delineate TTWAs in the UK. However, a cause for concern when using a single-year data set is the problem of sparse data, which can result in problems of interpretability and can reduce the robustness of the regionalisation process, which should be acknowledged from the outset (see Green *et al,* 1986; Coombes *et al*, 1988; Casado-Diaz, 2000).

In principle, the Output Areas (OAs) defined as the geographical building blocks of the 2001 Census (Martin, 2002) could be used to delineate both TTWAs and HMAs. However, significant problems would be faced in handling both the potential scale of the inter-OA flow matrices, and the small cell adjustment issue is likely to be most acute at finer spatial scales (Coombes, 2002). Previously, the geography of TTWAs has been based on wards. This prompted use of the ward as the base unit for HMA delineation, providing a further degree of consistency between the TTWA and HMA frameworks.

Delineating Housing Market Areas for North West England

This section applies the conceptual and methodological principles raised in the previous sections to delineate empirically a system of HMAs in North West England. The core principles guiding the HMA delineation process are:

1. The HMAs should be based on the adoption of a measure of supply and demand, represented by the origin and destination flows of migrants, which takes into consideration the essential tenet of spatial arbitrage.
2. An understanding of the process of market search should be informed by continuous consultation with local estate agents.
3. The HMAs should incorporate a supply-side and demand-side self-containment measure and both sides of the self-containment measure should exceed a 70 per cent threshold if an area is to be considered a viable HMA.
4. The HMAs should have a close association in terms of size and scale to TTWAs[23].

The first stage in the delineation of the HMAs was to flag the core wards identified in the settlements, which meant that 43-groups were initially identified (Figure 6.3). The 43-group solution contained 14 HMAs, which failed to exceed the 70 per cent self-containment threshold on either the supply-side, demand-side or both of the measure (Table 6.2).

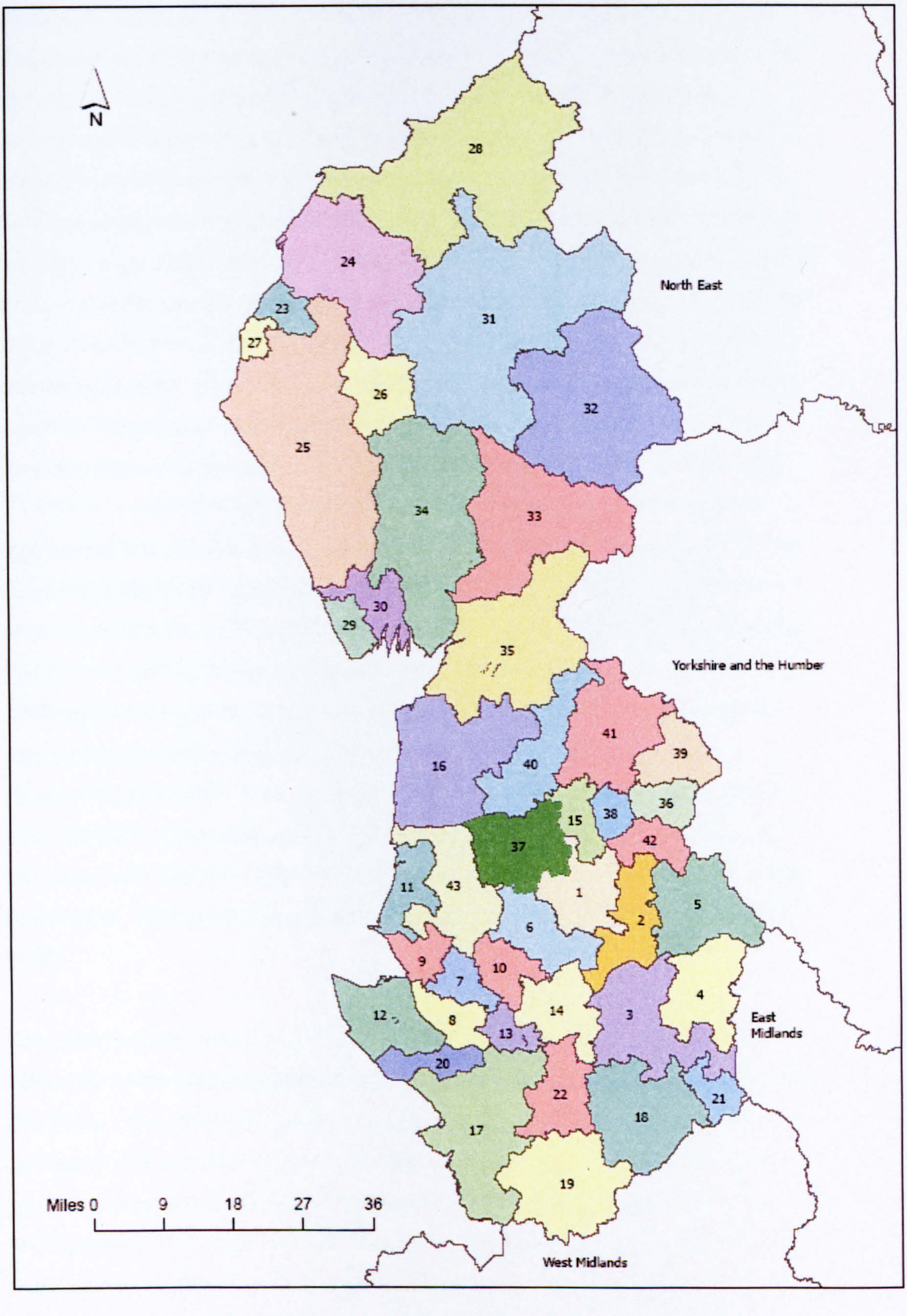
[23] In the case of this research, the adjusted TTWAs will be used compare HMA and TTWA boundaries.

Table 6.2: 43-Group Solution and Corresponding Self-Containment Measures

Group Name	Group Number	Supply-Side Self-Containment (%)	Demand-Side Self-Containment (%)
Bolton	1	80	79
Bury and Salford	2	75	76
Wilmslow	3	74	75
Manchester	4	80	79
Rochdale and Oldham	5	84	86
Wigan	6	82	80
Kirkby	7	66*	69*
Liverpool	8	75	76
Maghull and Lydiate	9	68*	70
St. Helens	10	78	79
Southport	11	74	73
Wirral	12	87	88
Runcorn and Widnes	13	76	81
Warrington	14	76	75
Blackburn	15	81	84
Blackpool	16	88	86
Chester	17	73	73
Congleton	18	71	67*
Crewe and Nantwich	19	84	78
Ellesmere Port and Neston	20	72	70
Macclesfield	21	73	73
Northwich and Winsford	22	76	69*
Maryport	23	67*	69*
Siloth and Oulton	24	65*	65*
Whitehaven	25	79	80
Keswick	26	57*	64*
Workington	27	72	77
Carlisle	28	86	85
Barrow-in-Furness	29	83	83
Ulverston	30	61*	61*
Penrith	31	72	68*
Appleby	32	59*	62*
Kendal	33	73	69*
Windermere	34	61*	65*
Lancaster and Morecambe	35	85	81
Burnley and Nelson and Colne	36	77	81
Chorley	37	76	71
Accrington	38	76	77
Barnoldswick	39	81	81
Preston	40	72	73
Clitheroe	41	67*	62*
Rossendale	42	72	72
Ormskirk and Burscough	43	69*	69*

* Denotes HMAs which have failed to exceed the 70 per cent threshold

Figure 6.3: 43-Group Solution of HMAs in the North West



A number of the HMAs from the first stage failed to exceed the self-containment threshold. These areas were either the satellite settlements, which surround larger and more dominant urban settlements or the smaller settlements in rural parts of the region, particularly Cumbria. These areas have always been problematic in developing functional regions because of the problem of small populations at the centre of a large rural area. This problem is exacerbated in rural areas because the wards, which are defined based on population density, are often large and therefore their size can distort the relative importance of the group in relation to the population it contains. The initial construction of the 43 groups was based on the grouping of all the core settlements recommended by the estate agents. However, an examination of the resulting self-containment levels of the groups revealed that a number of the groups were more likely to be extensions of larger HMAs rather than constituting HMAs in their own right. Therefore, a second round of consultation was undertaken with the estate agents and the decision was taken to remove the flags of the areas, which had been identified as being peripheral settlements on the basis that the groups failed to satisfy the self-containment and estate agent criterion. The wards that had formed part of the original group would then be grouped with neighbouring HMAs to form larger and greater self-contained markets. However, it should also be acknowledged that not all of the cores of the failed groups were removed at this point. This was because some settlements were considered more dominant than other settlements. It was recognised that, by removing less dominant cores, the self-containment levels of surrounding HMAs was likely to increase. Therefore, the number of groups in the second stage was reduced to 36.

The second (and subsequent) stages of the process sought to improve the efficiency of the grouping process and to increase the self-containment levels of the HMAs. The 36-group solution (second stage) contained 8 groups that did not satisfy the self-containment criteria. The failed groups were Congleton, Northwich and Winsford, Maryport, Keswick, Penrith, Appleby, Kendal, and Windermere. The settlements of Congleton and Northwich and Winsford are surrounded by settlements that are more dominant. In the case of Northwich and Winsford, the settlement is surrounded by Manchester and Warrington in the north, Chester in the west, Crewe in the south and Macclesfield in the east.

In addition, Congleton is located near to Macclesfield and Crewe and Nantwich. As such, Northwich and Winsford and Congleton are likely to be extensions of larger and more dominant HMAs. This is also likely to be the case in relation to Maryport, which is neighbouring Whitehaven and Keswick. On the contrary, Keswick, Penrith, Appleby, Kendal, and Windermere illustrate a different kind of problem identified by Coombes *et al* (1979) relating to a small population contained within a large geographical area. The problem appears to be that there are too many cores competing for relatively few non-core wards, most of which are sparsely populated which suggests that removing some of the cores would be advantageous. As such, the flags of Congleton, Northwich and Winsford, and Maryport were removed because these areas were recognised as being further extensions of larger HMAs. In addition, the core of Appleby was also removed because the Appleby HMA had a consistently low level of self-containment throughout the grouping process. The Keswick, Penrith, Kendal, and Windermere cores were retained for the third stage because by removing the Appleby and Maryport cores the self-containment of the surrounding groups increases with less competition between fewer cores. The number of groups for the third stage was reduced to 32. The 32-group solution led to Congleton, and Northwich and Winsford being integrated with Crewe and Nantwich, Maryport being integrated with Workington, and Appleby being integrated with Penrith to form the Eden HMA. The 32-group solution contained three problematic HMAs, which did not exceed the self-containment threshold. These groups were Keswick, Kendal, and Windermere. The Eden HMA had benefited from the removal of Appleby; however, the removal of the Appleby and Maryport cores did not sufficiently increase the self-containment level of the Keswick, Kendal, or Windermere HMAs. Indeed, the self-containment of Keswick, Kendal, and Windermere remained the same on both sides of the self-containment measure despite the removal of the Appleby group.

Therefore, the fourth stage was concerned with resolving the self-containment issues in the Keswick, Kendal, and Windermere HMAs. The initial starting point was to examine the self-containment levels of the three HMAs. Kendal had a consistently high self-containment level throughout all the stages of grouping. Indeed, it exceeded the self-containment threshold on the supply-side measure and was 1 per cent below the 70 per cent threshold on the demand-side self-containment measure, whereas Keswick and Windermere had lower self-containment levels on both the demand and supply-side measures throughout the delineation process. Therefore, Kendal was retained as the dominant settlement. However, the decision as to whether the core of Keswick or Windermere was to be removed was less obvious. The removal of either core had the potential to raise the self-containment level of the other HMA because the two HMAs share a boundary. Therefore, a test was conducted in which one core was retained and the other core was removed. However, the removal of one core had little effect on the self-containment of the retained HMA. Indeed, when Keswick was retained, the self-containment was 66 per cent on the supply-side and 68 per cent on the demand-side, and when the Windermere core was retained, the self-containment was 61 per cent on the supply-side and 65 per cent on the demand-side. Despite competing with one less core, neither of the cores was more dominant suggesting that these settlements are extensions of larger HMAs. As a result, both the Keswick and Windermere cores were removed.

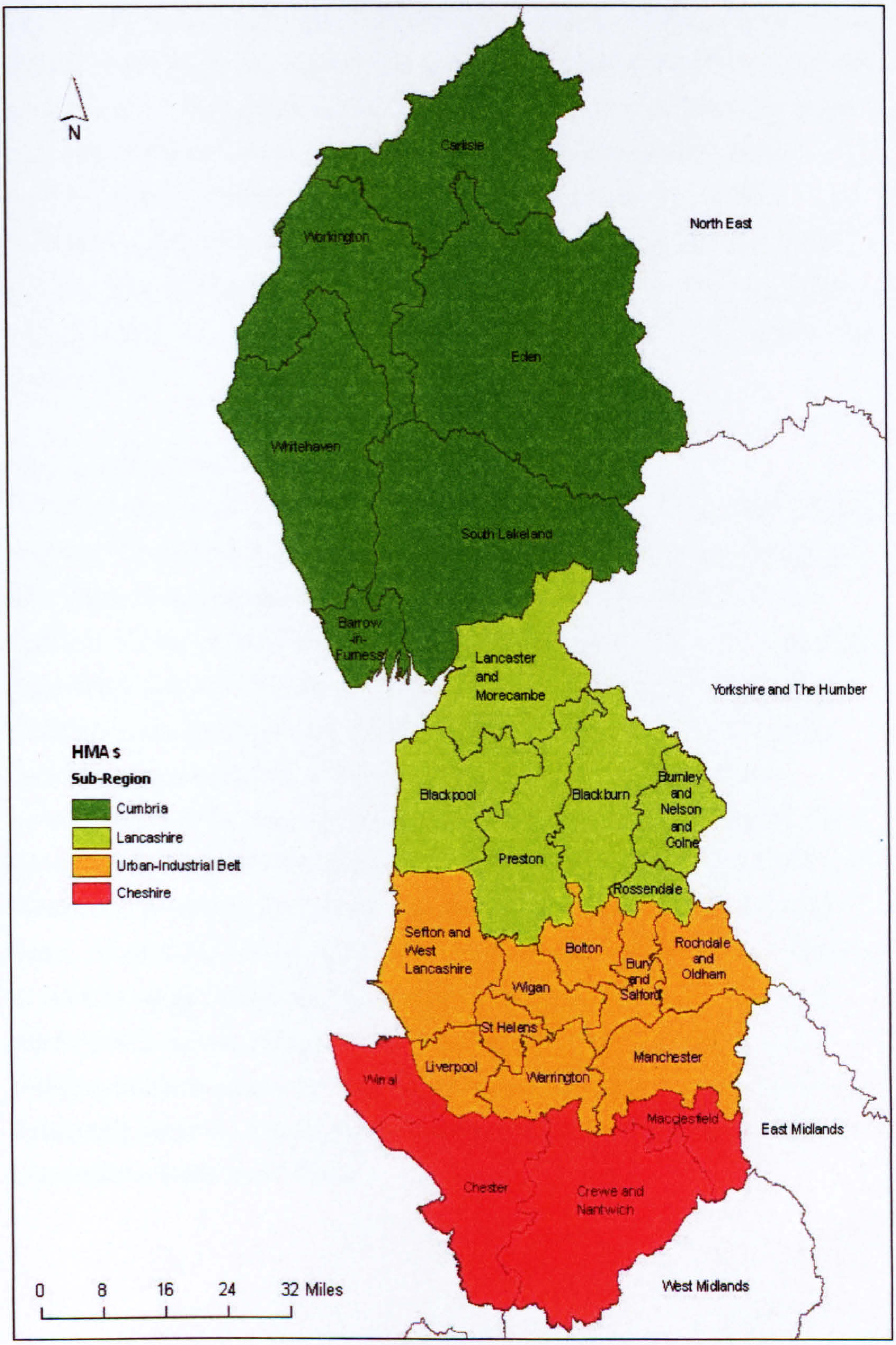
At this point of the iteration procedure, it became apparent that the majority of groups that had been retained satisfied both the self-containment and estate agent criterion. However, a further stage of the process involved a fourth round of consultation with the estate agents and further assessment of the groupings to determine whether smaller and less dominant groups constituted HMAs in their own right or whether they were likely to be extensions or submarkets of more dominant settlements, despite exceeding the self-containment threshold. The consultation process highlighted the case for linking the contiguous Chorley, Accrington, and Barnoldswick HMAs with more dominant HMAs. In addition, the estate agents recommended removing the Ellesmere Port, Wilmslow, and Runcorn and Widnes cores. Therefore, the number of groups in the fourth stage was reduced to 25 (Figure 6.4) and the self-containment of the groups was re-calculated (Table 6.3). Further adjustments proved necessary, which led to Keswick being integrated with Workington, Windermere being integrated with Kendal, Ellesmere Port being integrated with Chester, Runcorn and Widnes being integrated with Warrington, Chorley being combined with Preston, Accrington being combined with Blackburn, Wilmslow being integrated with

Macclesfield, and Barnoldswick being integrated with Burnley and Nelson and Colne.

Table 6.3: 25-Group Solution and Corresponding Self-Containment Measures

Group Name	Group Number	Supply-Side Self-Containment (%)	Demand-Side Self-Containment (%)
Bolton	1	80	79
Bury and Salford	2	75	76
Manchester	3	86	86
Rochdale and Oldham	4	84	86
Wigan	5	82	80
Liverpool	6	82	84
Sefton and West Lancashire	7	80	81
St. Helens	8	78	79
Wirral	9	87	88
Warrington	10	79	80
Blackburn	11	86	88
Blackpool	12	88	86
Chester	13	79	78
Crewe and Nantwich	14	87	81
Macclesfield	15	70	71
Workington	16	79	83
Whitehaven	17	79	80
Carlisle	18	86	86
Barrow-in-Furness and Ulverston	19	87	87
Eden	20	77	74
South Lakeland	21	77	77
Lancaster and Morecambe	22	85	81
Burnley and Nelson and Colne	23	87	90
Preston	24	83	80
Rossendale	25	72	72

Figure 6.4: 25-Group Solution of HMAs in the North West and Core Sub-Regions



Assessing the Delineated Housing Market Areas

The previous section has applied the conceptual and methodological framework, which was developed in earlier sections to delineate a system of HMAs in North West England. The purpose of this section is to provide an assessment of the delineated HMAs in the North West. Two significant issues raised in the literature were that HMAs should have a degree of similarity to TTWA boundaries, which are currently the 1991-based TTWAs, and that the HMAs should have a relatively high level of self-containment, measured at a 70 per cent threshold. As such, these two issues provide the focus for the assessment in this section.

The Configuration of the HMA Boundaries

The initial assessment criterion dictates that the HMA boundaries should have a degree of similarity with the adjusted TTWA boundaries. Figure 6.5 illustrates the correspondence between the 25 HMA and 23 TTWA boundaries in the region by overlaying the HMA boundaries onto the adjusted TTWA boundaries. This reveals a striking degree of variability in the boundaries of the HMAs and TTWAs in many areas, particularly in Cumbria with the exception of Carlisle, perhaps raising a question about the effect of imposing a standard self-containment criterion throughout the whole region. Indeed, it might be that a self-containment trade-off is required, similar to that incorporated in the TTWA framework, to reflect and acknowledge the contrast between urban and rural areas. In addition, the distinctions in the boundaries of HMAs when compared to corresponding TTWAs also reflects the changes that have occurred in the relationship between residential and workplace locations, the impacts of changing urban systems, the corresponding changes that have occurred in commuting patterns, and the inherent differences in the methods adopted to delineate the HMAs and TTWAs.

Figure 6.5: 25-Group Solution Superimposed on TTWA Boundaries

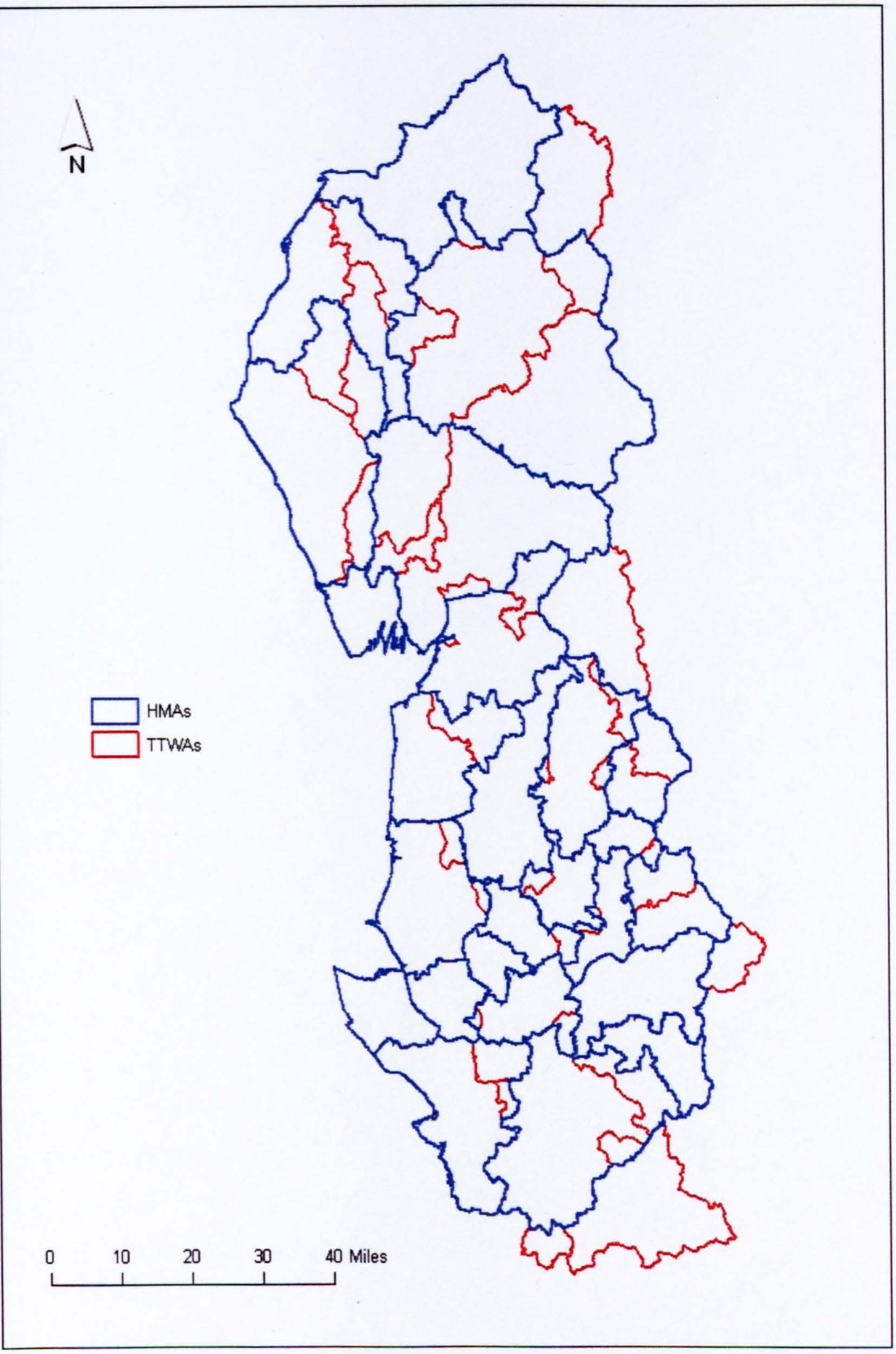
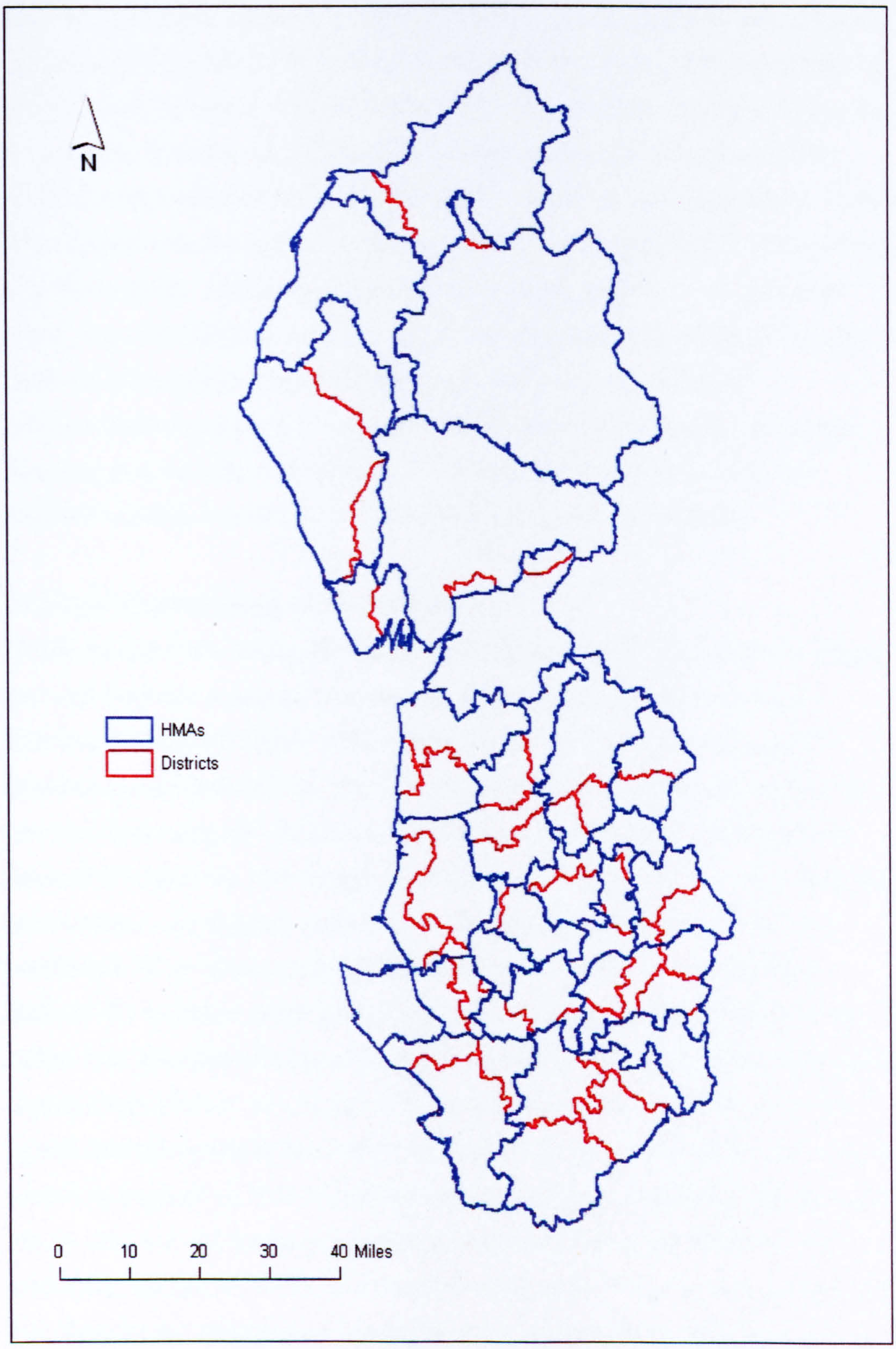


Figure 6.6: 25-Group Solution Superimposed on Local Authority Boundaries



It is also instructive to observe how the geography of the 25 HMAs compares with the geography of the 43 local authority boundaries in the region. Figure 6.6 illustrates the relationship between the HMA and local authority boundaries in the region by overlaying the HMA boundaries onto the boundaries of the local authorities. Interestingly, it shows how larger groupings of local authority districts have been created as a consequence of the groupings of wards. This is most evident, for example, in Sefton and West Lancashire, Crewe and Nantwich, and Workington. However, it also highlights the degree to which, in many areas, the HMA geography differs quite markedly from that of the underlying local authority administrative boundary geography, suggesting that unquestioned acceptance of local authority boundaries as approximations to local housing markets is likely to result in incomplete intelligence on sub-regional housing markets, and unreliable housing market analyses.

The Self-Containment of the HMAs

Of the 25 identified HMAs, 22 have a self-containment level on both the supply and demand-side measure that exceeds 75 per cent, indicating that the delineated HMAs are highly self-contained markets. When examining the previous grouping solutions, it is clear that had a self-containment level of 50 per cent been adopted the groups identified in the 43-group solution would have all achieved the self-containment threshold and at a 60 per cent threshold, only Keswick and Appleby would have failed to meet the cut-off. However, adopting a 50 or 60 per cent self-containment threshold would also have allowed the retention of peripheral and satellite settlements as distinct HMAs rather than identifying these areas as being extensions of more dominant HMAs. Significantly, even at the 70 per cent self-containment threshold, the estate agents identified settlements which exceeded the 70 per cent self-containment measure, suggesting that these settlements had closed migration patterns, but which were not considered to be distinct HMAs by the estate agents, which ultimately resulted in the cores of such groups being removed. In contrast, the Macclesfield and Rossendale groups have the lowest self-containment levels of all the markets and, in practice, may have had their cores removed to increase the self-containment of the surrounding markets.

However, the consultation process with the estate agents led to the recommendation that the Macclesfield and Rossendale groups be retained as individual HMAs. In addition to Macclesfield and Rossendale, the estate agents also identified Bury and Salford, Sefton and West Lancashire, and Wirral as constituting distinct HMAs, despite these areas not being considered separate TTWAs in the 1991-based delineation (see Coombes and ONS, 1998). Significantly, Macclesfield, Rossendale, Bury and Salford, Sefton and West Lancashire, and Wirral all achieved the 70 per cent self-containment threshold, which suggests that these areas, along with the other HMAs identified in the 25-group solution retain a high degree of internal arbitrage, represented in a basic form by migration flows within each of the HMAs (Jones, 2002).

Table 6.4 contains a summary of the features of the aggregated inter-HMA migration flow matrix, including the resident population and number of migrants that originate and terminate in each HMA, and their respective shares of the North West.

The shares of total outward and inward migration reflect the overall population levels of the identified HMAs, with the more extensive metropolitan HMAs accounting for the largest shares of the total. The Manchester HMA accounts for the largest share on both measures of migration scale at over 16 per cent, followed by Liverpool (7.9 – 8.1 per cent), Rochdale and Oldham (7.5 – 7.7 per cent), Sefton and West Lancashire (6.3 – 6.2 per cent), and Bury and Salford (6.2 – 6.3 per cent). There is a degree of consistency in the rates of in and out-migration around the mean rate of 8.9 per cent, with the obvious exceptions of Lancaster and Morecambe with the highest rate of 13.1 per cent, and Chester the lowest at 7.1 per cent. In relation to the migration self-containment of the final 25-group solution, the Manchester HMA has a relatively high degree of self-containment similar to the self-containment levels of Blackpool, Wirral, Burnley and Nelson and Colne, Barrow-in-Furness and Ulverston, Crewe and Nantwich, and Blackburn. Indeed, it is evident from Table 6.4 that the HMAs with the highest number of migrants are those of, or surrounding, the larger urban settlements. However, there appears to be a degree of fuzziness at the boundaries of the HMAs (Jones, 2002) because a number of HMAs which have relatively high internal migration are connected to the two metropolitan HMAs.

Table 6.4: Summary of Migration for each of the HMAs

Housing Market Area	Resident Population	% Total Population	Origin HMA	% Total Migration	Migration Rate	Destination HMA	% Total Migration
Bolton	259903	3.9	22470	3.8	8.6	22808	3.9
Bury and Salford	403456	6.1	37233	6.3	9.2	36357	6.2
Manchester	997333	15.1	98543	16.7	9.9	98255	16.7
Rochdale and Oldham	504874	7.6	45274	7.7	9.0	44202	7.5
Wigan	309007	4.7	24561	4.2	7.9	25176	4.3
Liverpool	490608	7.4	47521	8.1	9.7	46554	7.9
Sefton and West Lancashire	473465	7.2	37243	6.3	7.9	36793	6.2
St Helens	163701	2.5	12416	2.1	7.6	12299	2.1
Wirral	308452	4.7	24078	4.1	7.8	24001	4.1
Warrington	305747	4.6	23861	4.1	7.8	23484	4.0
Blackburn	255840	3.9	24868	4.2	9.7	24375	4.1
Blackpool	312262	4.7	30884	5.2	9.9	31689	5.4
Chester	218678	3.3	15538	2.6	7.1	15751	2.7
Crewe and Nantwich	305094	4.6	23318	4.0	7.6	25028	4.3
Macclesfield	134341	2.0	10689	1.8	8.0	10490	1.8
Workington	84200	1.3	7126	1.2	8.5	6800	1.2
Whitehaven	75001	1.1	6178	1.0	8.2	6124	1.0
Carlisle	98693	1.5	8681	1.5	8.8	8710	1.5
Barrow-in-Furness and Ulverston	86585	1.3	7699	1.3	8.9	7691	1.3
Eden	52974	0.8	4378	0.7	8.3	4564	0.8
South Lakeland	81173	1.2	7150	1.2	8.8	7193	1.2
Lancaster and Morecambe	127088	1.9	16683	2.8	13.1	17588	3.0
Burnley and Nelson and Colne	176938	2.7	17401	3.0	9.8	16924	2.9
Preston	328872	5.0	29074	4.9	8.8	30030	5.1
Rossendale	61387	0.9	5928	1.0	9.7	5909	1.0
Total	**6615672**	**100.0**	**588795**	**100.0**	**8.9**	**588795**	**100.0**

Thus, the analysis illustrates the complexities associated with identifying HMAs. Indeed, the process is complicated by the problems associated with distinguishing between submarkets and HMAs, and often this is an issue that cannot be resolved by relying solely on the self-containment measure. This is because both HMAs and submarkets have been shown to be highly self-contained in terms of migration patterns (Jones, 2002; Jones *et al*, 2004). Therefore, the results support the idea of using local knowledge in conjunction with the self-containment measure in the process of delineating HMAs as recommended by DTZ Pieda (2004b).

The HMAs containing the housing market renewal (HMR) areas tend to have high migration rates (e.g. Manchester, Rochdale and Oldham, Liverpool, Sefton and West Lancashire, and Bury and Salford). In addition, Blackburn, Wirral, Burnley and Nelson and Colne, and Bolton also have moderate turnover and have been identified as areas at risk from housing market failure (Leather *et al*, 2003), which suggest that areas of low demand and abandonment are witnessing an increase in the migration flows within the affected HMAs. Indeed, in an analysis of housing market trends in the North West, Leather and Roberts (2004) highlight that the M62 corridor forms a low value housing zone. In this zone, private sector vacancy rates and housing association void rates increased significantly between 1996 and 2001 and it is an area where migration rates are high, which when the migration and vacancy rates are combined indicate a weakness in the housing market (Nevin *et al*, 2001; Leather *et al*, 2003).

The HMAs that account for the smallest proportion of migrants are those in Cumbria. The lower volume of migration flows might reflect the smaller population size in Cumbria when compared to other highly populated HMAs in the region. However, there are also a number of localised factors, which are likely to have affected migration in Cumbria. These include low levels of housing supply (Gallent *et al*, 2003) coupled with high house prices creating problems of affordability, which is exacerbated by rates of second homeownership of between 5 and 10 per cent, which has the effect of reducing the ability of households to enter the local housing market (Leather and Roberts, 2004).

Conclusion

This chapter has developed a framework and methodology to facilitate the delineation of sub-regional housing markets in North West England. In doing so, the chapter addresses three research questions posed in objective one. The first question is what approach should be adopted to identify and delineate housing markets at sub-regional level? The review of the literature and the development of the conceptual framework identify housing market areas (HMAs) as being the most suitable approach for conceptualising and delineating sub-regional housing markets (Jones, 2002; Coombes *et al*, 2006). Indeed, the access-space model, the hedonic approach, and the submarket framework are unable to be used from a theoretical perspective to define sub-regional housing markets. However, the HMA approach provides a framework that moves beyond the 'urban' focus of the access-space model, the hedonic approach, and the submarket framework to provide full housing market coverage across the study region. In addition, HMAs are not constrained by the use of convenient administrative boundaries, especially local authority boundaries, and they share a degree of similarity in terms of size and scale to TTWAs, the sub-regional labour market framework adopted in this research. Thus, from a theoretical and practical viewpoint, the HMA framework offered a number of advantages over the alternative housing market approaches.

Having accepted that HMAs provide the most suitable conceptualisation of sub-regional housing markets, the chapter developed a framework to guide and facilitate the delineation of HMAs in North West England. In doing so, this addressed the second research question, which is what issues need to be considered in relation to the conceptual and methodological requirements of the sub-regional housing market approach and how might these requirements become operationalised to identify sub-regional housing markets? The sub-regional housing market has received relatively little attention in the academic arena, but this appears to be a general problem, particularly in relation to planning that practice has tended to outpace research capacity because sub-regional working has developed as a response to a number of 'top-down' and 'bottom-up' pressures (Roberts and Baker, 2004). However, this neglect has resulted in a housing market agenda that is distorted by the use of convenient administrative boundaries and the neglect of economics in housing market policy and research. Hence, a review of relevant concepts and principles was undertaken to provide a firm theoretical basis for delineating HMAs.

The framework is underpinned by the assumption that HMAs are areas within which the majority of people move without necessarily changing jobs (O'Sullivan *et al*, 2004). Thus, the HMA framework that was developed recognised the role played by migration in defining HMAs and the process of market search as a basis for informing migration decision-making. A review of the concepts that could potentially be used to underpin the HMA framework were explored. The problems associated with the use of markets search (as a method for solely defining HMAs as opposed to informing the delineation process) and spatial arbitrage (due to lack of appropriate data in England) meant that the most practical approach for informing HMA delineation was the supply and demand measure. This is based on the understanding that flows of migrants reflect the interaction between the supply of, and effective demand for, housing within a defined market area. The advantage of the supply and demand measure is that as a concept it suits the data that is available in England (SMS datasets) whilst also providing an economically driven approach to defining sub-regional housing markets.

The issue of HMA size was also explored on the basis that HMAs and TTWAs might be expected to share a number of common features, which is likely to include a degree of similarity in their boundaries and coverage. This is based on the assumption that people will move home within their existing TTWA unless a change of job forces a move beyond their existing labour market.

Likewise, the issue of migration self-containment was also addressed in the HMA framework. It was assumed that by definition HMAs should have relatively closed migration patterns (DTZ Pieda, 2004b), which is consistent with the understanding that HMAs should have internal coherence. The issue to address in the HMA framework was what the minimum threshold for self-containment should be and whether a supply-side self-containment measure should be adopted (e.g. Jones, 2002) or whether a supply and demand-side self-containment measure would be more appropriate. It was decided that a supply and demand-side self-containment threshold would increase the robustness of the HMA framework by accounting for the effects of migrants originating from within the HMA (supply-side) and those originating from outside the HMA (demand-side) (see Coombes *et al*, 2006). In addition, a minimum 70 per cent self-containment threshold was adopted which is consistent with the recommendations made in the *Housing Market Assessment Manual* (DTZ Pieda, 2004b).

The final conceptual issue to address was the need to distinguish between HMAs and submarkets. Jones (2002) identified this to be a problem in HMA delineation particularly as submarkets have been shown to have relatively high levels of self-containment levels in relation to migration (Jones *et al*, 2004; Jones *et al*, 2005). However, it was decided that the test for a HMA should draw on the existence of high levels of internal migration flows but it was also decided to draw on the knowledge of local housing market professionals (estate agents) to inform the decision-making process in order to distinguish between HMAs and submarkets (DTZ Pieda, 2004b).

The problem in identifying the HMAs was that there was no consensus on how to incorporate the conceptual issues into a methodology that would allow the HMA framework to be operationalised. The *Housing Market Assessment Manual* (DTZ Pieda, 2004b) offers a number of valuable insights into relevant sources of data and the practical steps involved in addressing many of these issues. In addition, the iterative algorithm proposed by Jones (2002) and the adaptation of the TTWA algorithm to allow HMA delineation as proposed by Coombes *et al* (2006) provide useful insights into the methodological and operational issues associated with HMA delineation. An iterative methodology was developed to operationalise the HMA framework following extensive consideration of existing HMA and functional regionalisation literature. The methodology was based on the identification of HMA core wards using estate knowledge of local housing markets. HMAs were then created through the aggregation of wards through the functional regionalisation of 2001 Special Migration Statistics (Table MG201) using intramax. The aggregation process was constrained by the fact that only a single 'core' ward could be included in any HMA. The self-containment of the resulting HMAs was examined to identify potential candidate HMAs for which core re-specification might be appropriate in the light of a further round of estate agent consultation. The iterative process continued until the HMA self-containment and estate agent criteria were satisfied, and this was achieved in the operationalisation of the HMA framework in four iterations. Thus, the HMA delineation framework that emerges is both consistent with the requirements set out in the *Housing Market Assessment Manual* (DTZ Pieda, 2004b) and in principle is transferable beyond the North West to other regions.

The third research question addressed in the chapter is what is the nature and configuration of the identified housing markets in the North West? This has been assessed on two grounds: the configuration of HMA boundaries and HMA self-containment. The iterative methodology resulted in the identification of a final group of 25 HMAs, which closely corresponds to the number of TTWAs in the region (23 in total). The analysis reveals that there is a high degree of variability between the boundaries of the HMAs and those of the TTWAs. This is particularly pronounced in Manchester where multiple HMAs are embedded within a single TTWA whilst in Cumbria, a single HMA can serve more than one TTWA. Similar problems are also evident when comparing the HMAs with local authority boundaries. The analysis showed how larger groupings of local authorities have been created as a consequence of ward level aggregation whilst in other areas there is little association between local authority geography. What this illustrates is that taking administrative boundaries as approximations to housing markets is likely to result in misspecifications of the nature of housing markets in specific areas and incomplete intelligence on housing market functioning. In relation to the self-containment criteria, the analysis revealed that all the HMAs met the 70 per cent self-containment threshold, and 22 of the 25 HMAs had self-containment levels on both the supply and demand-side measure of 75 per cent or over, suggesting that the HMAs had high internal coherence.

The analysis revealed that from a planning perspective the HMAs would aid policymakers in providing a more effective framework within which to assess housing market performance and plan for housing. In addition, a combination of the HMA and TTWA frameworks would assist in the identification of relationships between the different *functional* markets associated with individual settlements, including housing and labour market interaction, a capability that is not afforded by current reliance on the TTWA framework or the relatively unquestioned acceptance of local authority boundaries as approximations to housing markets.

CHAPTER 7
THE INTERACTION OF HOUSING AND LABOUR MARKETS IN NORTH WEST ENGLAND

Introduction

The debates surrounding the North-South divide, differential regional development, cross-boundary spatial processes, and the decentralisation of population and employment from urban areas, have intensified over the last decade in academic and policy circles. Wong *et al* (2000) suggest that such processes are intimately connected to housing and labour markets, and the dynamic nature of their interaction. The corollary of the intensification of the debates surrounding such processes has been the growing awareness of the reciprocal relationship that exists between housing and labour markets (Allen and Hamnett, 1991a; Champion *et al*, 1998; Breheny, 1999a; Jarvis, 1999; Wong *et al*, 2000; Wong, 2002; Morrison and Monk, 2006). However, despite growing awareness of such issues the understanding of the interaction of housing and labour markets has been restricted by a paucity of basic intelligence and narrowly focused research and policy agendas. Indeed, the policy review chapter highlights that the government's understanding of the relationship between housing and labour markets is borne from a crude macroeconomic perspective that considers housing market rigidities to be a key constraint on labour mobility, and thus a constraining factor on economic competitiveness. The result of this has been a preoccupation with the idea that housing policy should encourage development in areas with good access to jobs through the strategic targeting of housing supply informed through the national household projections (e.g. ODPM, 2003). However, this macroeconomic perspective has resulted in an overwhelming focus on the implications of permanent labour mobility on housing and labour market interaction, which has led to the neglect of the daily interaction of housing and labour markets.

Thus, the purpose of this chapter is to explore the daily interaction of housing and labour markets in North West England. It begins by outlining the research methodology adopted, after which the spatial intersection of the identified sub-regional housing and labour markets is explored as a basis for analysing the spatial interaction of housing and labour markets through commuting. Trends in distance travelled to work are also considered. Following this, the analysis turns to consider the effects that 'people factors' and 'place factors' have on commuting and thus on the daily interaction of housing and labour markets, which is followed by a discussion of the results and a conclusion section.

Methods for Analysing the Daily Interaction of Housing and Labour Markets

The method used to examine the interaction of the housing and labour markets is comprised of five parts. Part one of the analysis involves determining the spatial intersection of the sub-regional housing and labour markets, and this is achieved using a Geographical Information System (GIS) based approach (ArcGIS 9). The process first involves mapping the HMA and TTWA boundaries. Following this, the buffer tool in the *proximity* utility in the GIS software is then used to create buffers around the TTWA boundaries. Typically, buffers are used to establish the degree of overlap between an input feature (e.g. a road) and additional features (e.g. local authorities) within a specified distance from the input feature. However, in this instance, the distance parameter from each of the TTWA boundaries (input feature) is minimised so that only those HMAs that overlap each of the TTWAs are identified. Having identified the HMAs that overlap each of the TTWAs, a conceptual typology is developed describing the nature of the intersection of the HMAs and TTWAs, and this is used to classify the intersection of specific housing and labour markets.

Part two of the analysis focuses on the spatial interaction of the HMAs and TTWAs at the sub-regional level. Step one of the analysis is the aggregation of ward level commuting flow data derived from the 2001 Special Workplace Statistics (SWS) Census dataset (Table W201). The result of the aggregation process is the creation of a 25x23 origin and destination matrix that records the number of commuters travelling from each of the HMAs (origins) to each of the TTWAs (destinations). Following the aggregation procedure, the analysis explores the volume of commuting in the region. The volume of commuting relates to the magnitude of outgoing commuting from each of the HMAs and incoming commuting into each of the TTWAs (see Van der Laan, 1998). The analysis of commuting volume provides an indication of the general pattern of commuting in the region, and the relative importance of particular HMAs and TTWAs in relation to labour supply and demand, measured by the concentration of outgoing commuting (supply), and incoming commuting (demand). The degree of concentration of incoming and outgoing commuting is measured by the Gini coefficient and Lorenz curve. Where the coefficient is equal to 0, each of the HMAs would have an equal share of outgoing commuting and each of the TTWAs an equal share of incoming commuting. Where the coefficient is equal to 1, outgoing commuting would be concentrated from a single HMA, and incoming commuting would be concentrated into a single TTWA.

After examining the commuting volume, the analysis proceeds to step two to explore the spatial patterns of commuting between the HMAs and TTWAs. Having already created a commuting origin and destination matrix, the second stage involves simplifying the patterns of commuting in order to aid interpretation and permit the interpretation of flow patterns between origins and destinations. A number of methods have been developed and applied with the aim of reducing the complexity of origin and destination matrices. However, these methods rely on arbitrary values in determining cut-off thresholds for different flow magnitudes (e.g. dominant flows or second order flows). Therefore, an alternative approach, the *flow standardisation method*, is developed to simplify the flow matrices. This method is summarised below:

1) For each individual destination TTWA, convert the commuting inflows from each of the origin HMAs into z-scores. The conversion of inflows into z-scores is not undertaken through a single step for the entire origin and destination matrix but is undertaken individually for each destination, essentially a column at a time for each column in the matrix.
2) For each of the destinations, identity the inflows of *exceptional* magnitudes based on the identification of z-scores above 1.65 (p<0.05). These flows are taken to represent the salient flows (i.e. dominant first order flows) into each destination.
3) Having identified the dominant flows, remove these from consideration (i.e. delete them from the matrix).
4) Calculate the mean for each of the destinations of the remaining non-salient flows. The flows above the non-salient mean values are taken to represent

second order flows for each of the destinations, and those below the mean values are taken to represent third order flows.

5) Having identified the first, second, and third order flows for each of the TTWAs using z-scores, convert the absolute inflow values in the original origin and destination matrix into a proportion of the total incoming commuters into each TTWA to aid interpretation.

Step three of the approach involves mapping the commuting flows. The use of GIS provides an important geovisualisation tool for analysing and representing the spatial interaction of the housing and labour markets (e.g. see Kwan, 2000). The *Flow Data Model Tool for ArcGIS 9* is used to map the commuting flows between the HMAs and TTWAs. This involves generating centroids for each of the HMAs and TTWAs followed by the reorganisation of the commuting flow origin and destination matrix into three columns: an origin column, a destination column, and a flow magnitude column. The file is then added to ArcGIS as a *table* and is used in the *Create Flow Lines* utility in the *Flow Data Model Tool* to generate flow lines (polylines) between each of the origin HMA and destination TTWA centroids. The flows for each of the origins are classified according to the identification of first, second, or third order commuting flows using the flow standardisation method.

Part three of the analysis examines the distance travelled to work for both the home-end (HMA resident population) and work-end (TTWA workplace population) of the home-work trip[24]. The 2001 Census provides data related to distance travelled to work at ward level for resident and workplace populations based on eight distance bands. Due to the fact that each ward forms both HMAs and TTWAs, it is possible to aggregate the ward level data for resident population distance bands to sub-regional level for each HMA, and workplace population distance bands to sub-regional level for each TTWA. This gives a measure of distance travelled for resident populations of each HMA and workplace population of each TTWA.

[24] Data related to commuting time is available in datasets such as the Household Panel Survey, however, the datasets are not detailed enough to allow the same depth of analysis of journey distance, which accounts for the consideration of distance but not time.

Part four of the analysis determines the influence of 'people factors' on the interaction of housing and labour markets. A number of studies highlight the significance of demographic and socio-economic characteristics on the nature of the commuting (see Chapter 2). One of the difficulties associated with exploring the effect of people factors on commuting is the lack of quality spatial data relating to the different socio-economic and demographic characteristics of commuters. However, the SWS datasets from the 2001 Census of Population contain commuting flow data, which has been disaggregated based on a selection of demographic and socio-economic characteristics. The available datasets include gender, age, employment status, and socio-economic status. The commuting flows are aggregated from ward level to explore the interaction of the sub-regional housing and labour markets based on different demographic and socio-economic characteristics. The analysis explores whether there is a significant difference in the interaction of adjacent and non-adjacent housing and labour markets based on commuter characteristics. The differentiation of adjacent and non-adjacent interaction is based on the typology of the spatial intersection of housing and labour market boundaries. In a sequence of paired comparisons, the adjacent and non-adjacent interaction samples were split according to specific variables identified in Chapter 2. In each case for both adjacent and non-adjacent interaction, an independent samples t-test is used to test for the presence of a significant difference in the composition of the commuters. The actual flows are subject to the flow standardisation approach and are mapped to provide a geovisualisation of the interaction of the markets in relation to the different demographic and socio-economic characteristics.

Part five of the analysis explores the influence of 'place factors' on the interaction of housing and labour markets and specifically the influence of employment and population decentralisation, and spatial structure. In relation to decentralisation, the analysis draws on a six-way urban-rural classification (ward based) and uses it to analyse the distribution of employment in different types of employment locations and the process of migration between different types of residential locations through the 2001 SMS at ward level (Table MG201) to illustrate the effect of decentralisation on employment and population distribution. The classification is then used to explore the effect of decentralisation on commuting and specifically on the daily interaction of different types of residential and workplace locations. The commuting flows between different types of residential and workplace locations are aggregated to sub-regional level by allocating the wards to their specific HMAs and TTWAs, and the impact of decentralisation is explored in the context of adjacent and non-adjacent housing and labour market interaction.

In relation to spatial structure, the ward based urban-rural classification is used to explore the impact of spatial form on commuting. The relationship between different residential and workplace locations and commuting distance is examined using the Spearman Rank Correlation for both the home and work-end trips of the commuting process (residential population for home-end and workplace population for the work-end). The correlation method was chosen because it is an appropriate non-parametric method for two-tailed bivariate correlations of ordinal and non-normally distributed data. The analysis goes on to explore the effect of population and employment density on commuting distance by also undertaking Spearman Rank Correlations. The analysis is further extended to sub-regional level to explore the effect of the population density of HMAs on commuting distance of resident populations and the employment density of TTWAs on commuting distance of workplace populations.

The Daily Interaction of Sub-Regional Housing and Labour Markets

Part One: The Spatial Intersection of Housing and Labour Markets

The first task in exploring the interaction of housing and labour markets is to determine the geographical relationship between the different HMAs and TTWAs in the region in order to ascertain which HMAs and TTWAs serve the same geographical areas. This builds on the simple comparison undertaken in Chapter 6 in assessing the configuration of the boundaries of the HMAs and TTWAs. However, it is an important exercise because the geographical relationship between HMAs and TTWAs will have a significant bearing on the nature of the interaction of housing and labour markets in the region. One of the underlying assumptions of the research is that because HMAs and TTWAs represent sub-regional market areas, in principle, the HMAs and TTWAs serving the same geographical area should share a degree of similarity in their extent and boundaries. This is consistent with the neoclassical assumption that people will move home within their existing TTWA except when a change of job forces the individual or household to move beyond their existing labour market boundary.

The analysis of the relationship between the HMAs and TTWAs highlights that there is a relatively high degree of variability between the boundaries of the HMAs and those of the TTWAs serving the same geographical areas. Indeed, some of the TTWAs are served by a single HMA. However, in other cases, multiple HMAs serve a single TTWA, and there are cases where a single HMA serves multiple TTWAs. As such, due to the complexity of the spatial intersection of the HMAs and TTWAs, it was decided to identify the primary HMA serving a particular TTWA. In many cases, this was a single HMA; however, there are also cases when more than one primary HMA serves a particular TTWA. In addition, the HMAs that cut-across a TTWA boundary but which are not considered a primary serving HMA are also identified. This provides the basis for developing a typology (Table 7.1) describing the relationships between HMAs and TTWAs (Table 7.2).

Table 7.1: Typology of the Spatial Intersection of HMAs and TTWAs

Category	**Description**
Single Primary HMA	Single HMA serves a single TTWA
Dual Primary HMAs	Two HMAs serve a single TTWA
Multiple Primary HMAs	More than two HMAs serve a single TTWA
Single Primary HMA with a Single Secondary HMA	Single primary HMA serves a single TTWA with one secondary HMA cutting-across the boundary of the TTWA
Single Primary HMA with Dual Secondary HMAs	Single primary HMA serves a single TTWA with two secondary HMAs cutting-across the boundary of the TTWA
Single Primary HMA with Multiple Secondary HMAs	Single primary HMA serves a single TTWA with more than two secondary HMAs cutting-across the boundary of the TTWA
Dual Primary HMAs with Single Secondary HMA	Two primary HMAs serve a single TTWA with one secondary HMA cutting-across the boundary of the TTWA
Multiple Primary HMAs with Multiple Secondary HMAs	More than two primary HMAs serve a single TTWA with more than two secondary HMAs cutting-across the boundary of the TTWA

Table 7.2: The Spatial Intersection of Housing and Labour Markets

Typology of Relationship between TTWAs and HMAs	TTWA	Primary Associated HMA(s)	Secondary HMA(s)
Single Primary HMA	Appleby	Eden	
Single Primary HMA	Blackpool	Blackpool	
Single Primary HMA	Kendal	South Lakeland	
Single Primary HMA	Penrith	Eden	
Single Primary HMA	Whitehaven	Whitehaven	
Single Primary HMA	Windermere	South Lakeland	
Dual Primary HMAs	Blackburn	Blackburn, Rossendale,	
Dual Primary HMAs	Liverpool	Liverpool, Sefton and West Lancashire	
Dual Primary HMAs	Wirral and Chester	Wirral, Chester	
Multiple Primary HMAs	Keswick	Whitehaven, Workington, Eden	
Single Primary HMA with a Single Secondary HMA	Bolton	Bolton	Bury and Salford
Single Primary HMA with a Single Secondary HMA	Burnley	Burnley and Nelson and Colne	Blackburn
Single Primary HMA with a Single Secondary HMA	Crewe	Crewe and Nantwich	Chester
Single Primary HMA with a Single Secondary HMA	Nelson and Colne	Burnley and Nelson and Colne	Blackburn
Single Primary HMA with a Single Secondary HMA	Rochdale	Rochdale and Oldham	Rossendale
Single Primary HMA with a Single Secondary HMA	Workington	Workington	Whitehaven
Single Primary HMA with Dual Secondary HMAs	Barrow-in-Furness	Barrow-in-Furness	Whitehaven, South Lakeland
Single Primary HMA with Dual Secondary HMAs	Carlisle	Carlisle	Whitehaven, Eden
Single Primary HMA with Dual Secondary HMAs	Lancaster and Morecambe	Lancaster and Morecambe	South Lakeland, Blackpool
Single Primary HMA with Dual Secondary HMAs	Warrington	Warrington	Wirral, Chester
Single Primary HMA with Multiple Secondary HMAs	Preston	Preston	Sefton and West Lancashire, Bolton, Blackburn
Dual Primary HMAs with Single Secondary HMA	Wigan and St Helens	Wigan, St Helens	Sefton and West Lancashire
Multiple Primary HMAs with Multiple Secondary HMAs	Manchester	Manchester, Bury and Salford, Macclesfield	Rochdale and Oldham, Warrington, Crewe and Nantwich, Wigan

The analysis reveals that six of the TTWAs are served by a single primary HMA. With the exception of the Blackpool TTWA, the TTWAs served by a single primary HMA are concentrated in Cumbria. This is related to the fact that the boundaries of the Eden, South Lakeland, and Whitehaven HMAs have extended beyond the boundaries of their associated TTWAs therefore preventing cross-cutting from surrounding HMAs. This is also the case in relation to the Blackpool HMA, which extends beyond the boundary of the Blackpool TTWA into the Lancaster and Morecambe TTWA. The analysis also reveals that there is extensive cross-cutting of TTWA boundaries by additional HMAs. Indeed, seven TTWAs are served by a single HMA but are cut-across by a secondary HMA, three TTWAs are served by a single HMA and cut-across by two secondary HMAs, whilst one TTWA is served by a single HMA, and cut-across by multiple secondary HMAs. Two HMAs serve three of the TTWAs, and two HMAs and a single secondary HMA serve one of the TTWAs. The emergence of dual HMAs serving single TTWAs reflects the fact that the area is composed of two distinct sub-regional housing markets.

In addition, the Keswick TTWA is served by multiple primary HMAs. This reflects the fact that the Keswick TTWA is not embedded within a single HMA but is positioned across the boundaries of three HMAs: Whitehaven, Workington, and Eden. Finally, the Manchester TTWA is served by multiple primary HMAs and cut-across by more than two secondary HMAs, which reflects the size of the Manchester labour market and the fact that there are a number of distinct sub-regional housing markets embedded within and serving the TTWA. In addition, the fuzziness at the boundaries of the HMAs and TTWA is reflected in the fact that multiple secondary HMAs cut-across the boundary of the Manchester TTWA.

Turning to the other side of the coin, the complex intersection between the two markets also means that a housing market does not necessarily supply labour to a particular dominant TTWA, and that a TTWA may be served by different distinct housing markets. In the North West, only eight (i.e. Barrow-in-Furness, Carlisle, Lancaster & Morecambe, Preston, Liverpool, St. Helens, Macclesfield and Manchester) out of the 25 HMAs serve as pure catchment area for one dominant TTWA. The others tend to have residents travelling to different

TTWAs. The most common patterns, however, is that the housing market area serve one dominant TTWA but also act as the secondary HMA for another TTWA. In total ten HMAs fall into this category, they include Blackpool, Blackburn, Rossendale, Wirral, Bolton, and Bury & Salford, as well as Warrington, Rochdale, Wigan, and Crewe which tend to serve as the secondary HMA of the Manchester TTWA. Other complex intersections include, for instance, Chester and Sefton & West Lancashire HMAs provide main labour supply to one TTWA and serve as secondary HMA to two other TTWAs; Workington and Burnley & Nelson & Colne HMAs serve as primary HMA for two TTWAs; Eden and South Lakeland HMAs serve as primary HMA for two TTWAs and secondary HMA for one TTWA; and Whitehaven is the primary HMA for two TTWAs and secondary HMAs for another two TTWAs. The analysis suggests that the housing markets in Cumbria tend to overlap with multiple labour market areas, which suggest that there is a higher possibility of their residents travel to more than one labour market areas.

The analysis of the spatial intersection of the HMAs and TTWAs effectively illustrate the complex spatial interaction of housing and labour market boundaries. The neoclassical economic theory's ideal situation is that where a single HMA serves a single TTWA, then the TTWA should attract the majority of commuters from the HMA serving the area. The analysis in the North West shows that there is not a single situation where there is one TTWA intersects solely with one HMA. The closest example is in the case of a single HMA primarily serving a single TTWA of similar size such as Blackpool. With the HMA boundaries intersect with two or more TTWAs, there is a higher likelihood that there is more complex outward commuting. Likewise, where dual and multiple HMAs serve a single TTWA, the TTWA will attract significant inflows of commuters from the range of HMAs.

Part Two: Patterns of Commuting

Volume of Commuting

Having explored the spatial intersection of the HMAs and TTWAs in the region, the next component of the analysis considers the volume of commuting in the region. According to Van der Laan (1998:236), commuting has a two-fold character: outgoing commuting and incoming commuting. In the context of this research, the outgoing commuting is related to the supply of labour from the housing markets and the incoming commuting relates to the demand for labour from labour markets. The analysis of the volume of commuting considers outgoing commuting from the HMAs and incoming commuting to the TTWAs.

Outgoing Commuting from HMAs

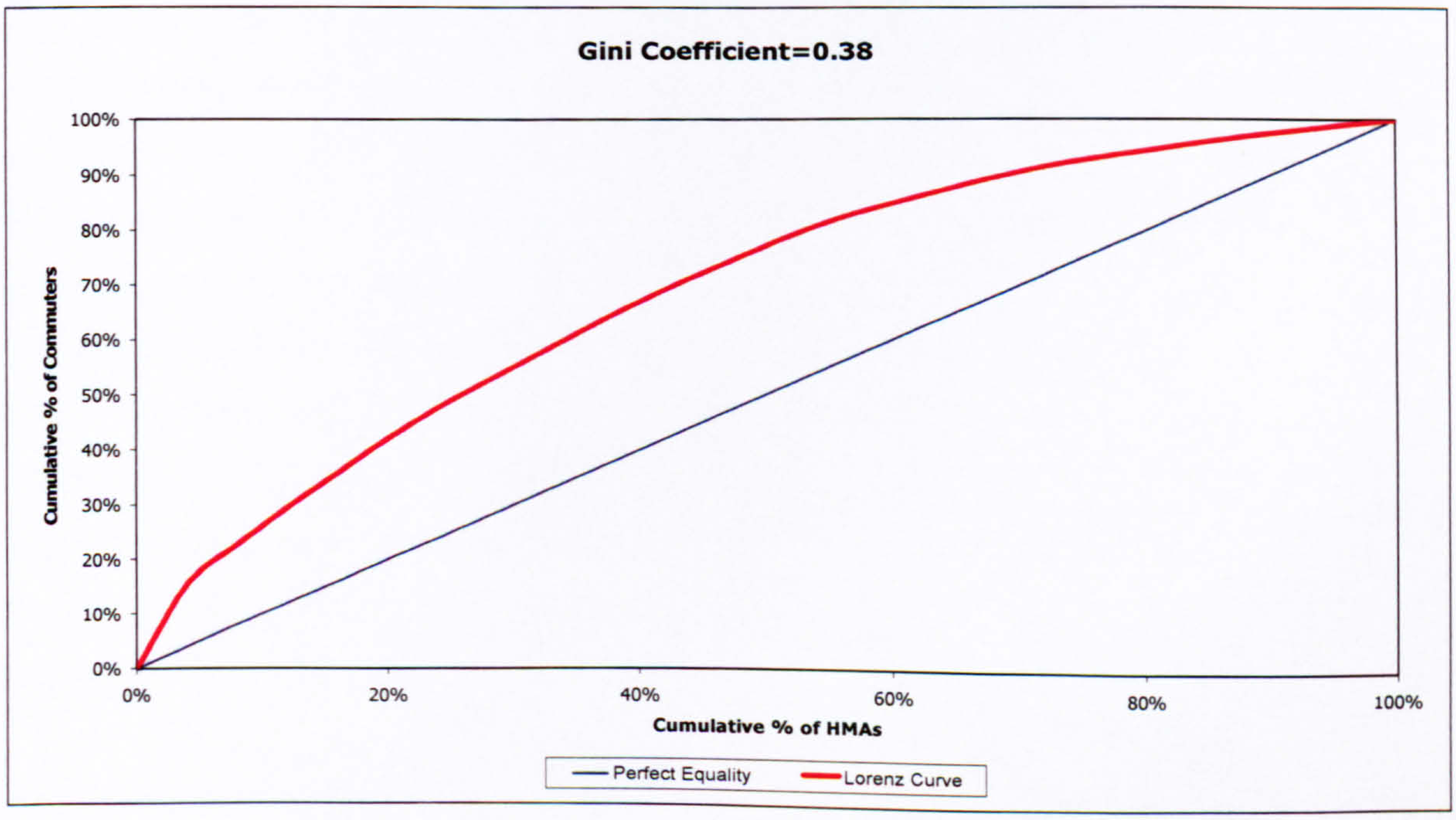
Table 7.3 outlines the supply of labour from housing markets in the form of outgoing commuting. The regional average of outgoing commuters from the HMAs is 112,282 workers per HMA. The analysis highlights that 12 of the 25 HMAs have a level of outgoing commuting above the regional average. However, an important issue to address here is the distribution of outgoing commuting (labour supply) across the range of HMAs. The Gini coefficient and Lorenz curve is used to measure the nature of the distribution of outgoing commuting across the range of HMAs, and specifically whether outgoing commuting is concentrated among a few dominant HMAs or whether it is relatively evenly dispersed throughout the range of housing markets.

The Gini coefficient suggests that there is some concentration of outgoing commuting among the region's housing markets (Figure 7.1). Indeed, 50 per cent of all outgoing commuting in the region originates from just seven HMAs. The top seven HMAs tend to serve the urban-industrial belt (as defined in Chapters 5 and 6), with the Manchester HMA accounting for over 15 per cent of outgoing commuting from all HMAs. In contrast, the smaller urban and more rural HMAs tend to account for much lower levels of outgoing commuting. Indeed, the likes of Eden and Rossendale account for less than 1 per cent of total outgoing commuting whilst Lancaster and Morecambe, Carlisle, South Lakeland, Workington, Barrow-in-Furness and Ulverston, and Whitehaven each account for less than 2 per cent of total outgoing commuting in the region. This reflects the smaller working populations of smaller urban and rural HMAs when compared to the larger urban HMAs.

Table 7.3: Outgoing Commuting from HMAs

HMA	Total Outgoing Commuters	% of Total Outgoing Regional Commuting
Manchester	433,596	15.43
Rochdale and Oldham	203,584	7.25
Sefton and West Lancashire	192,485	6.85
Bury and Salford	177,507	6.32
Liverpool	175,964	6.26
Preston	156,061	5.55
Warrington	138,719	4.94
Wigan	137,922	4.91
Blackpool	133,988	4.77
Crewe and Nantwich	130,289	4.64
Wirral	120,670	4.29
Bolton	112,419	4.00
Blackburn and Darwin	106,261	3.78
Chester	90,837	3.23
Burnley and Nelson and Colne	71,804	2.56
St Helens	66,383	2.36
Macclesfield	63,662	2.27
Lancaster and Morecambe	53,121	1.89
Carlisle	44,950	1.60
South Lakeland	38,948	1.39
Workington	37,624	1.34
Barrow-in-Furness and Ulverston	34,825	1.24
Whitehaven	32,257	1.15
Rossendale	27,676	0.99
Eden	25,498	0.91
Total	2,807,051	100.00

Figure 7.1: Gini Coefficient and Lorenz Curve for Outgoing Commuting from HMAs



Incoming Commuting to TTWAs

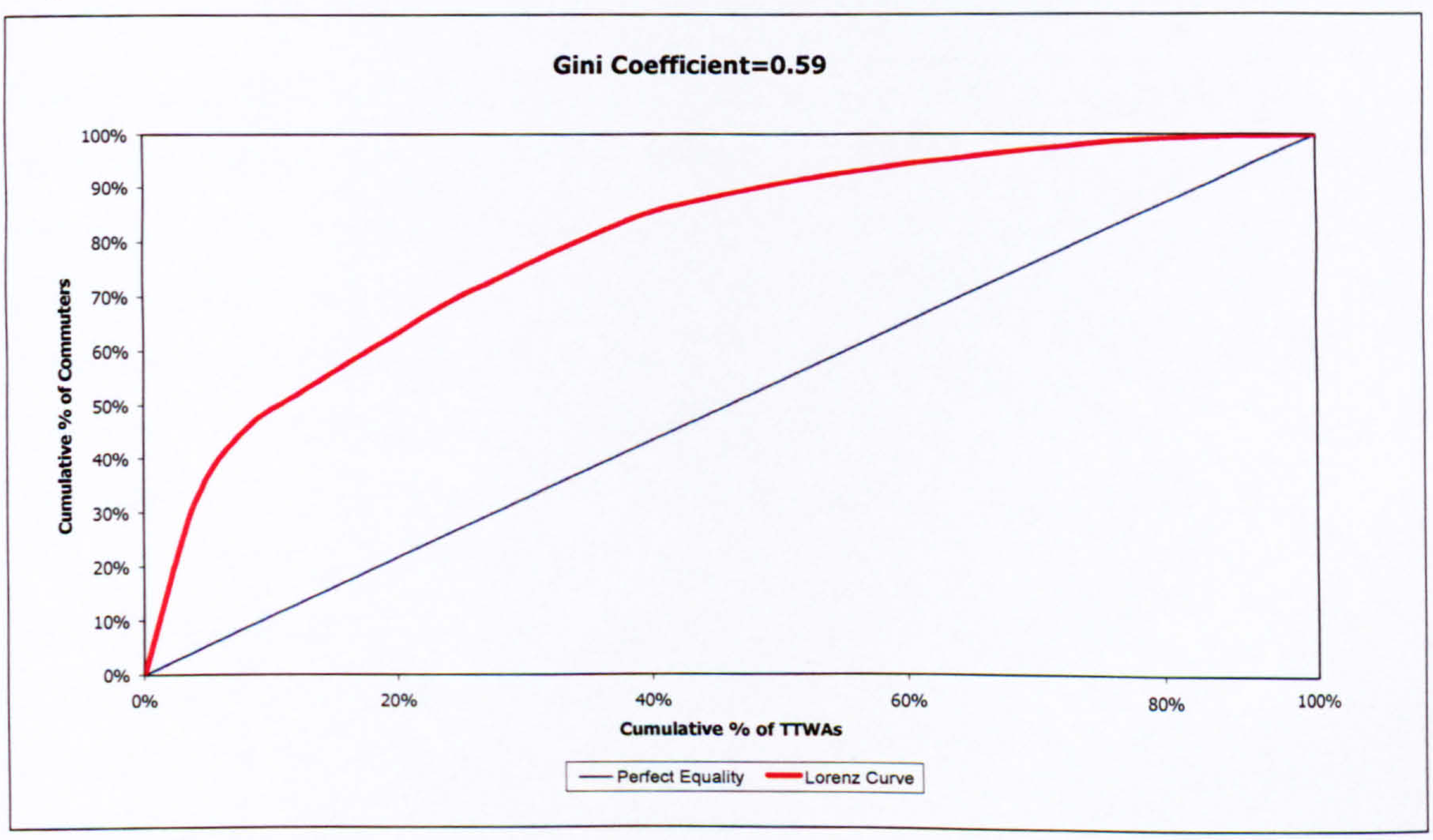
Table 7.4 outlines the demand of labour from labour markets in the form of incoming commuting. The regional average of incoming commuters to the TTWAs is 121,912 workers per TTWA. The analysis reveals that 8 of the 23 North West TTWAs have a level of incoming commuting above the regional average. The Gini coefficient and the associated Lorenz curve is used to measure the distribution of incoming commuting to TTWAs to determine whether incoming commuting is relatively evenly distributed across the TTWAs or whether it is concentrated among a few dominant TTWAs.

The Gini coefficient suggests that there is a relatively high degree of concentration of incoming commuting among the region's labour markets (Figure 7.2). Significantly, 50 per cent of incoming commuting is concentrated into just 12 per cent of the labour markets, equivalent to three TTWAs (Manchester, Liverpool, and Wirral and Chester). Indeed, the metropolitan TTWAs account for the highest levels of incoming commuting, with the Manchester TTWA dominating and accounting for nearly 32 per cent of all incoming commuting in the region. The Liverpool TTWA has the second highest level of incoming commuting, and together with the Manchester TTWA, they account for 45 per cent of all incoming commuting in the region. In addition, the TTWAs with incoming commuting above the regional average tend to serve the urban-industrial belt, which is a key location for economic activity and varied employment opportunities in the North West (NWDA, 2006). However, the contrast between the metropolitan and larger urban HMAs and the smaller urban and more rural HMAs is also apparent in relation to the TTWAs. Indeed, Workington, Kendal, Penrith, Windermere, Appleby, and Keswick account for less than 1 per cent of total incoming commuting in the region. There are also low levels of incoming commuting into the Carlisle, Burnley, Barrow-in-Furness, Nelson and Colne, and Whitehaven TTWAs, which each account for less than 2 per cent of incoming commuting in the region. This reflects the much lower levels of employment opportunities available in the smaller urban and rural focused TTWAs and the lower levels of working population in surrounding HMAs.

Table 7.4: Incoming Commuting to TTWAs

TTWA	Total Incoming Commuting	% of Total Incoming Regional Commuting
Manchester	893,452	31.86
Liverpool	381,606	13.61
Wirral and Chester	181,794	6.48
Preston	163,551	5.83
Warrington	157,523	5.62
Wigan and St Helens	157,297	5.61
Blackpool	126,438	4.51
Blackburn	125,499	4.48
Bolton	113,429	4.04
Crewe	99,901	3.56
Rochdale	61,755	2.20
Lancaster and Morecambe	58,519	2.09
Carlisle	53,270	1.90
Burnley	40,928	1.46
Barrow-in-Furness	35,714	1.27
Nelson and Colne	30,581	1.09
Whitehaven	30,010	1.07
Workington	27,873	0.99
Kendal	26,268	0.94
Penrith	16,924	0.60
Windermere	11,187	0.40
Appleby	5,550	0.20
Keswick	4,910	0.18
Total	2,803,979	100.00

Figure 7.2: Gini Coefficient and Lorenz Curve for Incoming Commuting to TTWAs



Commuting between Sub-Regional Housing and Labour Markets

The analysis of the aggregate commuting flows between the HMAs and TTWAs provides the starting point for exploring the spatial interaction of the housing and labour markets in the region. The initial exploration of the 25x23 matrix underlines the complexity of the interaction of housing and labour markets in the North West. This complexity is characterised by a high incidence of comparatively low magnitude flows and a much lower incidence of higher magnitude flows, which suggests that commuting flows are numerous but the concentration of commuters within the majority of flows is relatively low. This is reflected in the fact that of the 405 flows with a magnitude >10 recorded between the HMAs and TTWAs at sub-regional level, 334 flows had less than 3,640 commuters (82 per cent), which contrast significantly with the low number of links (15) that had more than 59,000 commuters (3 per cent). As such, in order to identify the nature of the interaction of the HMAs and TTWAs, the absolute flows between the HMAs and TTWAs were subjected to the flow standardisation method outlined above. Figure 7.3 outlines the distribution of first, second, and third order flows in the region determined through the *Flow Standardisation Method.* The flows were then mapped to provide a geovisualisation of the aggregate patterns of spatial interaction between the sub-regional housing and labour markets in the region (Figures 7.4 to 7.26).

The striking feature of the pattern of interaction is that the dominant flows into each of the TTWAs originate in geographically coincident HMAs. Although this was expected because of the constraint built into the TTWA framework, which requires the achievement of a high level of commuting self-containment for an area to be accepted as a TTWA (see Coombes and ONS, 1998), the outcome of this is the forging of dominant commuting links between geographically coincident housing and labour markets. This is particularly apparent in areas where the HMA and TTWA boundaries are comparable. The analysis of the commuting flows between the HMAs and TTWAs reveals that there are 25 flows classified as first order flows. These dominant flows account for a significant proportion of the total number of workers commuting to each of the TTWAs (68 per cent of all outgoing commuters). In addition, the average size of the dominant flows is 71 per cent of the destination TTWA total. This suggests that the majority of workers will commute to a limited number of local labour markets (see Lowe, 1998) and supports the assumption that in the majority of cases workers will attempt to balance residential and workplace locations to minimise commuting costs (Kain, 1962).

The largest of the dominant flows are recorded between the HMAs and TTWAs of Manchester and Liverpool. One-fifth of all commuting in the region occurs between the Liverpool HMA and Liverpool TTWA and the Manchester HMA and Manchester TTWA. The high level of commuting between these housing and labour markets is characteristic of the generally high levels of commuting across the urban-industrial belt. Indeed, the dominant flows connecting the urban-industrial TTWAs of Manchester, Bolton, Liverpool, Warrington, Rochdale, and Wigan and St Helens with local HMAs account for over a third of all commuting in the region. In addition to the urban-industrial belt, the interaction between the housing and labour markets of the other dominant urban centres in the region is also characterised by relatively large first order flows. High magnitude flows are characteristic of commuting between the housing and labour markets of Preston, Wirral and Chester, Lancaster and Morecambe, Blackpool, and Blackburn. This echoes the findings of Rain (1999) and Johannsen *et al* (2005) who suggest that large and medium-sized urban areas act like 'magnets' for commuters, and despite losing substantial numbers of jobs through economic restructuring (Bailey and Turok, 2000), the large and medium-sized urban areas continue to function as critical employment centres (NWDA, 2006). This is supported by the fact that the dominant commuting links to the TTWAs of Preston, Wirral and Chester, Blackpool, Blackburn, and Lancaster and Morecambe from their geographically coincident HMAs account for one-fifth of all commuting in the region.

In contrast, the magnitudes of the dominant flows in the north of the region are much smaller when compared to those in the south. However, the interaction of the housing and labour markets in the north of the region is characterised by high levels of commuting self-containment between geographically coincident housing and labour markets. Indeed, for each TTWA in the north of the region, four-fifths of incoming commuters originated in geographically coincident HMAs.

In contrast, the second order flows tend to have significantly smaller magnitudes when compared to the first order flows. This is reflected in the fact that a much smaller proportion of commuters (26 per cent of total commuters) are concentrated in the second order flows. Indeed, the average size of the second order flows is 3.04 per cent of the destination TTWA total, which is significantly smaller than the average size of the dominant flows in the region. A notable feature of the patterns of second order flows is that there is a significant degree of interaction between the HMAs and TTWAs of the urban-industrial belt. This is reflected in the fact that 11 per cent of all second order commuting in the region occurs between the housing and labour markets of the urban-industrial belt. When this is added to the first order flows, commuting between HMAs and TTWAs in the urban-industrial belt accounts for nearly half of all commuting in the region. However, interestingly, the analysis reveals that the second order flows tend to connect the TTWAs with HMAs, which the TTWA borders, but which are non-geographically coincident.

In relation to the second order flows, there is relatively strong interaction between the housing and labour markets located in the same sub-regional area. This is reflected in the fact that of all second order commuting to TTWAs in the urban-industrial belt, over two-thirds originate in HMAs located in the urban-industrial belt. Similarly, three-quarters of all second order commuters travelling to TTWAs in Lancashire originate in HMAs in Lancashire, whilst nine-tenths of second order commuters originating in Cumbrian HMAs commute to TTWAs in Cumbria. In contrast, only one-third of second order commuters originating in HMAs in Cheshire travel to labour markets in Cheshire.

In relation to second order flows between the housing and labour markets serving the urban-industrial belt, Cheshire, and Lancashire, there are a number of interesting trends. Indeed, 14 per cent of secondary commuting into the Lancashire TTWAs has its origin in the HMAs of the urban-industrial belt. However, secondary commuting in the opposite direction between the HMAs in Lancashire and the TTWAs in the urban-industrial belt is much lower at 5.3 per cent. In relation to Cheshire, 8.3 per cent of incoming commuting to the Cheshire TTWAs has its origin in the urban-industrial belt. However, nearly three-quarters of all secondary commuting between the urban-industrial belt, Cheshire and Lancashire is accounted for by commuting from HMAs in Cheshire to TTWAs in the urban-industrial belt. Although there are high proportions of workers commuting between the HMAs and TTWAs of the same sub-regions, the analysis suggests that in terms of second order commuting, there is a degree of balance cross-commuting taking place between the housing and labour markets of the urban-industrial belt and Lancashire. However, this contrasts significantly to the interaction between the urban-industrial belt and Cheshire in which the labour markets in the urban-industrial belt attract significant proportions of workers from HMAs in Cheshire. This highlights the importance of Cheshire as a hinterland for the two metropolitan areas, and the practice whereby workers locate in a desirable residential location for quality of life benefits and take up jobs located in the older industrial areas.

A number of additional trends have also emerged from the analysis of the second order flows. The urban-industrial belt appears to act as a buffer between the HMAs and TTWAs of Lancashire and Cheshire. Indeed, a key feature of the interaction of the HMAs and TTWAs is that in relation to the second order flows, there is no interaction between the shire sub-regions. Furthermore, with the exception of connections between the Sefton and West Lancashire HMA and Preston and Blackpool TTWAs, there was no interaction between the Merseyside HMAs and the Lancashire TTWAs or vice versa. In addition, the analysis of the second order flows reveals that with the exception of connections between the Lancaster and Morecambe HMA and Kendal and Windermere TTWAs, and the South Lakeland HMA and Lancaster and Morecambe TTWA there are no established connections between the north and south of the region. The first and second order flows, account for 94 per cent of all commuting in the region, and the fact that interaction between the north and south is lacking suggests that the two areas are highly self-contained in terms of the daily interaction of housing and labour markets.

The patterns of the third order flows contrast significantly with the patterns of the second order flows in that they tend to connect the TTWAs to more distant HMAs. The result of connecting the TTWAs with increasingly distant HMAs is a significant overall reduction in the magnitude of the third order flows, which is illustrated by the fact that just 6 per cent of commuters are concentrated in the third order flows. In relation to both the north and south of the region, there is no established pattern of interaction between the HMAs and TTWAs. Indeed, the third order flows tend to be less structured than the first and second order flows, which reflects the diversity of the low magnitude flows that connect the housing and labour markets in the region. The lowest absolute magnitude third order flow connects the Wirral and Chester TTWA with the Workington HMA and has a magnitude of 11 commuters whilst 7 TTWAs (Carlisle, Crewe, Kendal, Nelson and Colne, Rochdale, Wigan and St Helens, and Workington) have a lowest magnitude inflow of just 12 commuters. The highest absolute third order flow connects the Manchester TTWA with the Preston HMA (4,945 commuters).

The third order flows are unique in relation to the interaction of housing and labour markets. They continue to provide a link between the HMAs and TTWAs of the same sub-region. However, they also provide the link between the HMAs and TTWAs of previously disconnected sub-regions. In particular, there is evidence of third order interaction between Merseyside and Lancashire, and Cheshire and Lancashire. In addition, there is greater diversity in the interaction of the north and south of the region when compared to the limited interaction offered through the second order flows. However, it must be acknowledged that the third order flows connecting these different sub-regions have comparatively low magnitudes and represent a small proportion of all those people commuting in the region.

Figure 7.3: Distribution of Commuting Flow Types in the North West

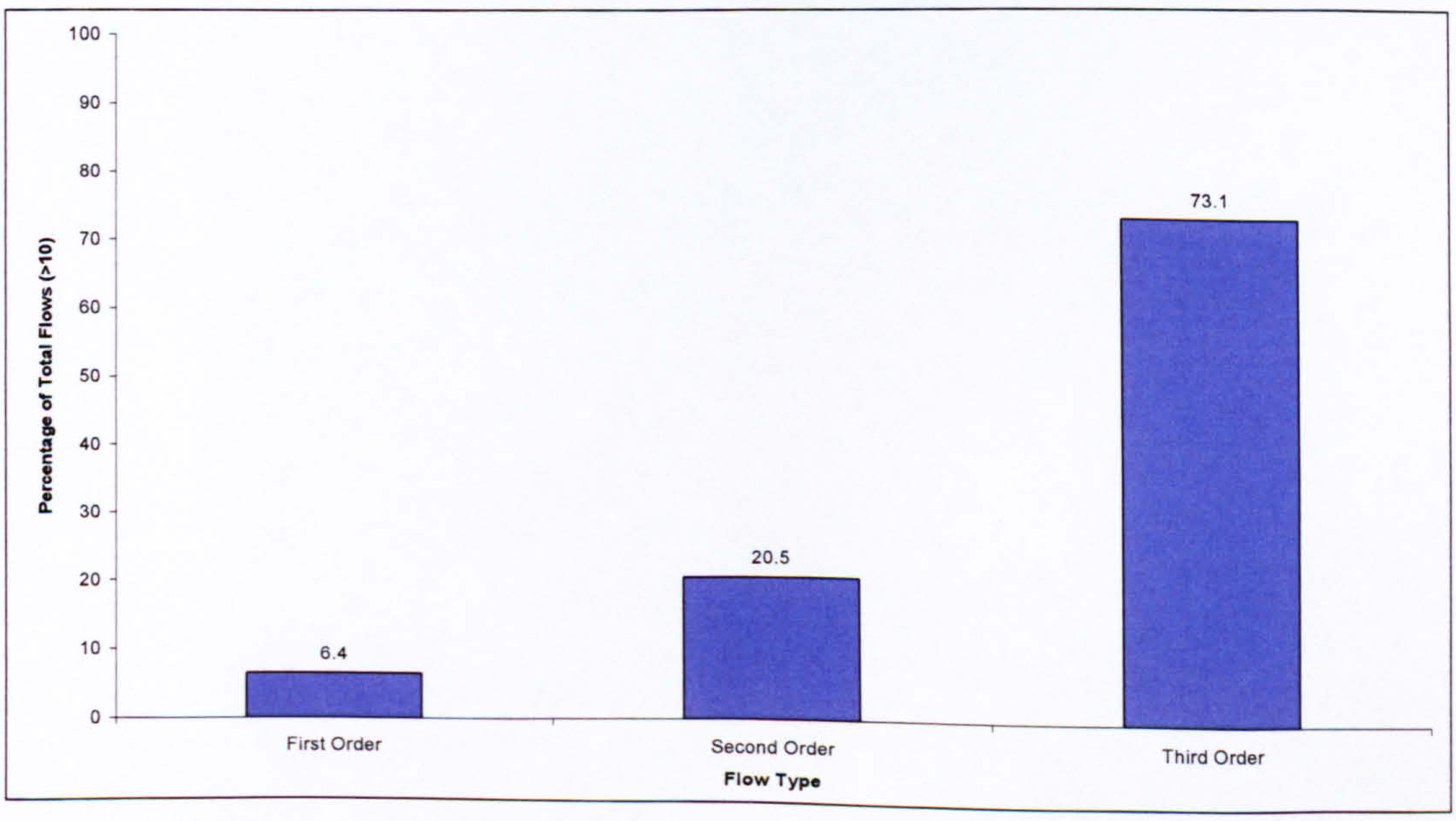


Figure 7.4: Commuting to the Appleby TTWA

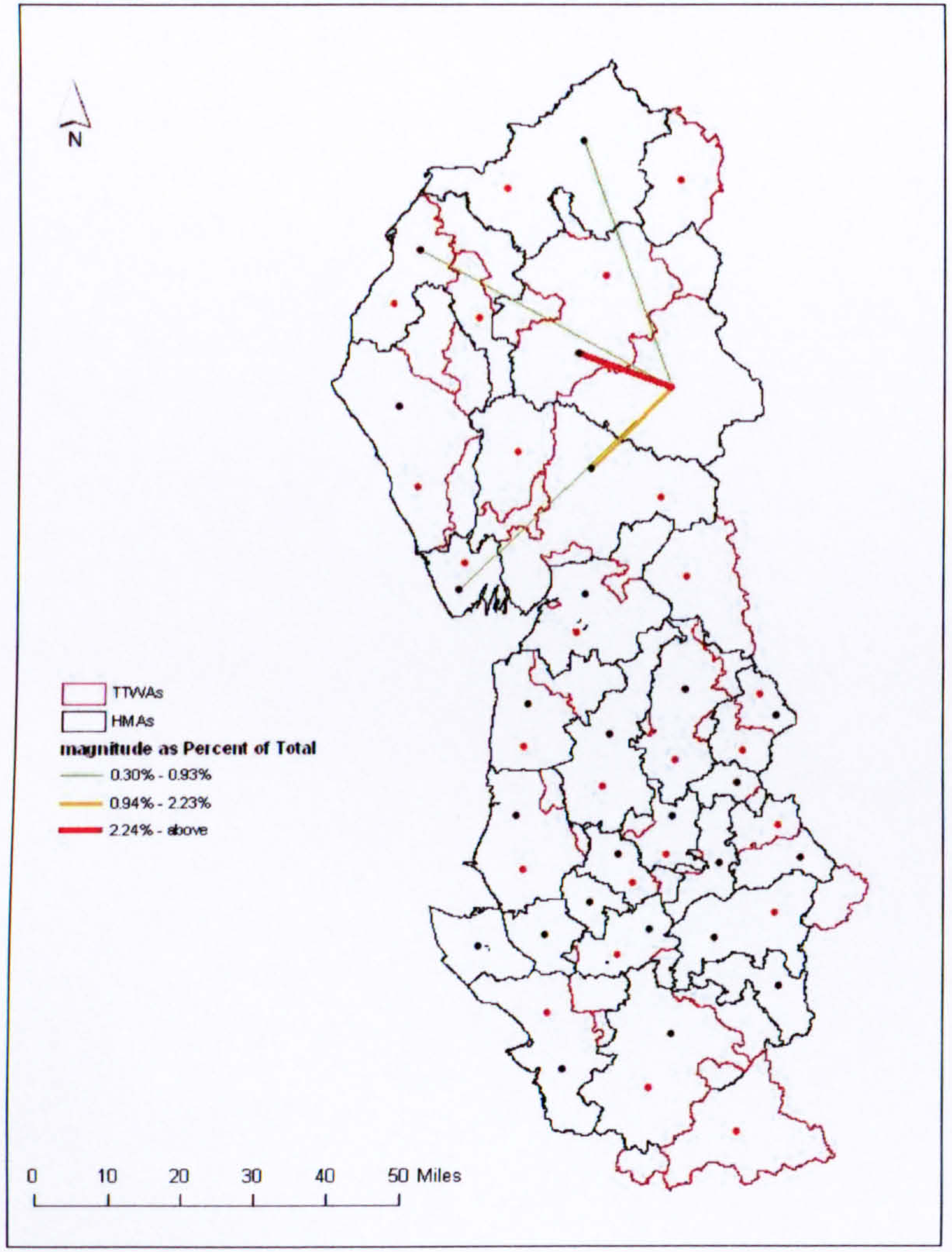


Figure 7.5: Commuting to the Barrow-in-Furness TTWA

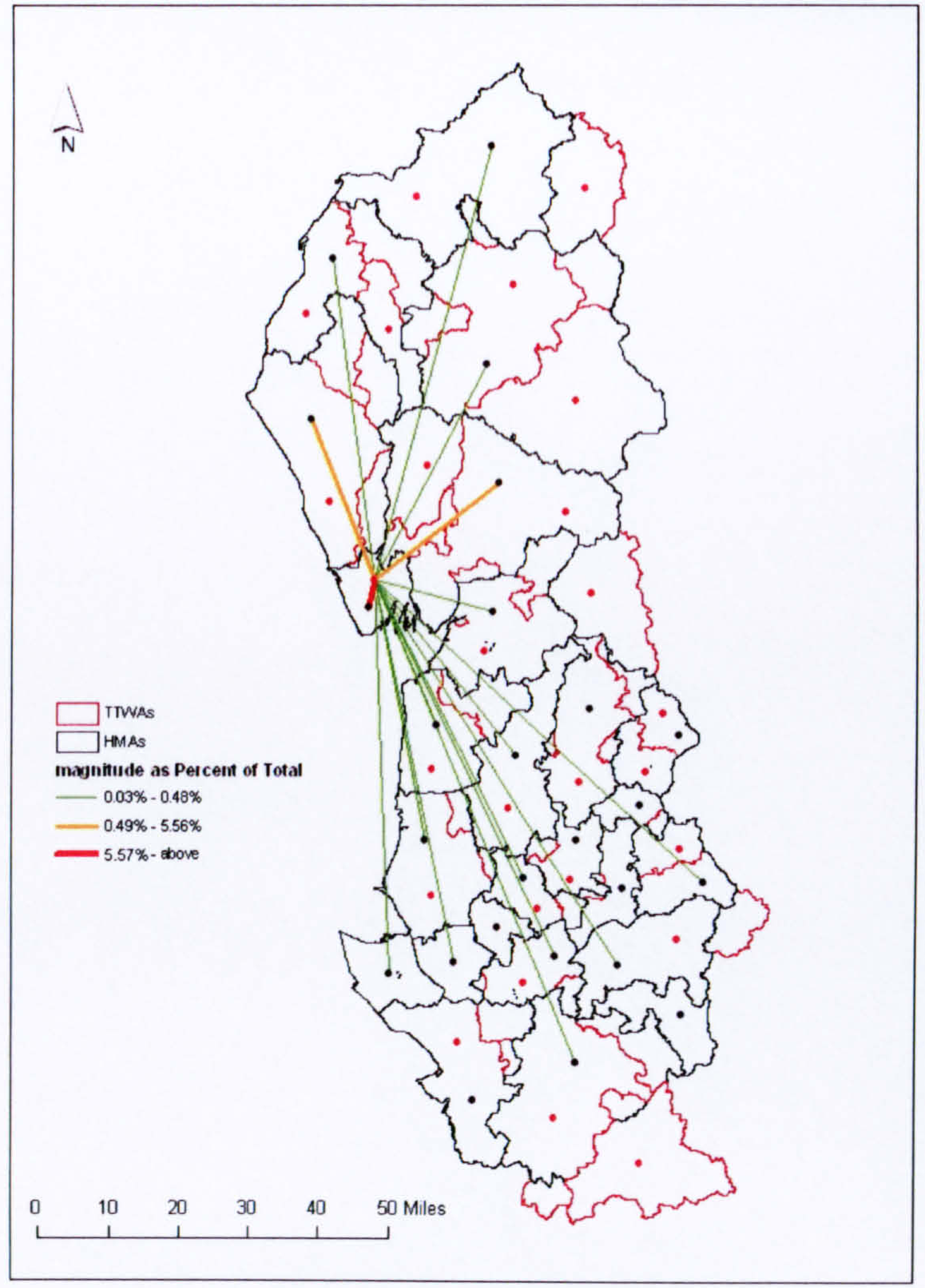


Figure 7.6: Commuting to the Blackburn TTWA

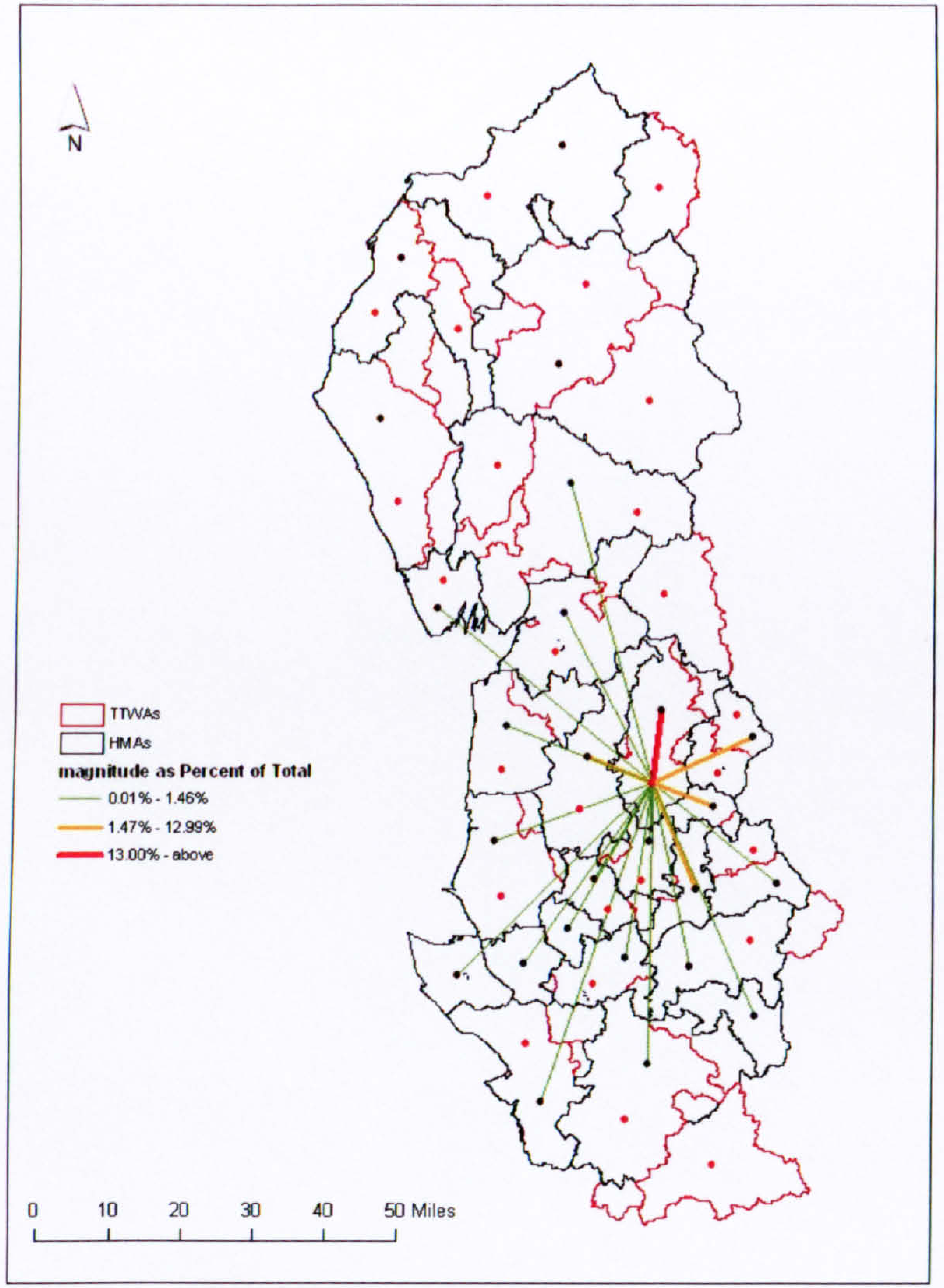


Figure 7.7: Commuting to the Blackpool TTWA

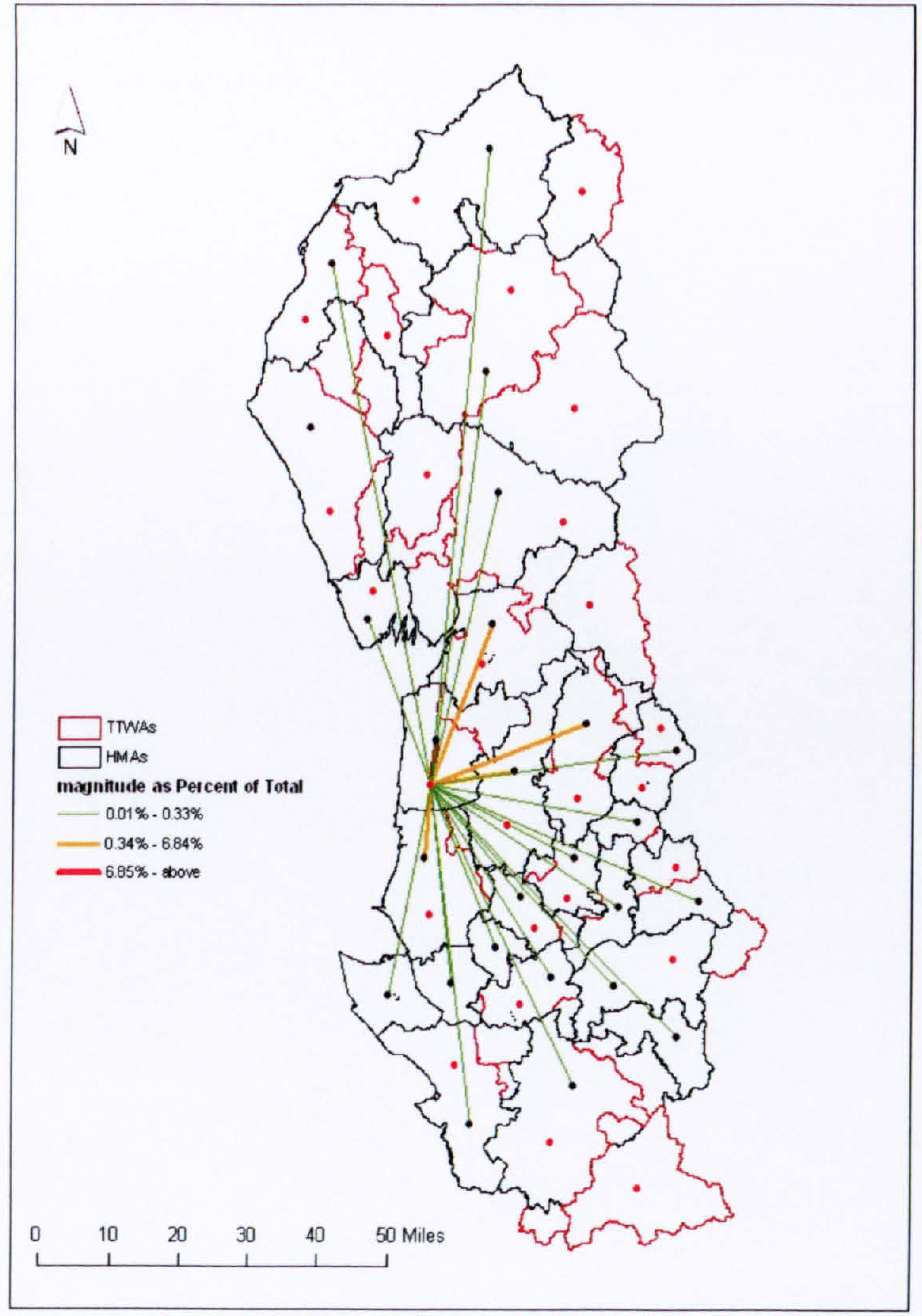


Figure 7.8: Commuting to the Bolton TTWA

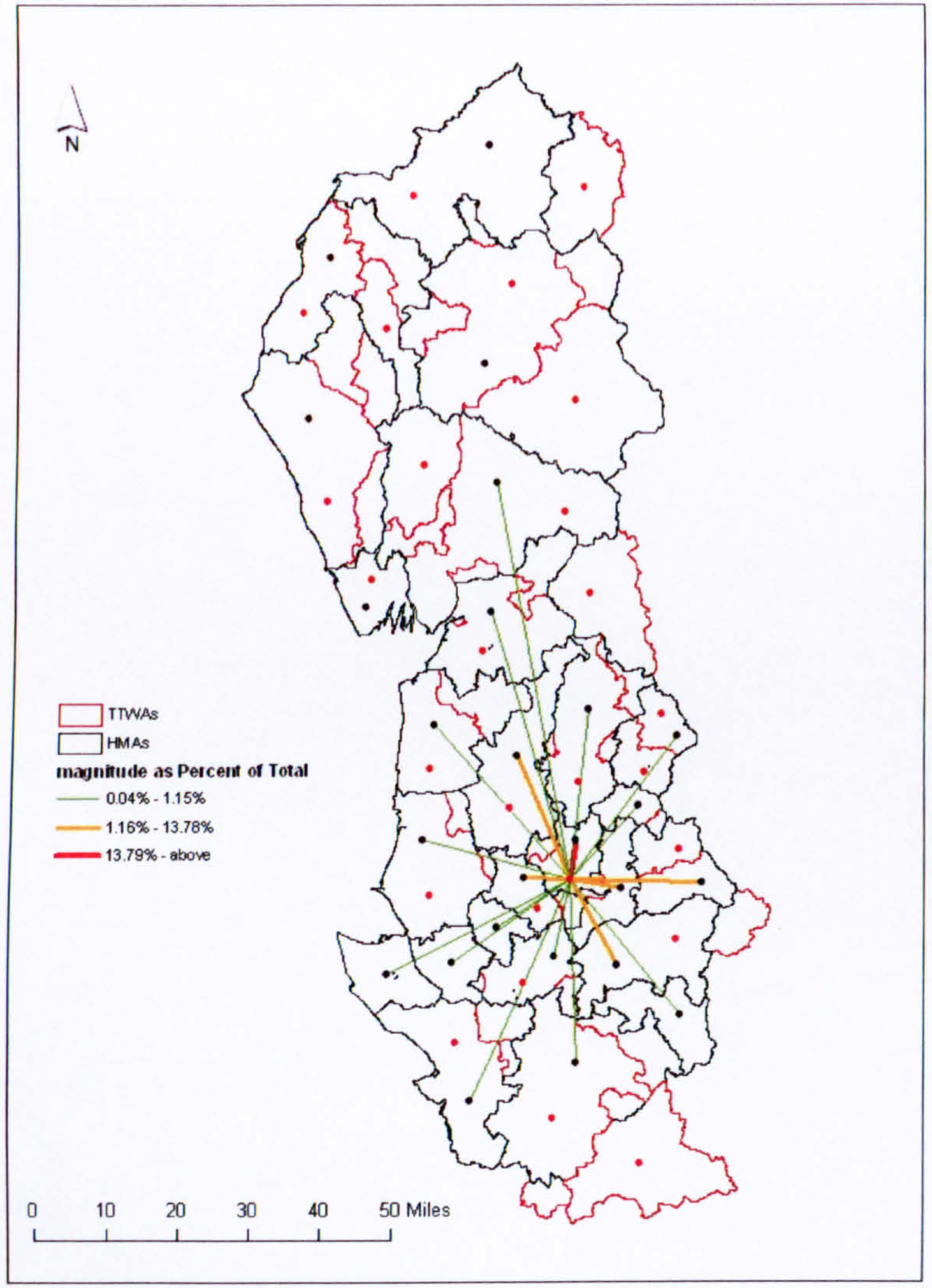


Figure 7.9: Commuting to the Burnley TTWA

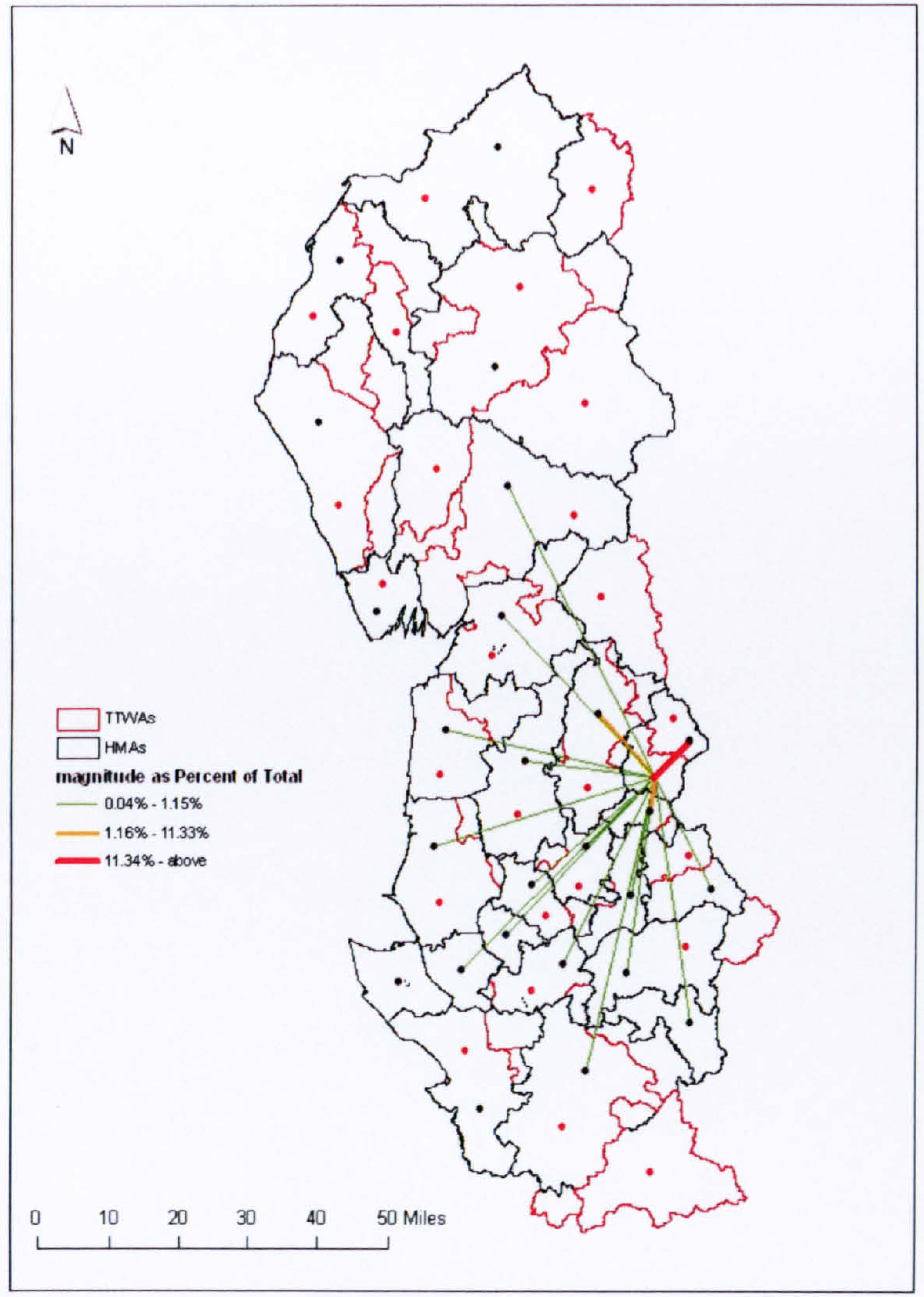


Figure 7.10: Commuting to the Carlisle TTWA

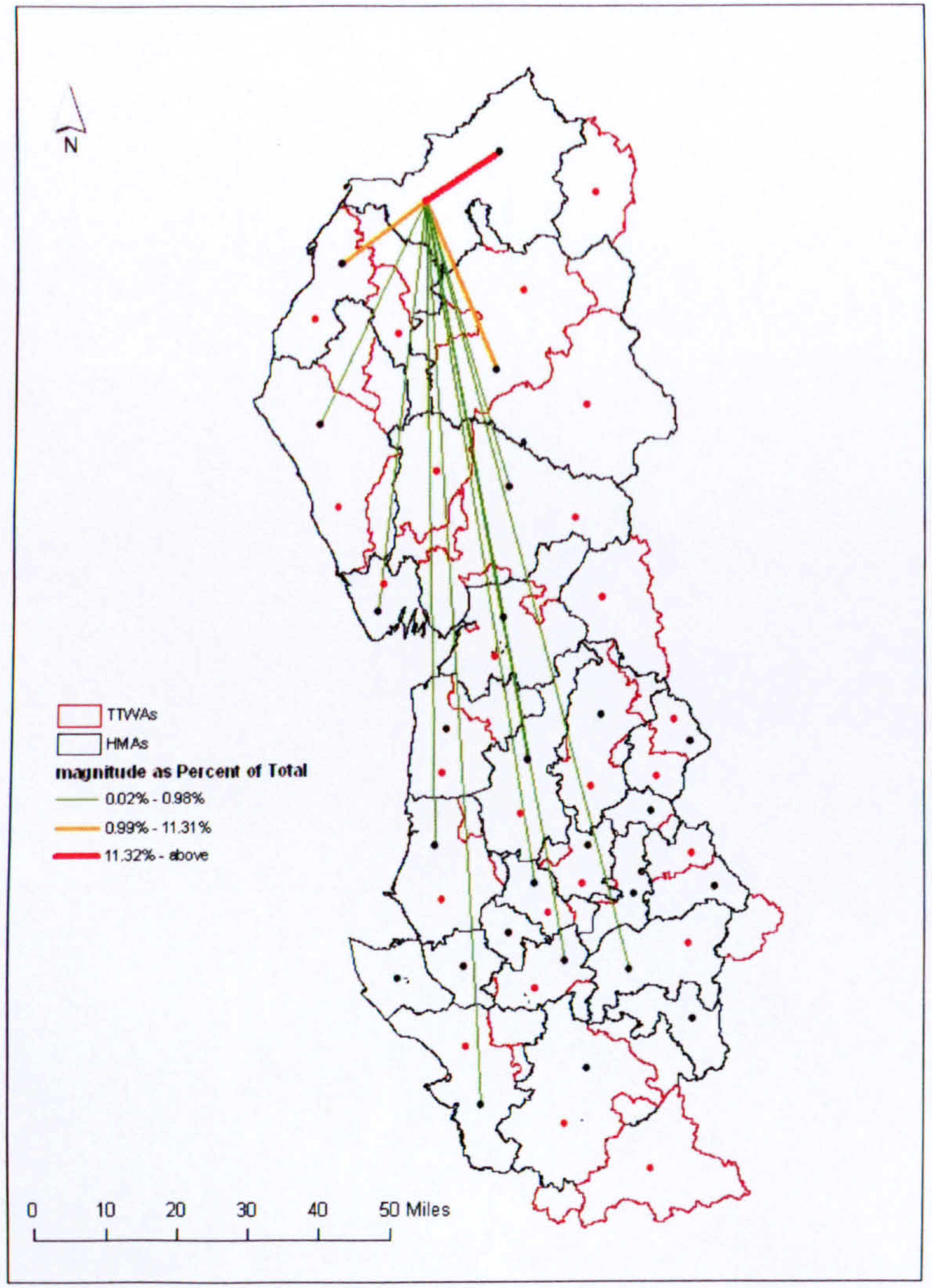


Figure 7.11: Commuting to the Crewe TTWA

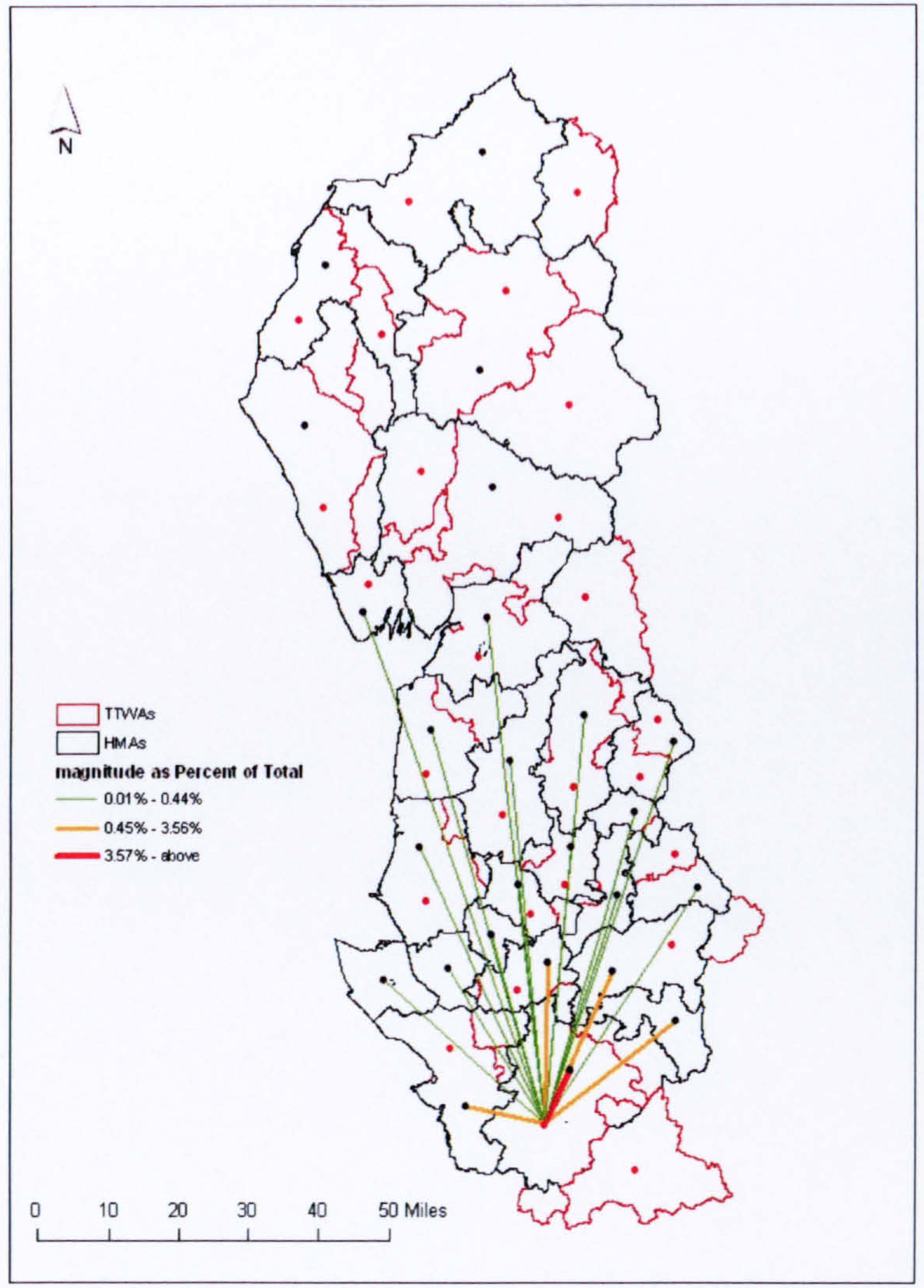


Figure 7.12: Commuting to the Kendal TTWA

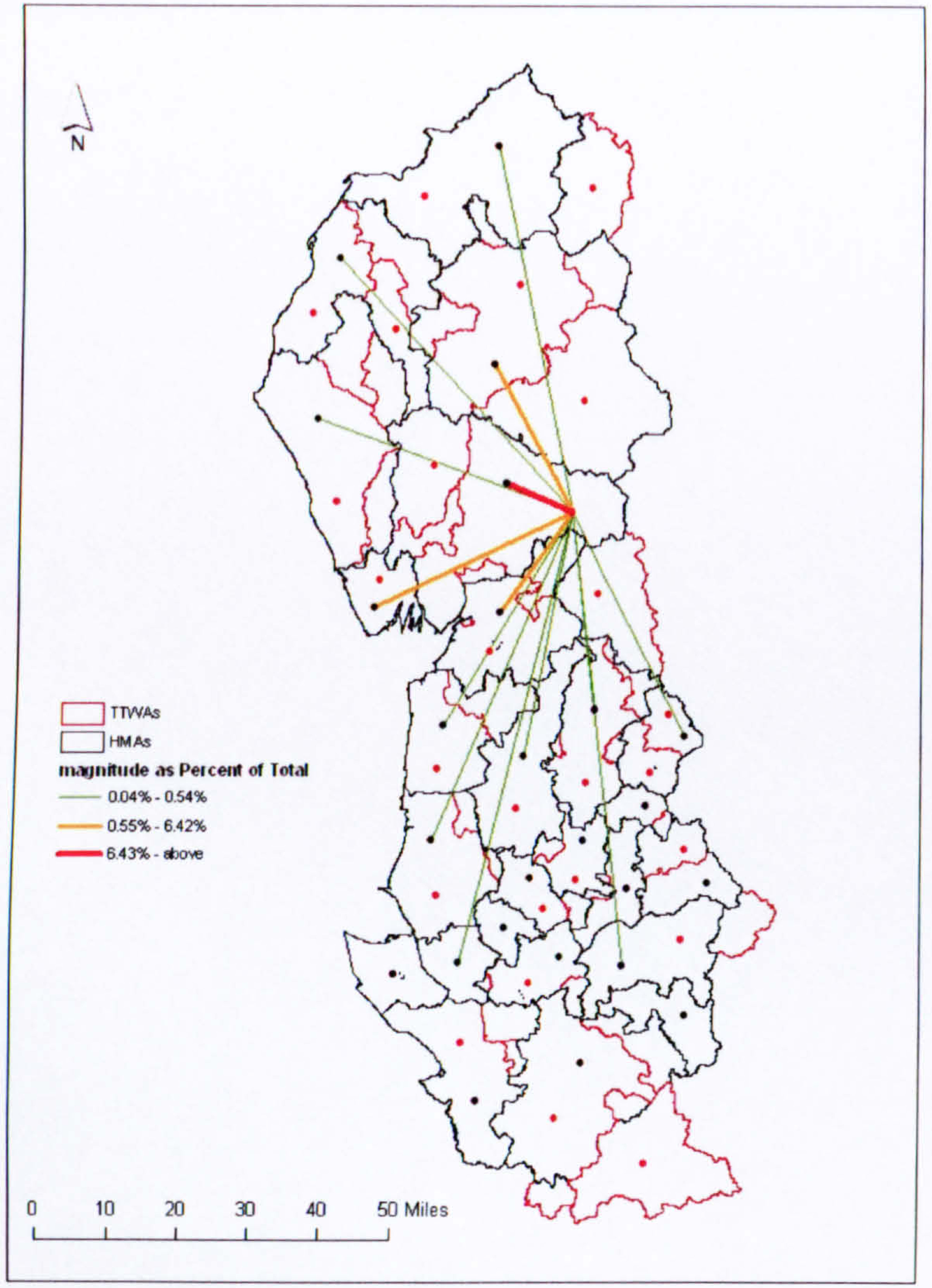


Figure 7.13: Commuting to the Keswick TTWA

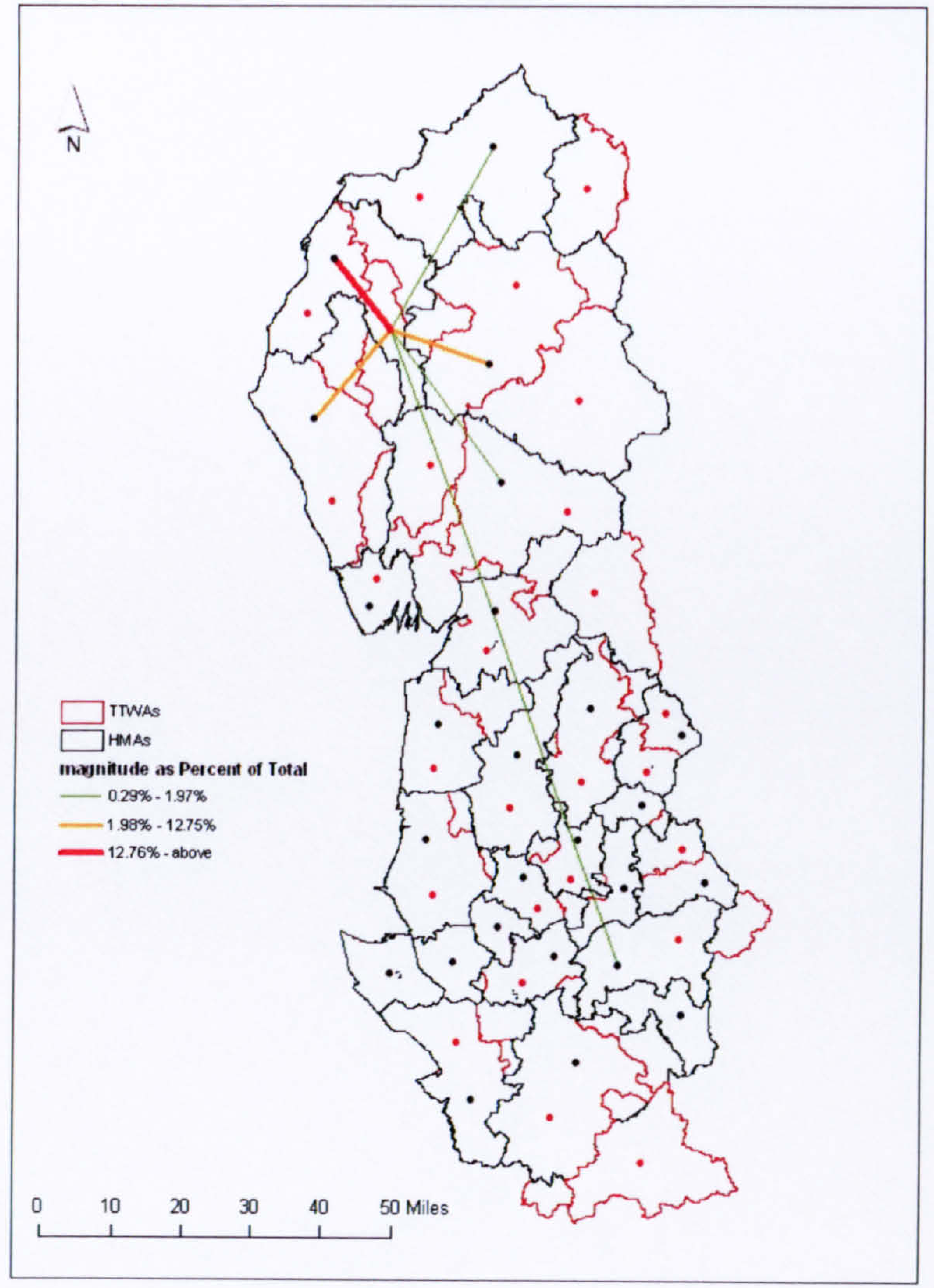


Figure 7.14: Commuting to the Lancaster and Morecambe TTWA

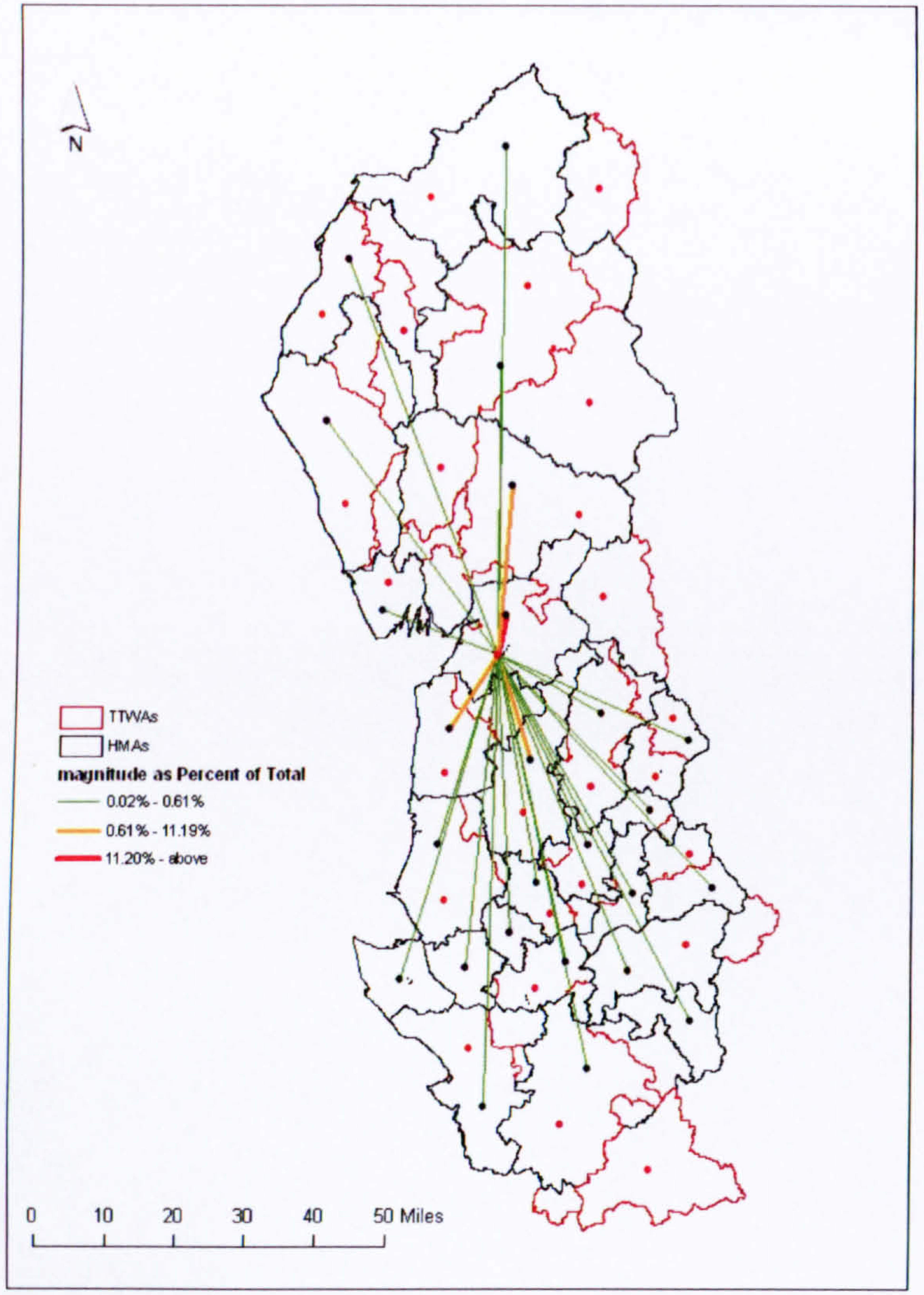


Figure 7.15: Commuting to the Liverpool TTWA

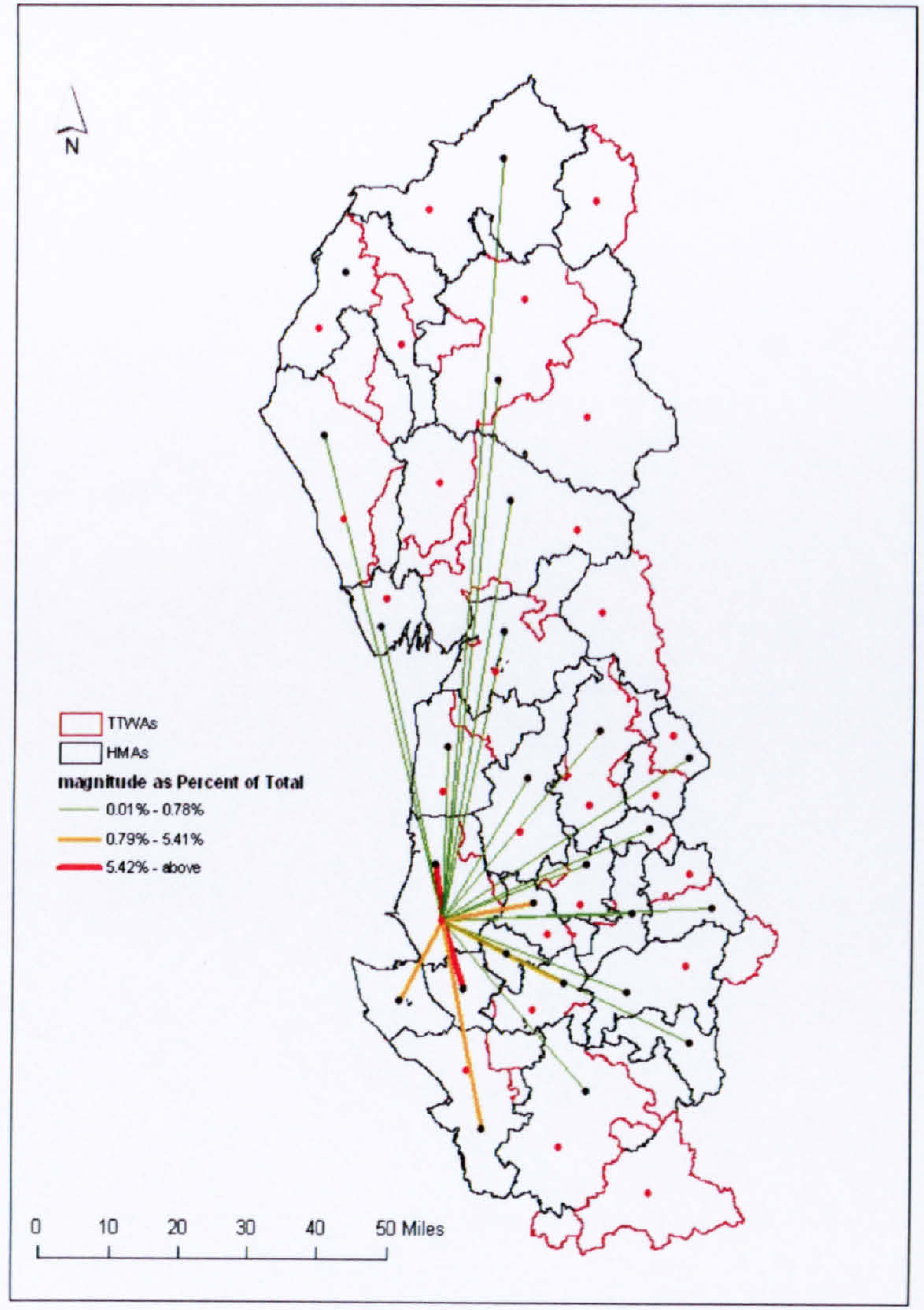


Figure 7.16: Commuting to the Manchester TTWA

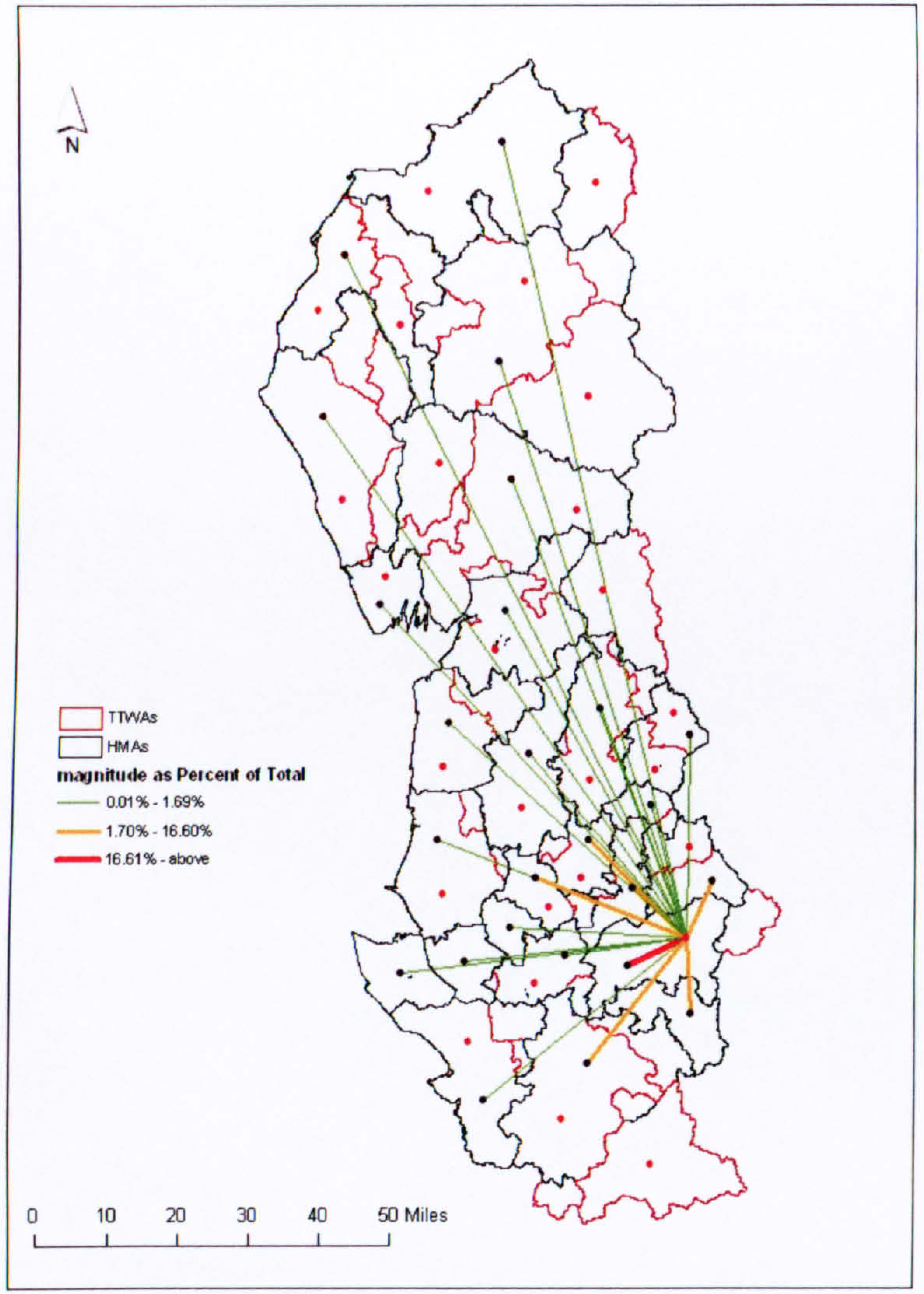


Figure 7.17: Commuting to the Nelson and Colne TTWA

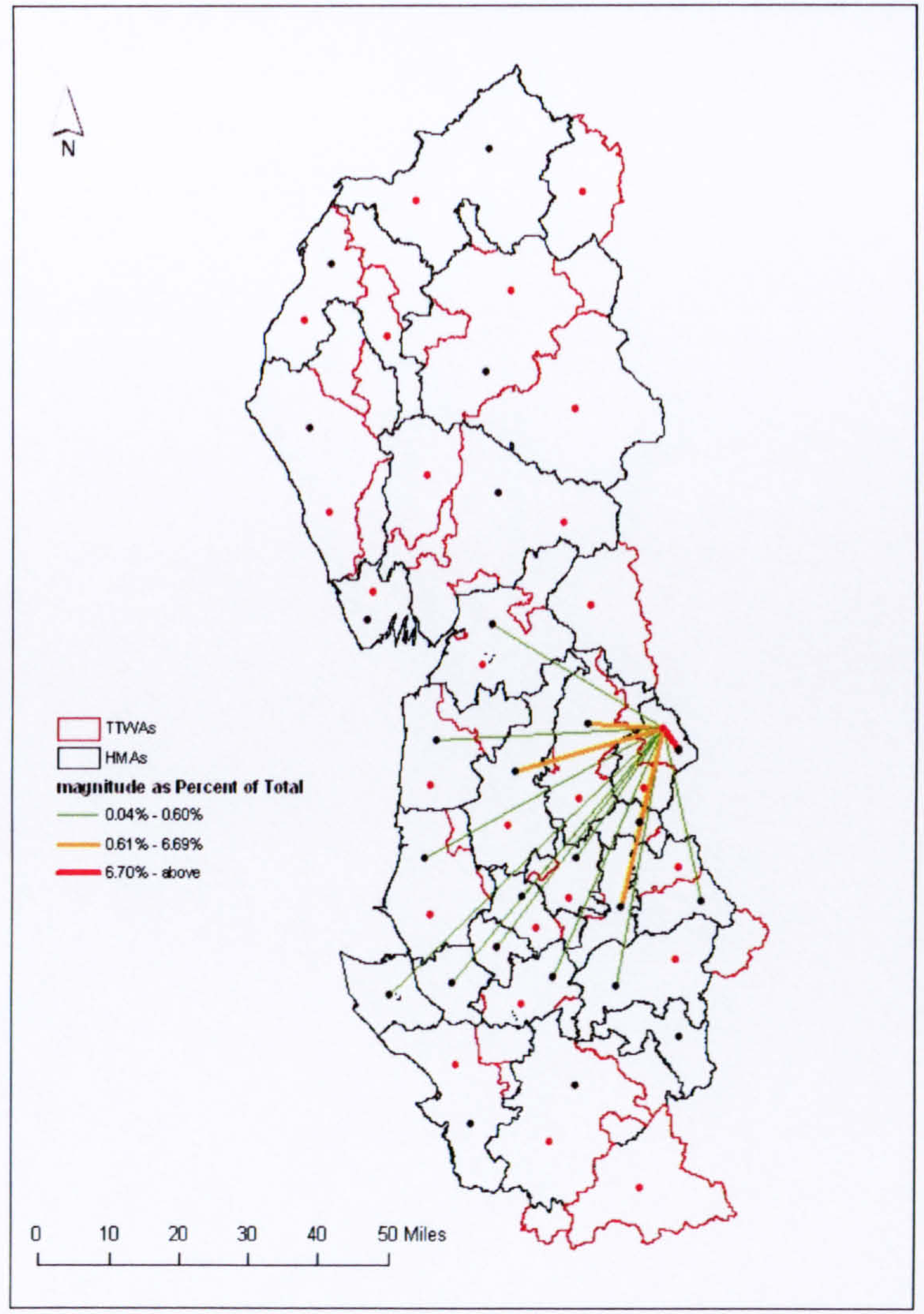


Figure 7.18: Commuting to the Penrith TTWA

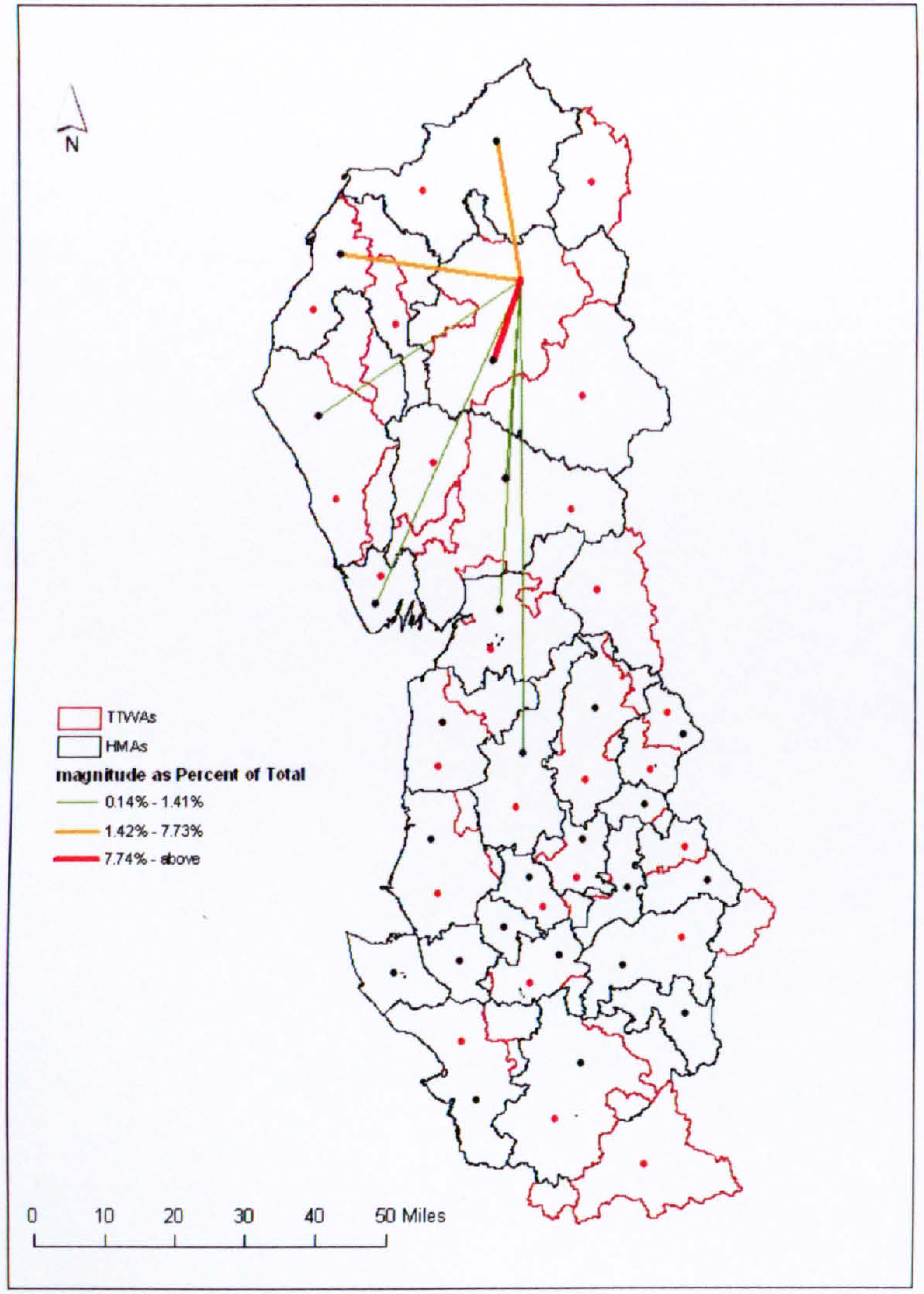


Figure 7.19: Commuting to the Preston TTWA

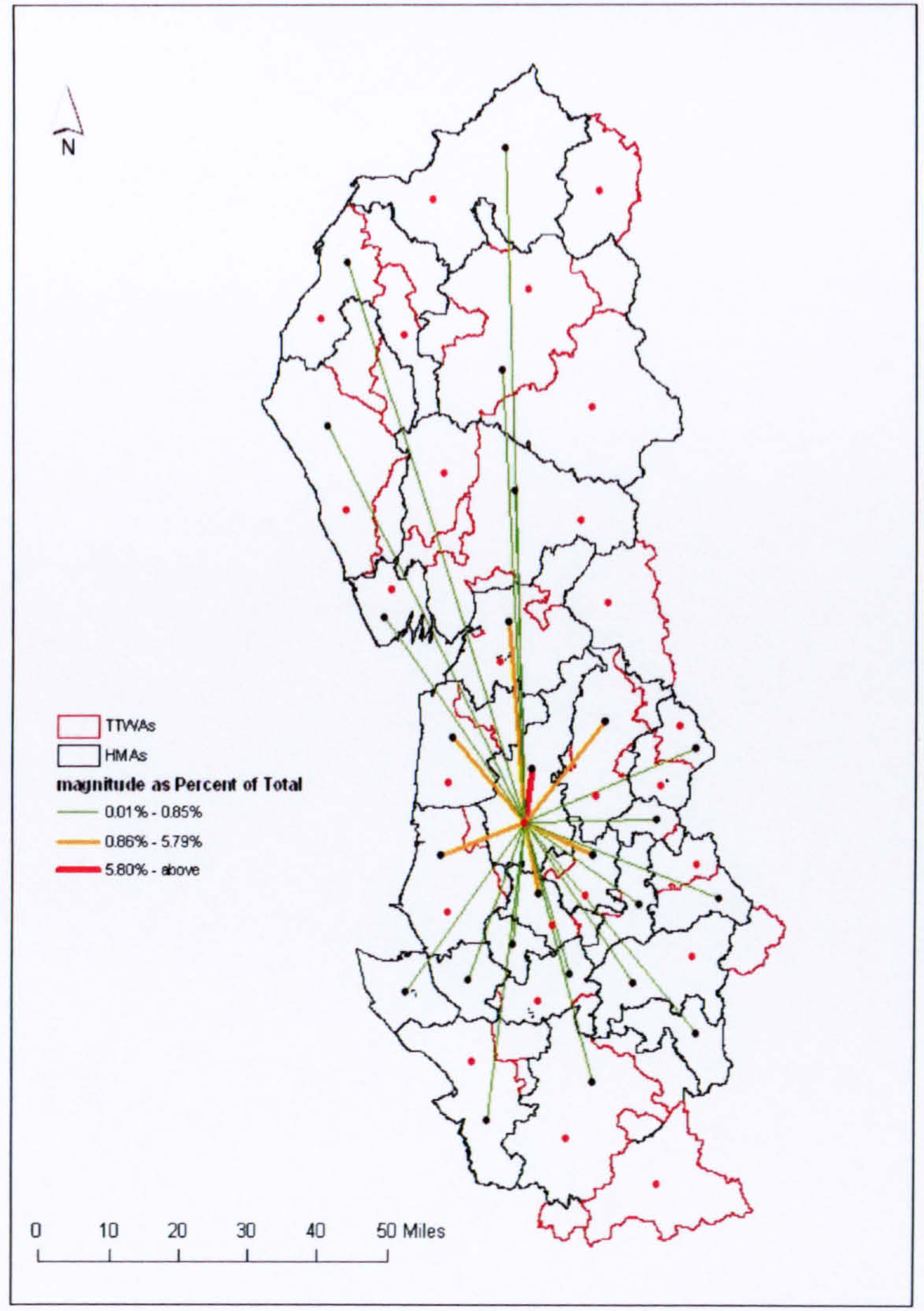


Figure 7.20: Commuting to the Rochdale TTWA

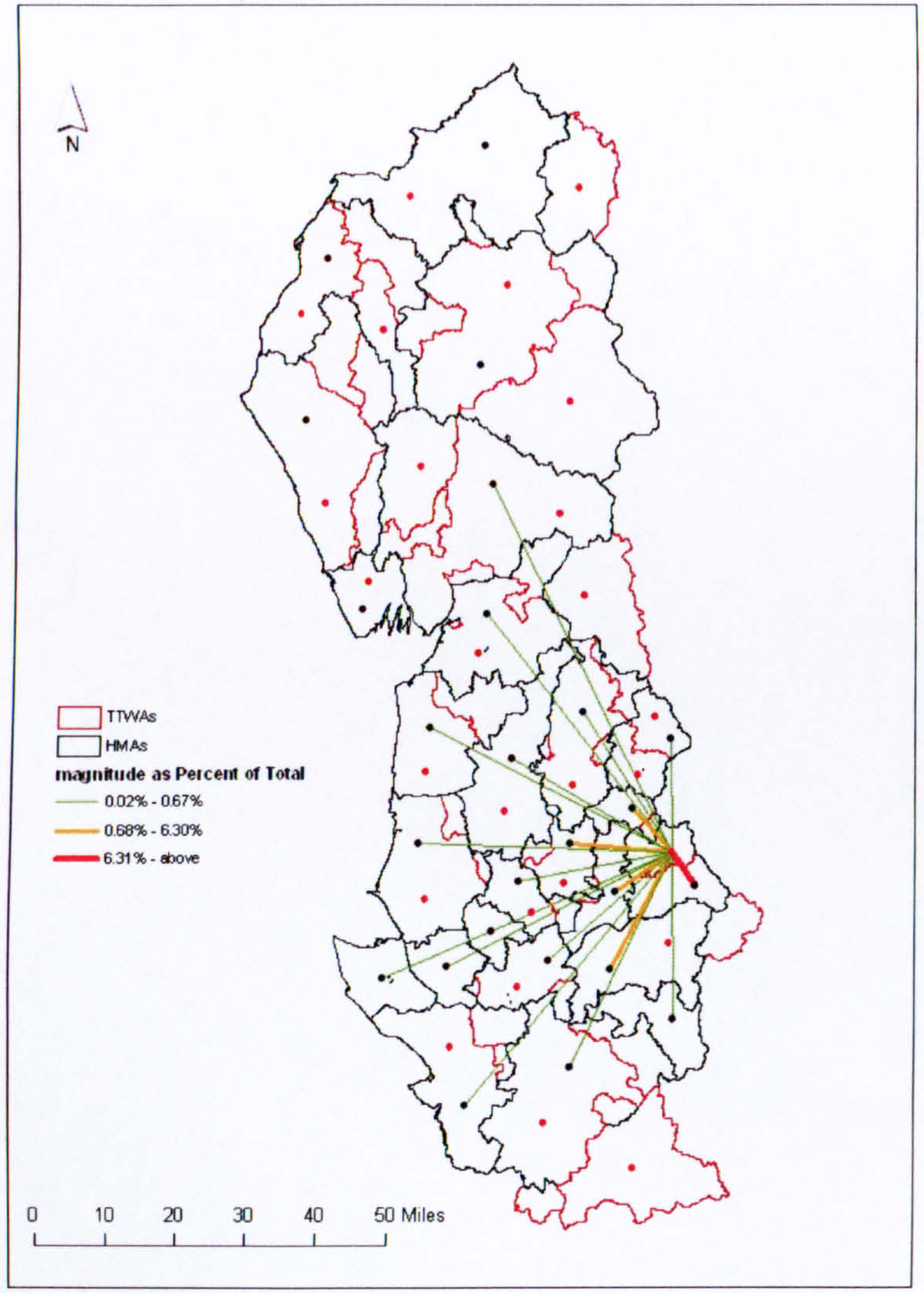


Figure 7.21: Commuting to the Warrington TTWA

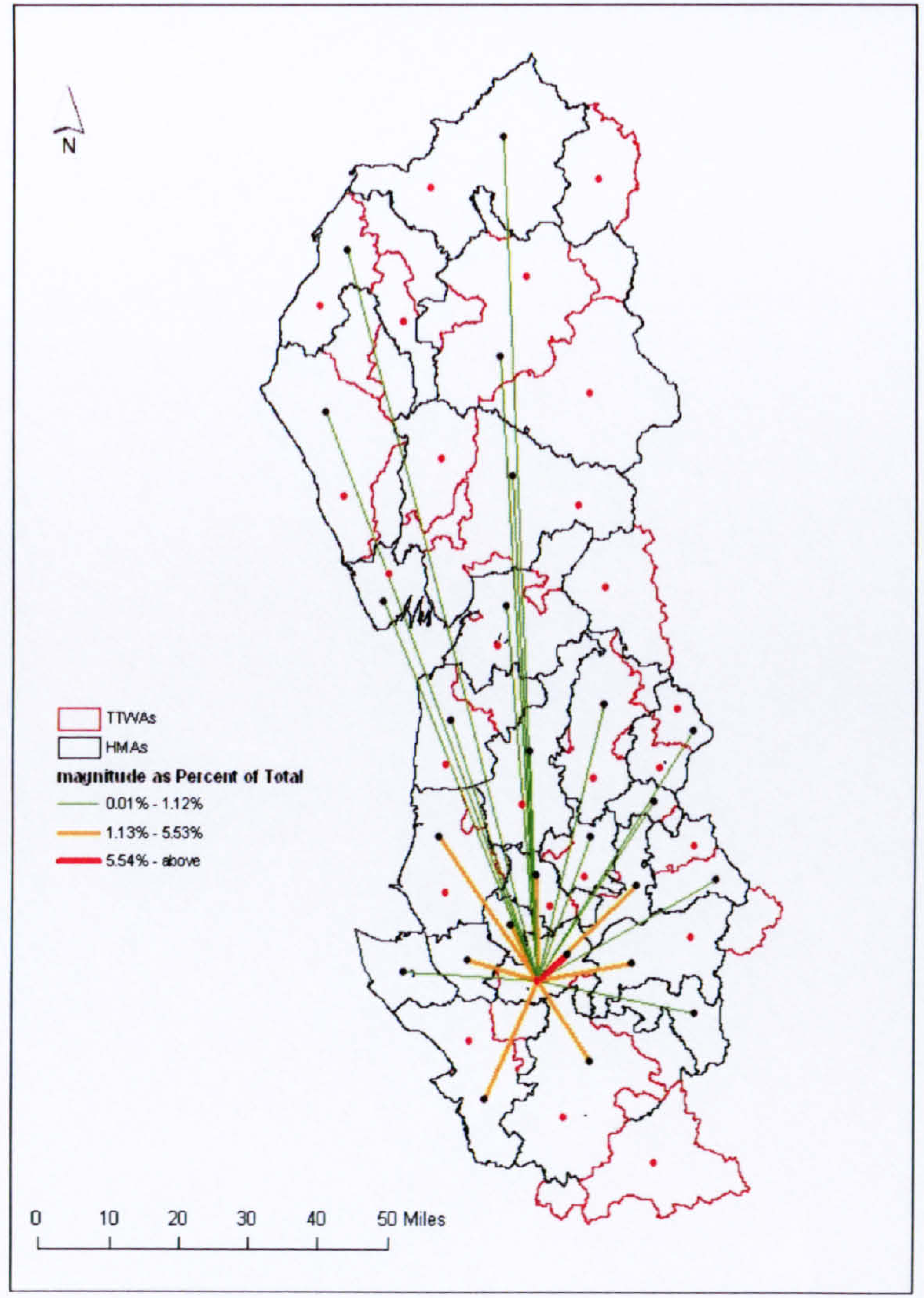


Figure 7.22: Commuting to the Whitehaven TTWA

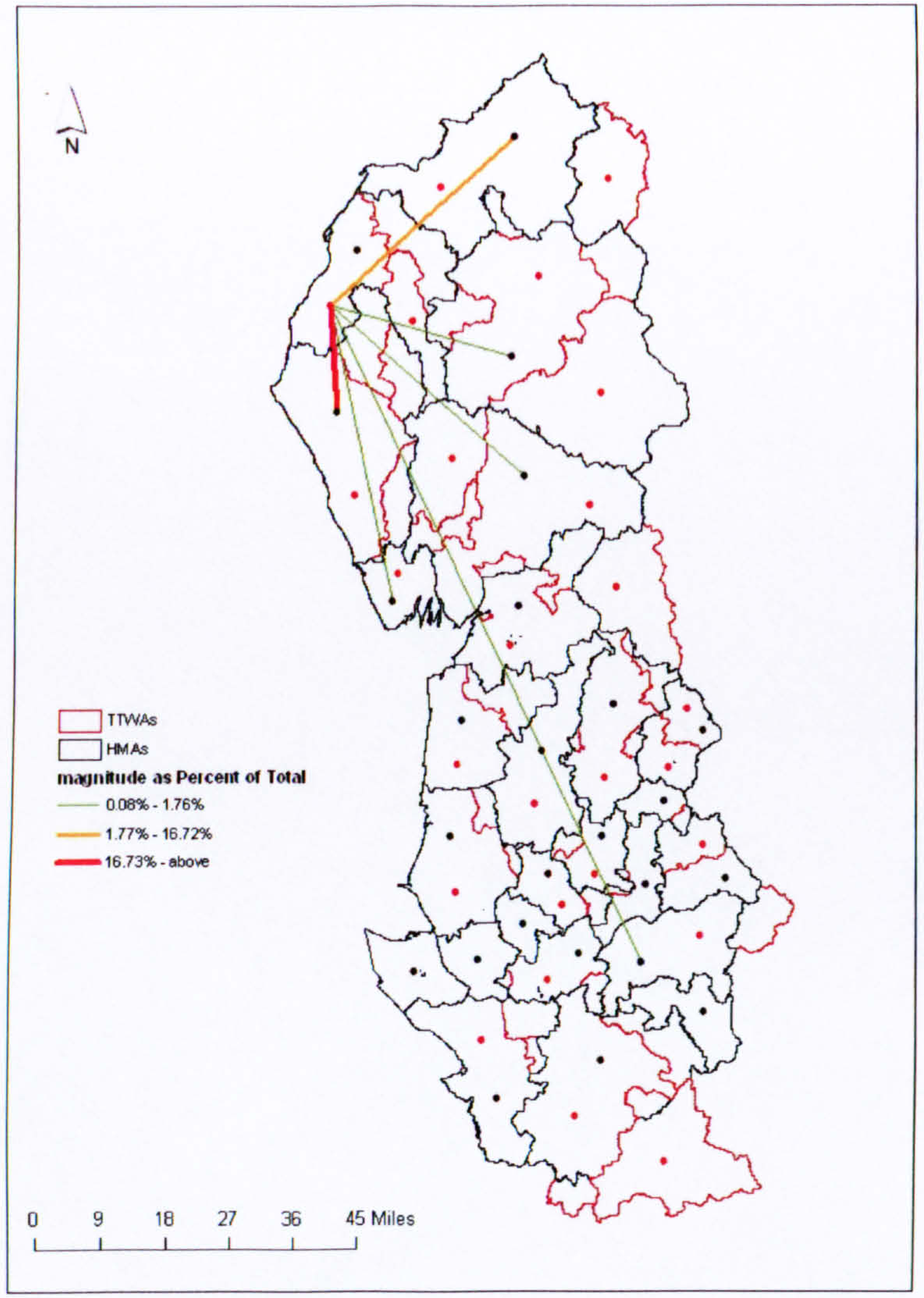


Figure 7.23: Commuting to the Wigan and St Helens TTWA

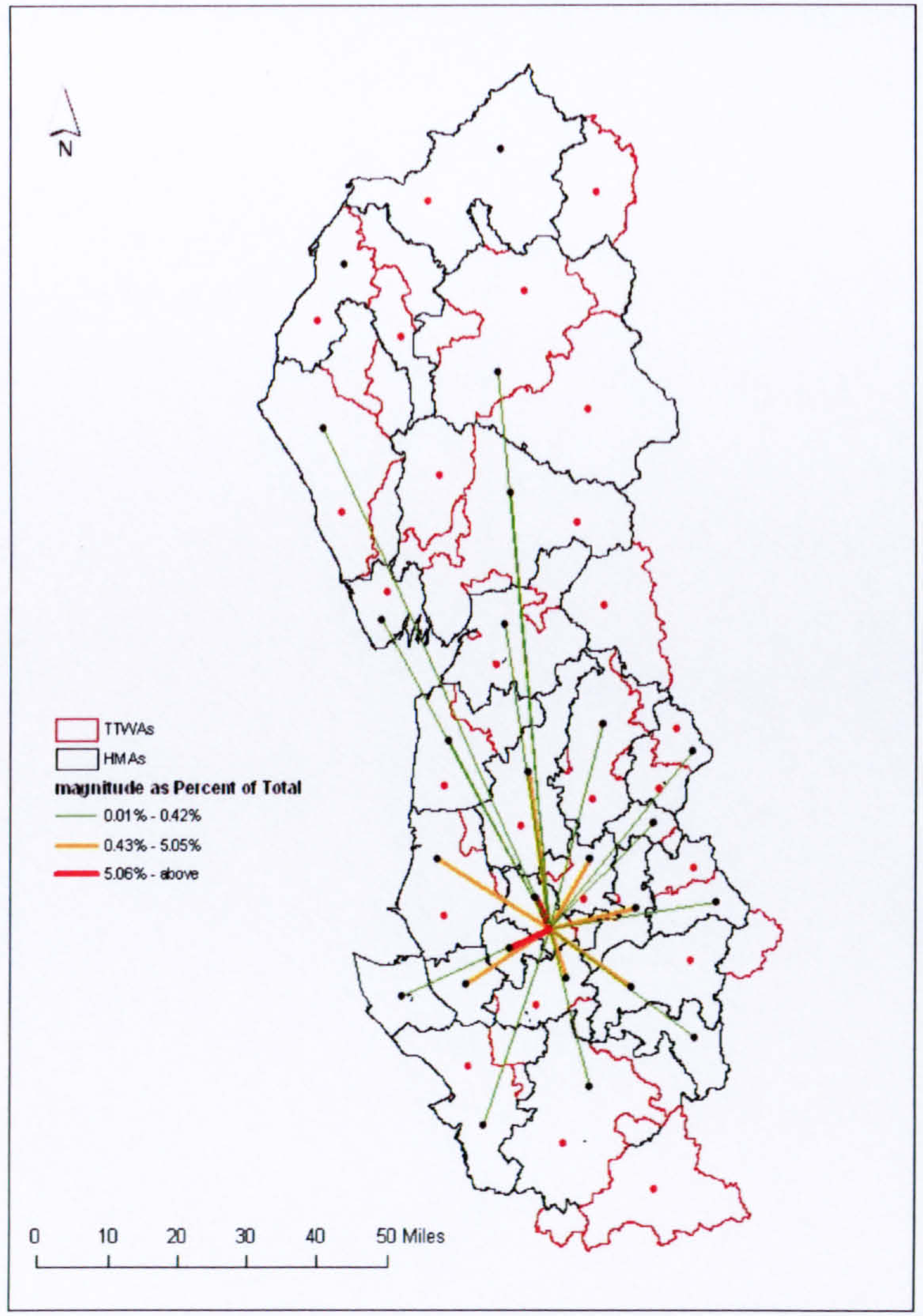


Figure 7.24: Commuting to the Windermere TTWA

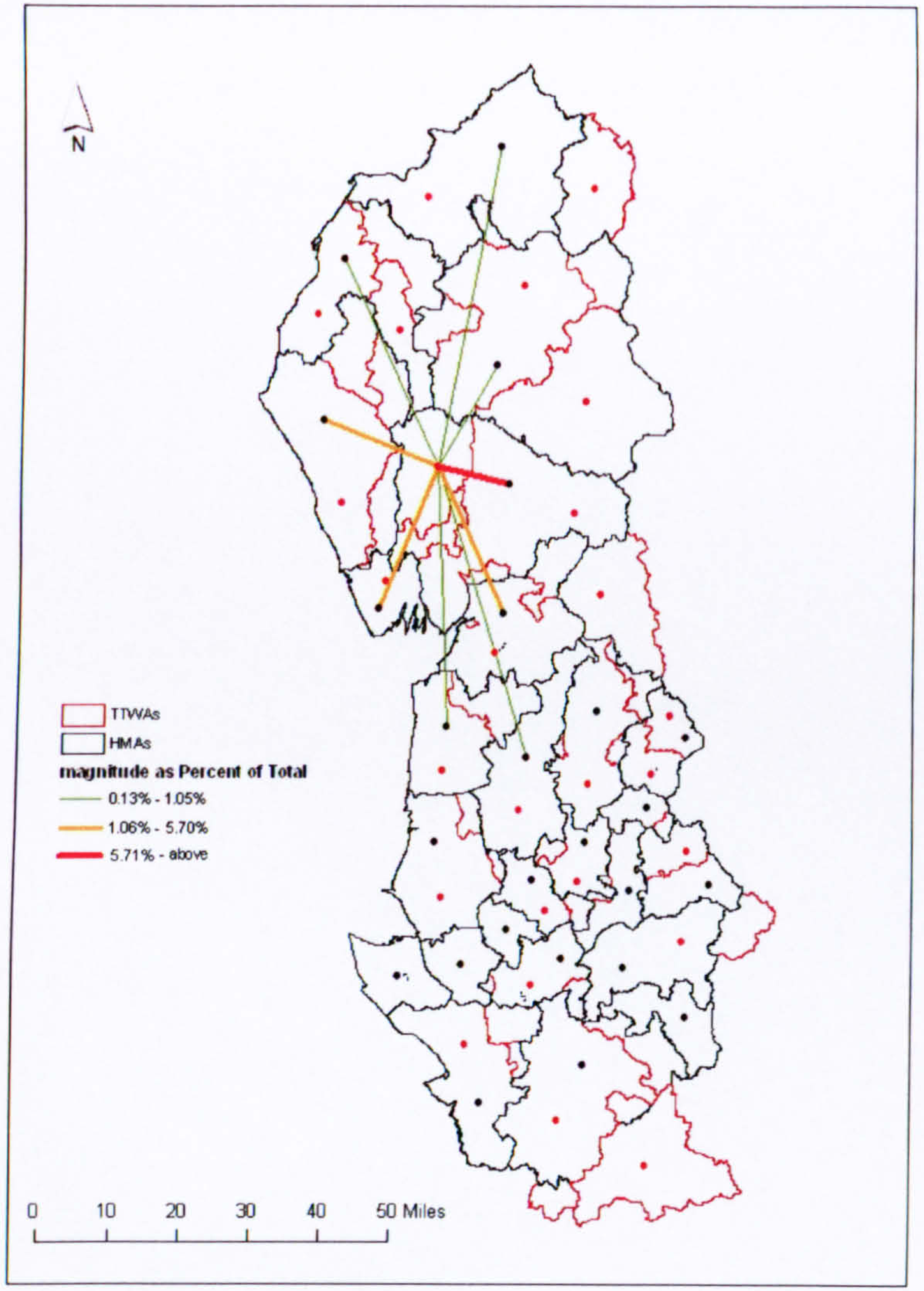


Figure 7.25: Commuting to the Wirral and Chester TTWA

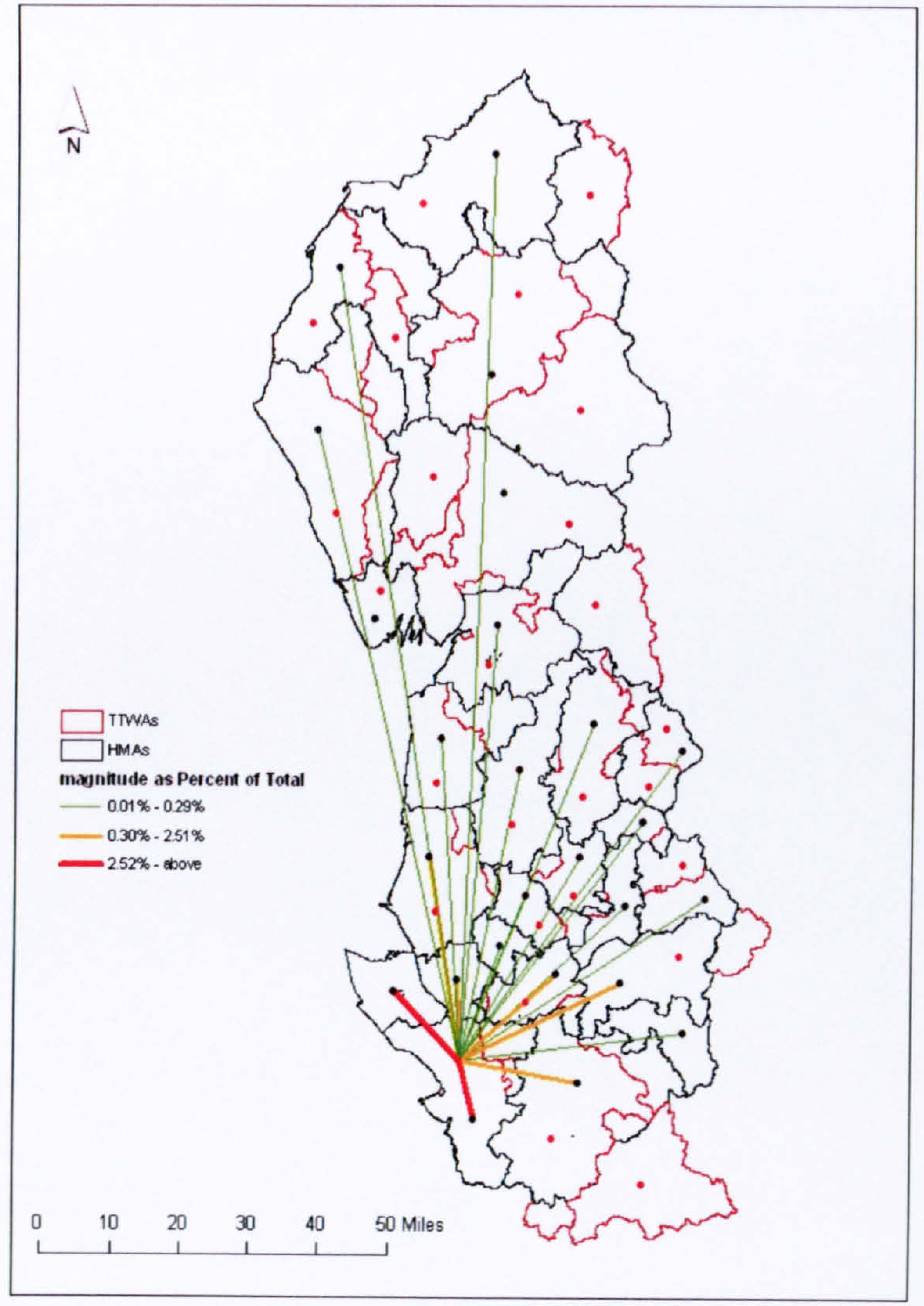
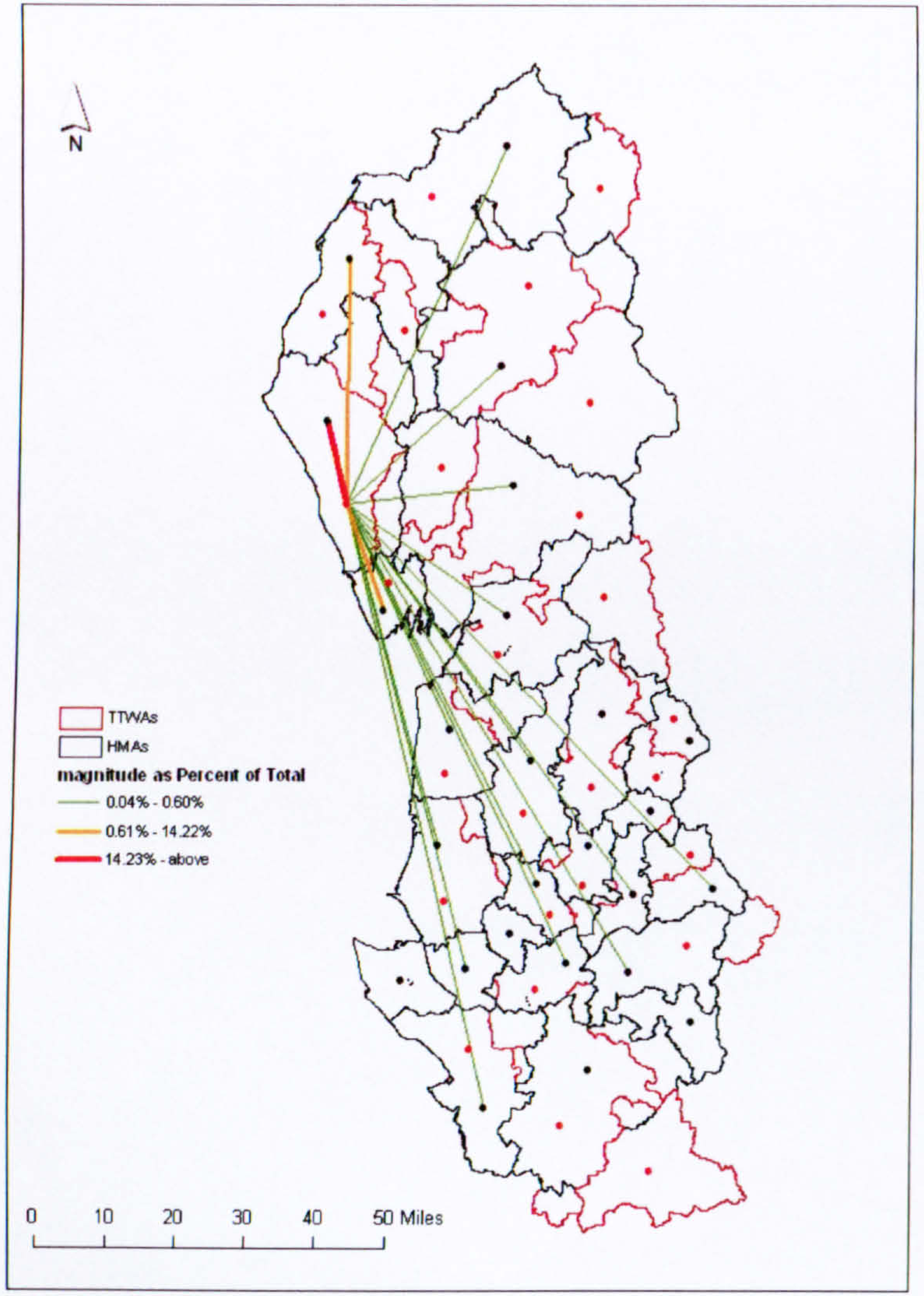


Figure 7.26: Commuting to the Workington TTWA



Part Three: Distance Travelled to Work

The 2001 Census provides data related to the distance travelled to work in the UK. The lowest distance band records work trips that are less than 2 kilometres in length and the highest distance band records work trips of 60 kilometres and over in length. The distances are calculated from the residential postcode centroid to the workplace postcode centroid through a straight-line. Ward level data relating to distance travelled to work for resident and workplace populations were aggregated to give a measure of the distance travelled to work for the resident population of the HMAs (Table 7.5) and the distance travelled to work for the workplace population of the TTWAs (Table 7.6). It is important to note that the regional averages do not sum to 100 per cent because people working from home are not included in the analysis. However, homeworking is explored in detail later in the section.

Table 7.5: Work Trip Lengths of Resident Population of North West HMAs (%)

HMA Name	**Less than 2km (%)**	**2km to less than 5km (%)**	**5km to less than 10km (%)**	**10km to less than 20km (%)**	**20km to less than 30km (%)**	**30km to less than 40km (%)**	**40km to less than 60km (%)**	**60km and over (%)**
Bolton	20.1	**25.4**	**19.2**	**16.3**	**6.7**	1.3	0.8	1.9
Bury and Salford	19.4	**24.2**	**24.2**	**16.9**	3.3	1.1	1.1	1.7
Manchester	19.1	**25.6**	**25.1**	**15.4**	2.2	0.9	1.5	1.9
Rochdale and Oldham	22.7	**27.3**	**21.7**	13.3	3.1	1.3	1.2	1.6
Wigan	20.2	**22.1**	**20.4**	**16.6**	**8.1**	2.3	0.7	2.0
Liverpool	18.4	**27.2**	**29.2**	11.5	2.4	1.2	**1.9**	2.2
Sefton and West Lancashire	21.9	20.4	**19.5**	**18.0**	**6.6**	1.8	**2.0**	2.0
St Helens	19.3	**25.2**	**20.0**	**17.8**	5.4	**3.0**	0.7	1.8
Wirral	17.9	**23.9**	**26.1**	**15.2**	4.0	1.2	**2.0**	2.3
Warrington	20.5	**26.8**	16.8	14.1	**8.3**	**2.7**	0.8	2.1
Blackburn and Darwin	**26.5**	**24.8**	17.6	12.3	4.0	**2.6**	1.6	1.6
Blackpool	**27.5**	**23.5**	16.7	11.4	4.7	1.2	1.7	**2.8**
Chester	19.3	19.8	16.9	**19.0**	**6.8**	**2.7**	**3.2**	**2.8**
Crewe and Nantwich	21.7	16.7	15.0	**17.7**	**8.1**	**4.8**	**2.3**	**2.8**
Macclesfield	**24.9**	16.3	15.4	**19.4**	**6.9**	1.7	**1.9**	2.5
Workington	**28.5**	12.5	10.5	**16.7**	**11.3**	**3.8**	**2.6**	**2.6**
Whitehaven	21.1	15.7	17.4	**24.8**	4.0	1.0	**2.4**	**3.0**
Carlisle	**32.3**	**28.9**	10.9	8.7	2.7	1.4	1.3	**3.6**
Barrow-in-Furness and Ulverston	**35.9**	**26.1**	12.8	7.6	2.3	**2.8**	1.2	**3.6**
Eden	**26.8**	8.9	13.5	14.3	**7.4**	**3.4**	**2.4**	**3.8**
South Lakeland	**31.1**	12.6	10.4	**14.9**	4.9	**2.6**	**1.9**	**5.0**
Lancaster and Morecambe	**28.9**	**23.8**	16.4	6.0	3.6	**4.7**	**1.8**	**4.5**
Burnley and Nelson and Colne	**29.8**	**25.3**	16.8	10.7	3.4	**3.0**	1.7	1.4
Preston	21.9	**25.2**	**19.0**	13.2	4.8	**3.0**	**2.2**	2.1
Rossendale	21.5	17.7	17.0	**19.2**	**10.0**	**2.6**	1.3	1.6
Regional Average (%)	**23.9**	**21.8**	**17.9**	**14.8**	**5.4**	**2.3**	**1.7**	**2.5**

Notes: Bold values are exceeding the regional average for the associated column
Source: 2001 Census (Distance Travelled to Work) (Table UV35)

Table 7.6: Work Trip Lengths of Workplace Populations of North West TTWAs (%)

TTWA Name	Less than 2km (%)	2km to less than 5km (%)	5km to less than 10km (%)	10km to less than 20km (%)	20km to less than 30km (%)	30km to less than 40km (%)	40km to less than 60km (%)	60km and over (%)
Appleby	24.6	9.0	9.5	11.7	4.7	1.5	**2.0**	1.8
Barrow-in-Furness	**35.6**	**24.9**	12.5	9.0	1.8	1.0	0.7	**2.9**
Blackburn	**26.2**	**23.0**	**17.7**	**13.3**	3.6	1.8	1.2	1.1
Blackpool	**26.8**	**23.4**	**17.6**	11.6	2.8	1.4	1.2	1.4
Bolton	21.0	**27.5**	**21.5**	10.8	3.8	1.1	0.9	1.2
Burnley	**28.3**	**27.5**	**16.6**	10.8	2.4	1.4	1.1	0.8
Carlisle	**28.5**	**24.5**	11.2	11.1	4.2	2.0	**2.0**	**3.0**
Crewe	23.1	**20.3**	**16.5**	**13.4**	**5.3**	**2.5**	**2.0**	**2.2**
Kendal	**31.9**	14.0	8.9	12.8	**5.7**	**3.3**	1.3	**2.4**
Keswick	**32.8**	5.2	7.5	11.0	**10.5**	**2.5**	1.0	**2.6**
Lancaster and Morecambe	**28.0**	**22.8**	**16.0**	8.5	4.0	**2.4**	1.2	**2.0**
Liverpool	18.5	**22.7**	**24.7**	**16.2**	4.4	1.2	1.2	1.4
Manchester	17.8	**21.5**	**21.4**	**17.2**	4.9	2.2	**2.2**	**1.9**
Nelson and Colne	**31.8**	**21.9**	**17.4**	9.3	3.2	1.5	1.2	1.2
Penrith	**28.2**	7.1	11.9	**14.1**	**7.0**	**4.9**	**3.3**	**2.7**
Preston	21.2	**24.0**	**17.0**	12.3	**7.4**	**2.9**	**1.7**	1.4
Rochdale	**25.9**	**27.6**	**17.6**	9.4	3.4	1.1	0.9	1.2
Warrington	18.2	**23.8**	**16.9**	**15.4**	**7.4**	**4.1**	**1.8**	**2.2**
Whitehaven	19.7	14.9	13.9	**22.9**	**10.0**	**3.7**	**1.9**	**2.7**
Wigan and St Helens	23.5	**27.0**	**19.3**	10.6	3.7	1.5	0.8	1.2
Windermere	**27.9**	8.0	11.7	**16.6**	**7.1**	**3.2**	1.3	**2.3**
Wirral and Chester	19.7	**22.5**	**19.4**	**16.5**	**5.5**	1.8	**1.7**	1.2
Workington	**28.5**	16.4	15.3	**15.6**	3.2	1.2	**1.9**	1.8
Regional Average (%)	**25.5**	**20.0**	**15.7**	**13.0**	**5.0**	**2.2**	**1.5**	**1.8**

Notes: Bold values are exceeding the regional average for the associated column
Source: 2001 Census (Distance Travelled to Work) (Table UV80)

Tables 7.5 and 7.6 demonstrate that the majority of commuting trips are of relatively short distances across the North West in relation to both the residential and workplace ends of the home-work trip. Indeed, 46 per cent of commuting is less than 5 kilometres in length for resident and workplace populations, 24 per cent of commuting is less than 2 kilometres in length from the HMAs, and 25.5 per cent of commuting to the TTWAs is less than 2 kilometres in length. In addition, just 27 per cent of commuting is over 10 kilometres in length from the residency end and 23.5 per cent in relation to commuting at the workplace end. Significantly, commuting in the North West compares favourably with that of the rest of England and Wales. Indeed, 44 per cent of commuting in England and Wales is less than 5 kilometres in length, 22 per cent is less than 2 kilometres, and 31 per cent is over 10 kilometres in length.

The general pattern in the data seems to suggest that for the residency and workplace ends of the home-work trip, short to medium distance journeys of between 2 and 20 kilometres (Spence and Frost, 1995), are well represented across the HMAs and TTWAs. This supports the findings that TTWAs tend to attract the majority of their workers from nearby HMAs that are located within a relatively short travelling distance. In contrast, longer distance commuting from 20 kilometres to over 60 kilometres in length tends to be underrepresented across the range of HMAs and TTWAs. Indeed, there is a substantial decline in the regional averages between the 10 kilometres to less than 20 kilometres band and 20 kilometres to less than 30 kilometres band, suggesting at this point there is a natural cut-off between short to medium distance commuting and longer distance commuting in the region. Indeed, the difference between the regional averages of the two distance bands is 9 per cent in relation to the HMAs and 8 per cent in relation to the TTWAs.

In relation to longer distance commuting, two processes are evident. The first is that the HMAs with above average longer distance commuting, above 30 kilometres in length, tend to be those HMAs and TTWAs that are surrounding the metropolitan areas, located in the urban-industrial belt and in Cheshire and south Lancashire. The second is that the HMAs and TTWAs in Cumbria are also well represented in the longer distance commuting bands. There are a number of possible factors that can be attributed to this. First, it has been shown that there is relatively high cross-commuting between the HMAs and TTWAs of the urban-industrial belt, owing much to the well developed transport networks in the urban-industrial belt, most notably the rail and motorway systems. Second, the Cheshire HMAs are the source for substantial numbers of commuters to the TTWAs located in the urban-industrial belt resulting in longer distance commuting. Third, there is relatively high secondary commuting between the HMAs of the urban-industrial belt and the TTWAs of Lancashire. The fourth factor that is perhaps more relevant to understanding the longer distance commuting from the HMAs of Cheshire, Lancashire and Cumbria relates to the fact that many of the HMAs and TTWAs in these sub-regions are large, containing at their centre an urban area, which is surrounded by a relatively large fringe or rural area (Coombes *et al*, 1979). The result of this is likely to be longer distance commuting from rural and suburban residential areas into urban workplace locations (Moss *et al*, 2004).

The analysis of the distance travelled to work for both the residency and work-ends of the home-work trip highlights that as distance from the source HMA increases or as distance from the destination TTWA increases so the propensity for the markets to interact decreases. In general, this suggests that the journey-to-work is a derived utility (Dijst and Vidokovic, 2000), and that the majority of workers will seek to minimise the distance they travel to work after a trade-off between residential and workplace locations (Spence and Frost, 1995; Rouwendal and Nijkamp, 2004; Shearmur, 2006). However, despite the acceptance that people seek to minimise the length of their journey-to-work, a significant proportion of workers, 11.9 per cent from the residency end, and 10.5 per cent from the workplace end, commute over 20 kilometres to work and over 6 per cent commute over 30 kilometres. This supports the findings of Green *et al* (1999) who highlight that the outcomes of post-Fordism have resulted in longer and more geographically diverse commuting flows, and the substitution by households of longer distance commuting in place of migration. In particular, the rise of dual earner households seeking better quality of life in more affluent residential locations in Cheshire and Lancashire has served to exacerbate the trend of cross-commuting and extended commuting journeys (Wong and Madden, 2000).

The diverse commuting patterns and the range of distances that workers in the region are prepared to travel reflects increasing access to private transport. This is illustrated in data on mode of travel (Table 7.7). When comparing the North West with England and Wales, travel-to-work by bicycle and foot is relatively similar. However, commuters in the North West are more reliant on the use of the car in travelling to work than commuters in England and Wales as a whole. In addition, travel-to-work by bus is higher in the North West than England and Wales whilst the use of the train is substantially lower in the region. The analysis of the modal choice for resident populations of the sub-regions illustrates that commuting by car is dominant across the four sub-regions, with Lancashire and Cheshire exceeding the regional average, which is serving to contribute to diverse commuting patterns and longer journeys (Wong and Madden, 2000).

Table 7.7: Modal Use for Resident Population of North West Sub-Regions (%)

Sub-Region (HMA)	**Train**	**Bus**	**Car**	**Bicycle**	**Foot**
Cumbria	0.9	5.6	64.0	2.3	**13.1**
Lancashire	0.8	6.2	**68.2**	2.2	**11.6**
Urban-Industrial Belt	**2.1**	**9.7**	65.9	2.0	9.8
Cheshire	**2.4**	4.4	**69.8**	**2.6**	8.8
Regional Average	**1.6**	**6.5**	**67.0**	**2.3**	**10.8**
England and Wales	**4.1**	**7.4**	**62.0**	**2.8**	**10.0**

Source: 2001 Census (Travel to Work) (Table KS15)

The Strategy of Homeworking: The Shortest 'Journey-to-Work'

A key feature of the last 20 years has been the increasing flexibility of economic systems, including labour markets (Peck, 1992; Peck, 2000; Peck and Tickell, 2000; Castree *et al*, 2004). The result of flexible labour market practices has been increasing diversity in the number of hours worked; changing working arrangements such as part-time work, career breaks, job-sharing; and practices designed to encourage family-friendly working strategies (Morgan, 1996). However, a key aspect of increasing labour market flexibility is the growing importance of homeworking. The significance of homeworking for individuals (including men), households, and the economy has been recognised (Gillespie, 1999; Green *et al*, 2000) for the benefits afforded to the employee, and employer, particularly as a means for reducing production costs and overheads (Watson, 1991). In addition to being the 'shortest journey-to-work', homeworking also tells use something about the reorganisation of the home-work link, which is often neglected (Peck, 1996; Peck, 2003).

The 2001 Census datasets relating to distance travelled to work include a count of the number of people whose usual place of work was at or from home[25]. The problem with understanding the spatial distribution of homeworking relates to the conceptual argument of whether homeworking is a housing or labour market issue or whether it is a feature of both. Due to the fact that in the case of homeworking both residency and workplaces are located in the same place,

[25] The definition of homeworking in the census was relatively loose and made no distinction between different types of work or sectors, or whether the individual was self-employed and working from home or whether the individual was employed by an organisation and based at home.

in theory, the spatial distribution of homeworking should not change between the residency or workplace ends of the 'home-work trip'. However, because of the differences in the boundaries of the HMAs and TTWAs, the spatial concentration of homeworking might change as a result of shifting boundaries. As such, it was decided to analyse the concentrations of homeworking in both HMAs and TTWAs in order to provide intelligence on the spatial distribution of homeworking in both markets. Ward level data relating to homeworking for resident and workplace populations were aggregated to give a measure of the level of homeworking for the resident population of the HMAs (Figure 7.27) and the level of homeworking for the workplace population of the TTWAs (Figure 7.28). The red shading reflects above average levels of homeworking and green below average levels.

In relation to the HMAs, the regional average of homeworking is 9.6 per cent and in relation to the TTWAs, the regional average is 15.3 per cent. In the case of England and Wales, the average level of homeworking is 13.6 per cent. The analysis highlights that homeworking tends to be concentrated in the HMAs of Cumbria. In addition, the Lancaster and Morecambe, Crewe and Nantwich, and Macclesfield HMAs have above average regional levels of homeworking. Similarly, the analysis of the TTWAs reveals that homeworking is concentrated in the TTWAs of central Cumbria. In addition, despite not exceeding the regional average, there are relatively high concentrations of homeworking in the TTWAs of Carlisle, Whitehaven, Lancaster and Morecambe, and Crewe. The concentrations of homeworking is likely to reflect the fact that these HMAs and TTWAs are predominantly rural and contain above average levels of small employers and own account workers who are self-employed and use their home as a base for work (Green *et al*, 2000) in farming, construction, real estate, health care and communication sectors (Commission for Rural Communities, 2006).

Figure 7.27: Homeworking of Resident Populations of HMAs

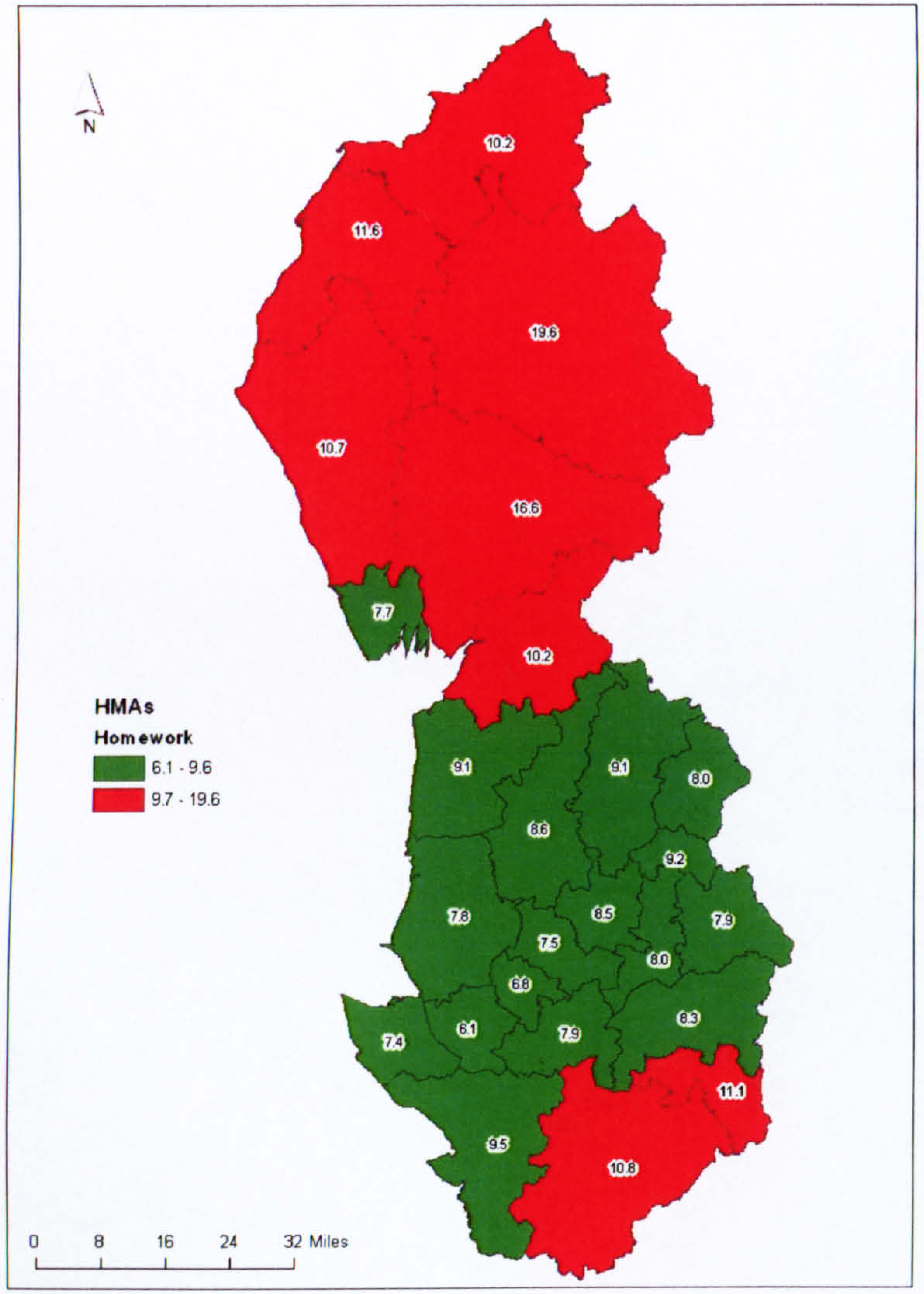
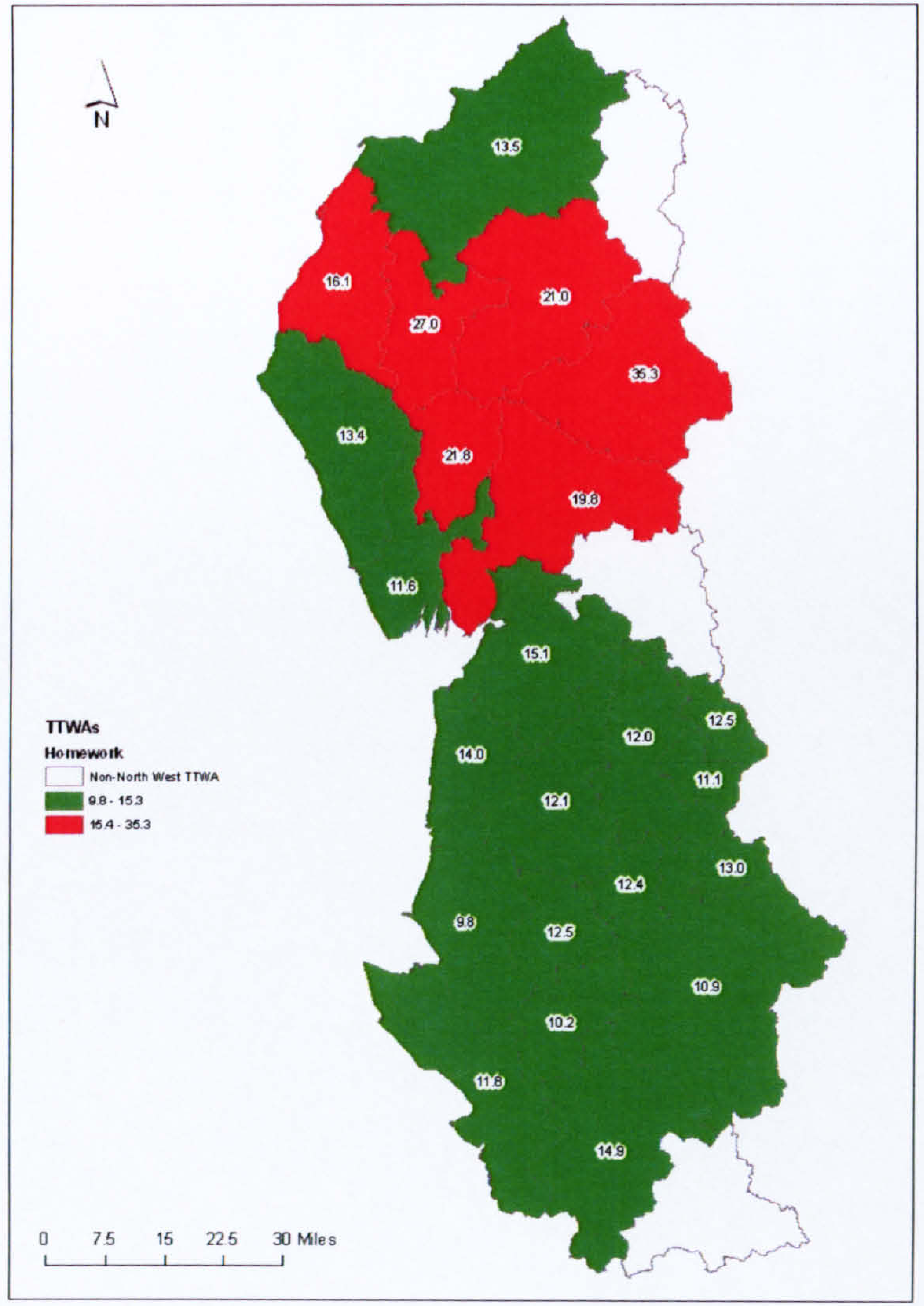


Figure 7.28: Homeworking of Workplace Populations of TTWAs



Part Four: The Influence of 'People Factors' on the Interaction of Housing and Labour Markets

The analysis of housing and labour markets interaction detailed above highlights a number of interesting trends and patterns at aggregate level. The analysis clearly identifies the importance of the interaction of adjacent housing and labour markets, but it also highlights the significance of the interaction of non-adjacent housing and labour markets.

However, the analysis at aggregate level conceals the underlying characteristics of commuters and their importance in structuring the nature of the interaction. The purpose of this section is to explore the influence of 'people factors' on the interaction of the North West housing and labour markets based on the demographic and socio-economic composition of the commuters from the 2001 SWS datasets, using an independent samples t-test to test for significant differences in the composition of the commuters.

However, rather than simply exploring the overall influence of socio-economic and demographic characteristics on commuting, the analysis explores the differences in composition of commuters in relation to: (1) the interaction of adjacent housing and labour markets; and (2) the interaction of non-adjacent housing and labour markets. The variables and groupings explored in the t-tests were adopted in response to the findings of previous research examining the influence of demographic and socio-economic characteristics on commuting (Table 7.8).

The influence of each of the variables on adjacent and non-adjacent housing and labour market interaction is explored below, and is supplemented with relevant mapping of the interaction of the markets in relation to demographic and socio-economic characteristics. The summary t-test statistics for the adjacent and non-adjacent interactions are presented in Tables 7.9 and 7.10.

Table 7.8: Characteristics Explored for Differences in Commuting Flow Composition

Explanatory Variable	Group 1 Composition	Group 2 Composition
Gender	Male	Female
Age	Age Groups 16-24 and 60-74	Age Groups 25-34 and 35-59
Employment Status	Full-Time	Part-Time
Gender Full-Time	Full-Time Male	Full-Time Female
Gender Part-Time	Part-Time Male	Part-Time Female
Socio-Economic Status	Higher and Lower Managerial and Professional Status	Other Socio-Economic Groups
Access to a Car	Car	Non-Car

Table 7.9: Independent Samples t-test: Differences in Composition of Commuting Flows for the Interaction of Adjacent Housing and Labour Markets

Variable (Group 1, Group 2)	**Mean Commuting** **Group 1**	**Group 2**	**Mean Difference**	***t*-value**
Gender	24183.08	23135.40	1047.67	.153
Age	9305.04	37958.44	-28653.40	-3.589**
Employment Status	34052.96	11480.73	22572.23	3.037**
Gender Full-Time	21404.35	12648.62	8755.73	1.701
Gender Part-Time	2020.65	9460.08	-7439.42	-3.997**
Socio-Economic Status	13628.27	30099.85	-16471.58	-2.484*
Access to a Car	25905.12	11630.85	14274.27	2.436*

Notes: * Significant at 0.05 ** Significant at 0.01

Table 7.10: Independent Samples t-test: Differences in Composition of Commuting Flows for the Interaction of Non-Adjacent Housing and Labour Markets

Variable (Group 1, Group 2)	**Mean Commuting** **Group 1**	**Group 2**	**Mean Difference**	***t*-value**
Gender	527.02	296.20	230.81	2.971**
Age	118.88	703.41	-584.53	-6.300**
Employment Status	732.13	155.21	576.92	4.726**
Gender Full-Time	499.07	213.80	285.27	4.139**
Gender Part-Time	20.58	72.56	-51.99	-4.581**
Socio-Economic Status	356.00	359.66	-3.66	-0.53
Access to a Car	643.00	107.78	535.22	6.371**

Notes: * Significant at 0.05 ** Significant at 0.01

Commuting Patterns of Males and Females

The analysis of commuting patterns for males and females reveals a distinct difference in gender composition of the interaction of adjacent and non-adjacent housing and labour markets. In relation to adjacent interaction, the analysis reveals that men have a slightly higher propensity to commute but there was no significant difference in the composition of interaction based on gender. Indeed, this is reflected in the comparatively low mean difference between males and females in relation to adjacent interaction, and the fact that adjacent interaction is comprised of 51.1 per cent male and 48.9 per cent female. In contrast, the analysis of the interaction of non-adjacent housing and labour markets highlights a significant difference between males and females (*t*-ratio=2.971; $p<0.01$). Indeed, females are less likely than males to commute beyond their adjacent labour markets (Bailey and Turok, 2001).

In contrast to the adjacent interaction, which has similar male and female composition, non-adjacent interaction contains a significantly higher proportion of males (64 per cent) than females (36 per cent). This highlights the lower mobility of females when compared to men. This is likely to reflect the desire/need of women to work in close proximity to schools and childcare facilities (Moss *et al*, 2004), and the constraints imposed on female commuting by family responsibilities, poorer access to private transport, and lower wages when compared to men (Madden, 1981; Dex *et al*, 1995; Camstra, 1996; Wyly, 1998). The mapping of the commuting patterns (Figures 7.29 and 7.30) illustrates that interaction between adjacent housing and labour markets is relatively similar for males and females, although the flow volumes are slightly higher for men. The main difference in the composition of the flows can be found in relation to the higher number of third order flows between non-adjacent housing and labour markets for men, which is likely to account for the significant difference found between gender composition of non-adjacent interaction.

Commuting Patterns for Different Age Groups

The variables used in the analysis of the composition of the age groups were constructed to reflect the assumption of bi-modality in relation to age and commuting. In particular, they were designed with the intention of exploring the assumption that the youngest and oldest workers are likely to have a lower propensity to commute than middle age group workers (Levinson, 1998; McQuaid, 2003). The analysis reveals that the middle age groups have the highest propensity to commute, and this is significant in relation to the interaction of adjacent housing and labour markets (t-ratio=-3.589; p<0.01), and non-adjacent housing and labour markets (t-ratio=-6.300; p<0.01). Indeed, of all adjacent interaction, 80.3 per cent of commuters are within the middle age groups, whilst the remaining 19.7 per cent is comprised of the youngest and oldest workers. The analysis also suggests that in relative terms, the younger and older age groups are less willing to commute to non-adjacent labour markets when compared to the middle age groups. This is supported by the fact that of all non-adjacent interaction, 85.5 per cent of commuters are within the middle age groups, whilst the remaining 14.5 per cent are workers within the younger and older age groups.

This is likely to reflect the fact that younger workers are less able to afford the costs associated with commuting longer distances to work because they tend to be employed in lower paid part-time jobs and therefore longer distance commuting is undesirable (Romani *et al*, 2003). In addition, the lower propensity for older workers to commute to non-adjacent labour markets reflects the fact that older workers are likely to have developed a good balance between home and work as a result of the adoption of residential and workplace relocation strategies that have been in place over an extended period of time. It is also likely to reflect the fact that older workers are unwilling to accept long distance commutes as a compromise between home and work (Turner and Niemeier, 1997). In contrast, the higher propensity for middle age groups to commute to a range of labour markets, adjacent and non-adjacent, is likely to reflect two main issues. First, middle age groups are generally career focused and willing to commute longer distances to work to fulfil career ambitions (Green, 1997), and second, family responsibilities often result in workers trading-off housing and residential locations for longer commutes (Green *et al*, 1999; Ory *et al*, 2004). This is likely to be much more of an issue for the middle-age groups than younger or older age groups. Indeed, younger workers are less likely to have the same family responsibilities as middle-age workers, and the need to balance residential and workplace locations and commuting is likely to have been more of an issue for older workers at earlier stages in their working life. The mapping of the commuting patterns clearly illustrates the significance of the interaction of adjacent housing and labour markets for all age groups (Figures 7.31-7.34). However, the importance of non-adjacent interaction for the 25-34 and 35-59 age groups is clearly illustrated in Figures 7.32 and 7.33. However, what is evident is the greater diversity in commuting between housing and labour markets in the 35-59 age group, particularly across the urban-industrial belt, and between the urban-industrial belt and the shire areas.

Commuting Patterns and Employment Status

The analysis of employment status reveals that there is a significant difference in the composition of the flows between full and part-time workers in relation to the interaction of adjacent housing and labour markets (t-ratio=3.037; $p<0.01$), and in relation to the interaction of non-adjacent housing and labour markets (t-ratio=4.139; $p<0.01$). The analysis suggests that full-time workers account for the highest levels of commuting in relation to both adjacent and non-adjacent interaction of housing and labour markets. This reflects the fact that full-time workers account for approximately 76 per cent of the workforce in the North West, and are therefore likely to have a greater impact on the nature of the interaction of housing and labour markets when compared to part-time workers. However, in relation to the significant difference recorded in non-adjacent interaction of housing and labour markets, this is likely to reflect the fact that full-time workers have a higher propensity to commute and are more likely to commute longer distances than part-time workers (Hanson and Pratt, 1995; MacDonald, 1999). When comparing the differences in the mean compositions of the flows for adjacent and non-adjacent interaction, the striking feature of the pattern of commuting is the scale of the differences in the flows of full-time and part-time commuters. In relation to adjacent interaction, almost three times as many full-time workers commute between adjacent housing and labour markets as part-time workers. However, this difference rises to almost five times as many full-time workers commuting between non-adjacent housing and labour markets. This reflects the constraints faced by part-time workers in relation to the costs associated with commuting longer distances (Gordon *et al*, 1989), and the fact that part-time workers will often seek employment close to home (Van der Laan, 1998). In contrast, full-time workers will tend to invest more in their career and this can result in the balancing of home and workplace locations through longer commutes (Green, 1997; Green *et al*, 1999).

However, the analysis goes further than simply exploring the overall influence of employment status on commuting by disaggregating the full and part-time employment composition of the flows by whether the commuter is male or female. The analysis reveals that there is no significant difference in the gender composition of full-time commuters in relation to adjacent housing and labour market interaction, but there is a significant difference in relation to non-adjacent interaction (t-ratio=4.139; $p<0.01$). Of all commuting in the region, 48.7 per cent is comprised of full-time male commuters, and 27.6 per cent of full-time female commuters. Thus, there are almost twice as many full-time male commuters in the region as full-time female commuters. These trends are reflected in relation to adjacent interaction. However, of all non-adjacent interaction, the proportion of full-time male commuters rises substantially to 61.9 per cent, whilst the proportion of full-time female commuting to non-adjacent labour markets declines slightly to 26.5 per cent (Figures 7.35 and 7.36).

There is a significant difference in the gender composition of part-time commuters in relation to adjacent housing and labour market interaction (t-ratio=-3.997; $p<0.1$), and non-adjacent interaction (t-ratio=-4.581; $p<0.01$). Of all commuting in the region, 4.2 per cent is comprised of part-time male commuters, whilst 19.3 per cent is part-time female commuters. Thus, there are almost five times as many part-time female commuters in the region as part-time male commuters, which reflects the fact that women are more likely to engage in part-time work than their male counterparts (Hanson and Johnson, 1985; Johnston-Anumonwo, 1992; Hanson and Pratt, 1995; MacDonald, 1999). These trends are again reflected in relation to adjacent interaction. However, of all non-adjacent interaction, the proportion of part-time male commuters declines to 2.6 per cent, whilst the proportion of part-time female commuting to non-adjacent labour markets falls to 9 per cent, a difference of approximately 11 per cent between adjacent and non-adjacent interaction. As such, there are higher numbers of full-time male workers commuting between adjacent and non-adjacent housing and labour markets, when compared to female full-time commuters. However, there are much higher numbers of part-time female workers commuting between adjacent and non-adjacent housing and labour markets when compared to male workers (Figure 7.37 and Figure 7.38).

The decline of manufacturing and the growth of the service sector have benefited female participation in the labour market and increasingly flexible working practices, particularly growth in part-time employment opportunities have meant that women are able to balance their traditional roles in the household with employment and career ambitions (Green, 1997; Green *et al*, 1999). Indeed, Green *et al* (1999) highlight that whilst the majority of growth has been in part-time employment, which reflects the dominance of part-time female employment in the analysis, the near continuous full-time employment of highly qualified women has resulted in a successful female career class and the emergence of dual career/dual earner households. However, the mapping of the commuting flows reveals the inherent differences that exist in the nature of housing and labour market interaction depending on gender and employment status. In particular, women tend to experience much greater levels of entrapment in highly localised labour markets when compared to men, especially in relation to part-time workers (MacDonald, 1999). However, the entrapment of women in adjacent labour markets is also reflected in relation to full-time commuting illustrated by the diversity in commuting patterns for full-time males in comparison to full-time females. This is also likely to reflect the fact that men tend to benefit from the use of private transport, whilst women tend to rely to a greater extent on public transport or being driven to a local workplace by other members of the household (Hjorthol, 2000). As a result, women are restricted in their ability to access jobs that are located at a distance from their home.

Commuting Patterns and Socio-Economic Status

The analysis of the influence of socio-economic groupings on commuting requires careful interpretation. The analysis reveals that there is a significant difference between the higher socio-economic groups and the other groups in relation to adjacent interaction (t-ratio=-2.484; p<0.05). However, in relation to non-adjacent interaction, there is no significant difference between the higher socio-economic groups and the other groups. The analysis reveals that all socio-economic groups play a significant role in adjacent interaction but that commuting between adjacent housing and labour markets is especially important for lower status workers. Indeed, lower status workers tend to commute shorter distances to work, and are therefore significantly more localised in their commuting behaviour than higher status socio-economic groups (Green *et al*, 1986; Coombes *et al*, 1988; Hanson and Pratt, 1995). This tends to reflect the fact that lower status workers often have poorer access to private transport and are unable to offset the costs associated with commuting longer distances (Turok, 1999). In contrast, the analysis reveals that higher status workers will tend to commute to non-adjacent housing markets to a greater extent than lower status and intermediate status workers because they are able to offset commuting costs and will tend to trade-off longer commutes for better residential locations (Green *et al*, 1999; Wong *et al*, 2000).

The dynamics of the flows become even more evident when examining the compositions of the flows between adjacent and non-adjacent housing and labour markets (Figures 7.39-7.45). In relation to adjacent interaction, 31.2 per cent of the flows are comprised of high status workers, 25.9 per cent intermediate workers, and 42.9 per cent low status workers. In relation to the high status composition, 6 per cent of the flows are higher managerial and professional workers and 25.1 per cent are lower managerial and professional workers. The intermediate flows are comprised of 14.7 per cent intermediate workers, and 11.2 per cent lower supervisory and technical workers. In relation to the low status composition, the highest proportion is semi-routine workers (18.4 per cent), followed by routine workers (13.6 per cent), and small employers and own account workers (10.9 per cent). In relation to non-adjacent interaction, high status workers account for half of all flows between non-adjacent housing and labour markets (49.7 per cent), followed by intermediate workers (25.6 per cent) and low status workers (24.7 per cent). The majority of the high status composition flows are comprised of lower managerial and professional workers (37.2 per cent) whilst higher status managerial and professional workers account for 12.5 per cent. However, there is a relatively even split in intermediate status composition flows with 13.5 per cent comprised of intermediate workers and 12.1 per cent lower supervisory and technical workers. Similarly, in relation to low status composition, semi-routine (10.5 per cent) and routine (9.9 per cent) account for similar proportions of flows. However, small employers and own account workers account for just 4.4 per cent of low status flows suggesting that own account workers are highly concentrated in labour markets that are adjacent to their housing market.

Access to a Car

In contrast to the demographic and socio-economic variables explored above, the SWS do not contain a specific variable measuring access to a car. However, the SWS do contain a dataset related to mode of travel adopted in travelling to work. Whilst this is not a pure measure of accessibility to a car, largely because it does not take account of people who have access to a car but choose to commute by other forms of travel, the variable provides a proxy measurement of access to a car which can be used to inform the understanding of the importance of private transport in the interaction of adjacent and non-adjacent housing and labour markets.

The analysis reveals the importance of private transport, namely the car, in the interaction of housing and labour markets (Figure 7.46) [26]. The car has emerged as the dominant mode of travel in the journey-to-work, and its significance is reflected in both the interaction of adjacent housing and labour markets (t-ratio=2.436; $p<0.05$), and non-adjacent housing and labour markets (t-ratio=6.371; $p<0.01$). The analysis illustrates that non-car travel also plays an important role in the interaction of adjacent housing and labour markets, despite the fact that the difference between the mean commuting compositions indicate that twice as many people commute by car between adjacent housing and labour markets as any of the other modes of travel combined (Figures 7.47-7.50). In relation to all modes of travel adopted in relation to adjacent interaction, the dominant mode is indeed the car (69 per cent). Commuting by bus accounts for 11.4 per cent but quite surprisingly walking to work accounts

[26] Due to the fact that the car is the dominant mode of travel adopted across all sub-regions, it was decided to only map the first and second order car flows in order to isolate the dominant flows by car, and to reduce the obscurity created by high levels of low magnitude third order flows.

for 14.5 per cent. In contrast, the adoption of the train and cycling are comparatively low, accounting for 1.8 per cent and 3.2 per cent respectively.

In comparative terms, the car is even more significant in relation to the interaction of non-adjacent housing and labour markets. The difference between the mean commuting compositions indicate that six times as many people commute by car between non-adjacent housing and labour markets as any of the other modes of travel combined. Indeed, 85 per cent of non-adjacent interaction is comprised of commuting by car. In contrast, all other modes of travel are lower in relative terms when compared to adjacent interaction with the exception of commuting by train. Indeed, commuting by train accounts for 4.7 per cent of the composition of the interaction of non-adjacent housing and labour markets, whilst commuting by bus accounts for 6.9 per cent, and cycling 0.8 per cent. Perhaps not surprisingly, the adoption of walking as a mode of travel between non-adjacent housing and labour markets is low at 1.9 per cent. This is likely to reflect inconsistencies and errors in the data, which have been amplified as a result of aggregation of ward level data to sub-regional level.

The results of the analysis tend to reflect the findings of previous research. Dieleman *et al* (2002) highlight that the car is the dominant mode of travel across all distance bands, and that access to a private car increases accessibility to more distant workplaces when compared to access to non-private travel (Levinson, 1998; Axhausen, 2001). As such, the propensity to commute by car is significant in relation to adjacent interaction but is heightened in relation to non-adjacent interaction. In addition, public transport, walking, and cycling have been shown to be in decline as modes of travel (Banister and Gallent, 1998; Pooley and Turnbull, 1999; Kingham *et al*, 2001), and with the exception of the train, their range for connecting housing and labour markets is limited to local connections (Dieleman *et al*, 2002). As a result, the car is often the only option for workers in relation to travelling-to-work (Kingham *et al*, 2001), and this is particularly the case in relation to the interaction of non-adjacent housing and labour markets.

Figure 7.29: Commuting for all Male Workers

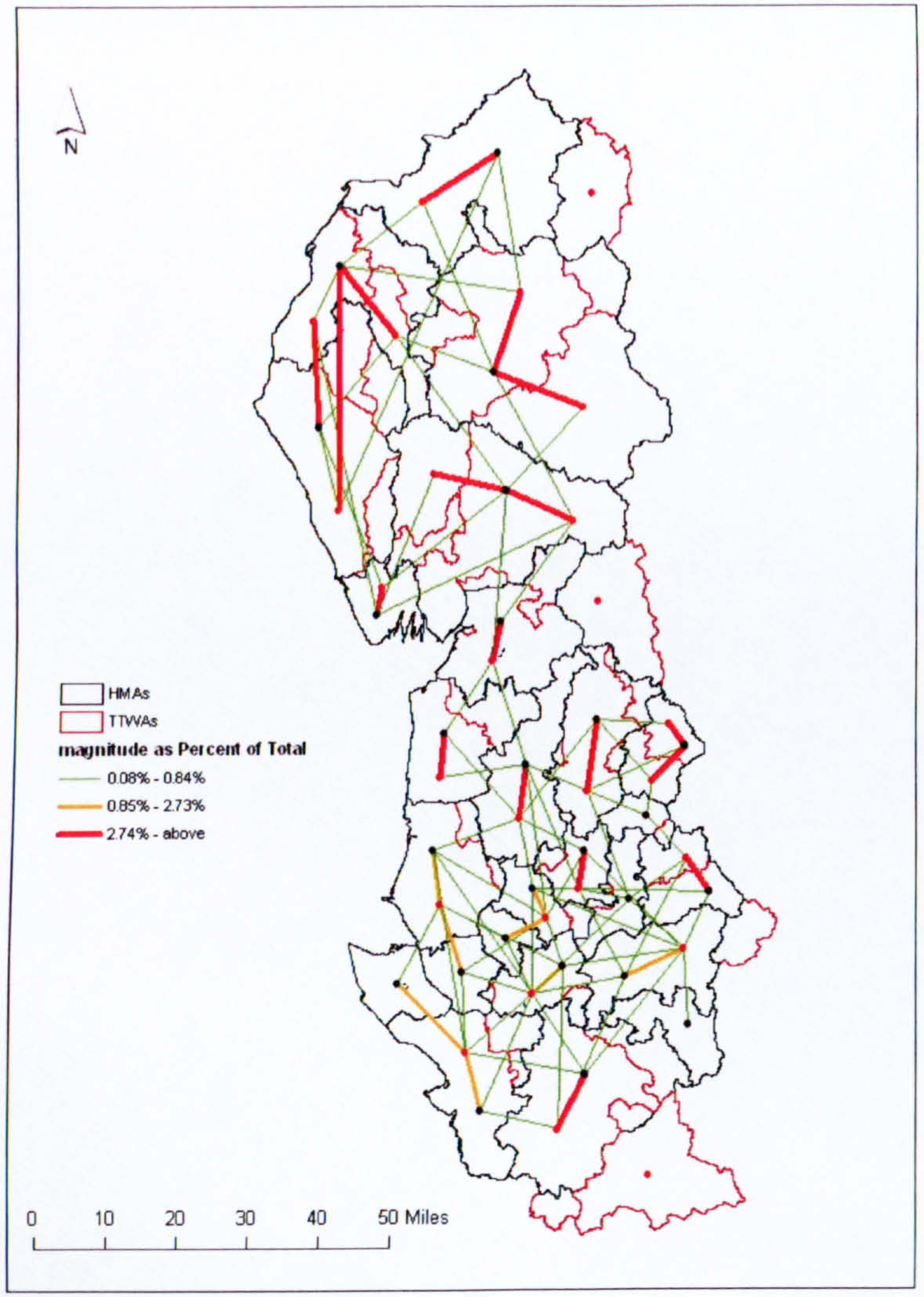


Figure 7.30: Commuting for all Female Workers

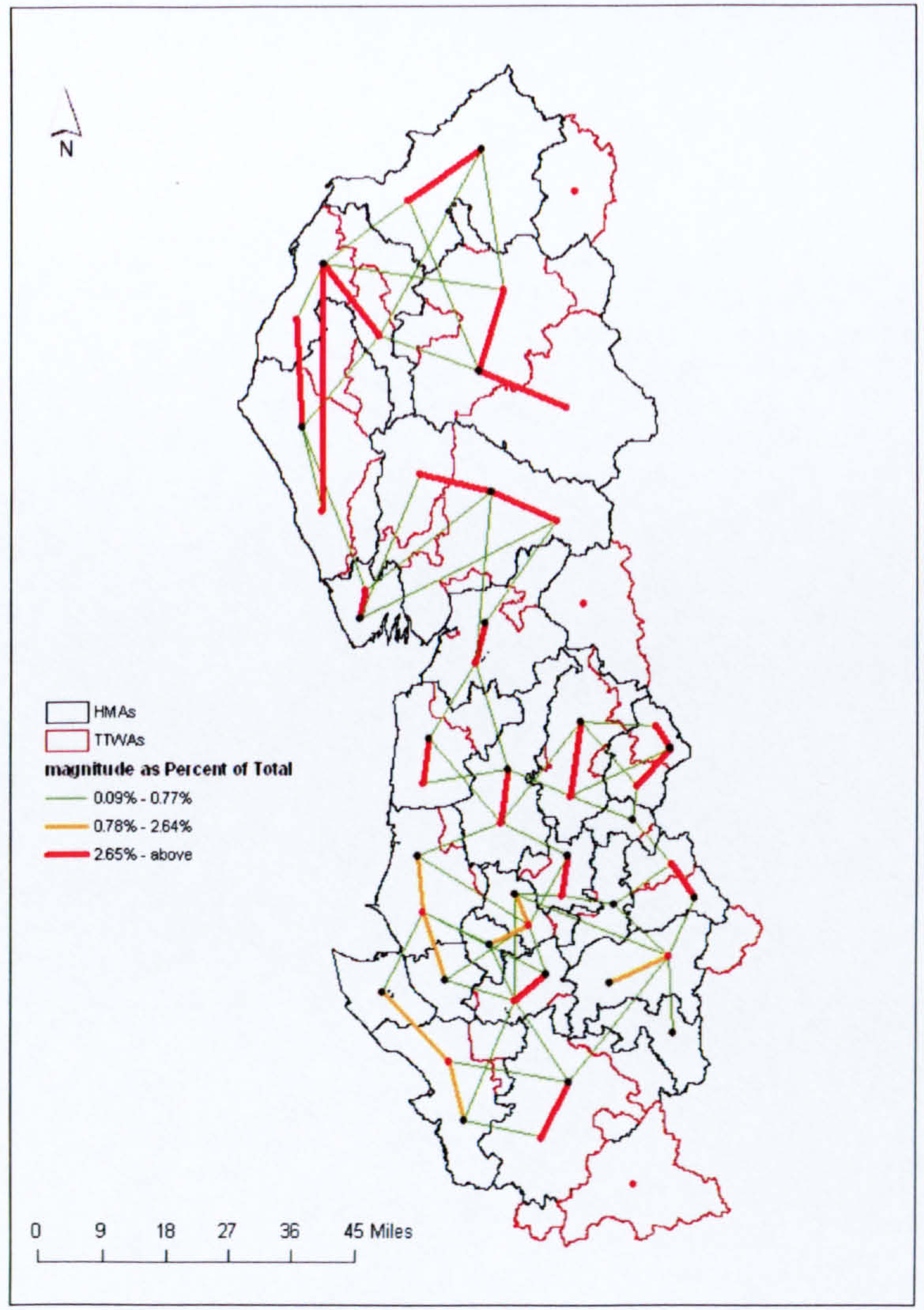


Figure 7.31: Commuting for all Workers Aged 16-24

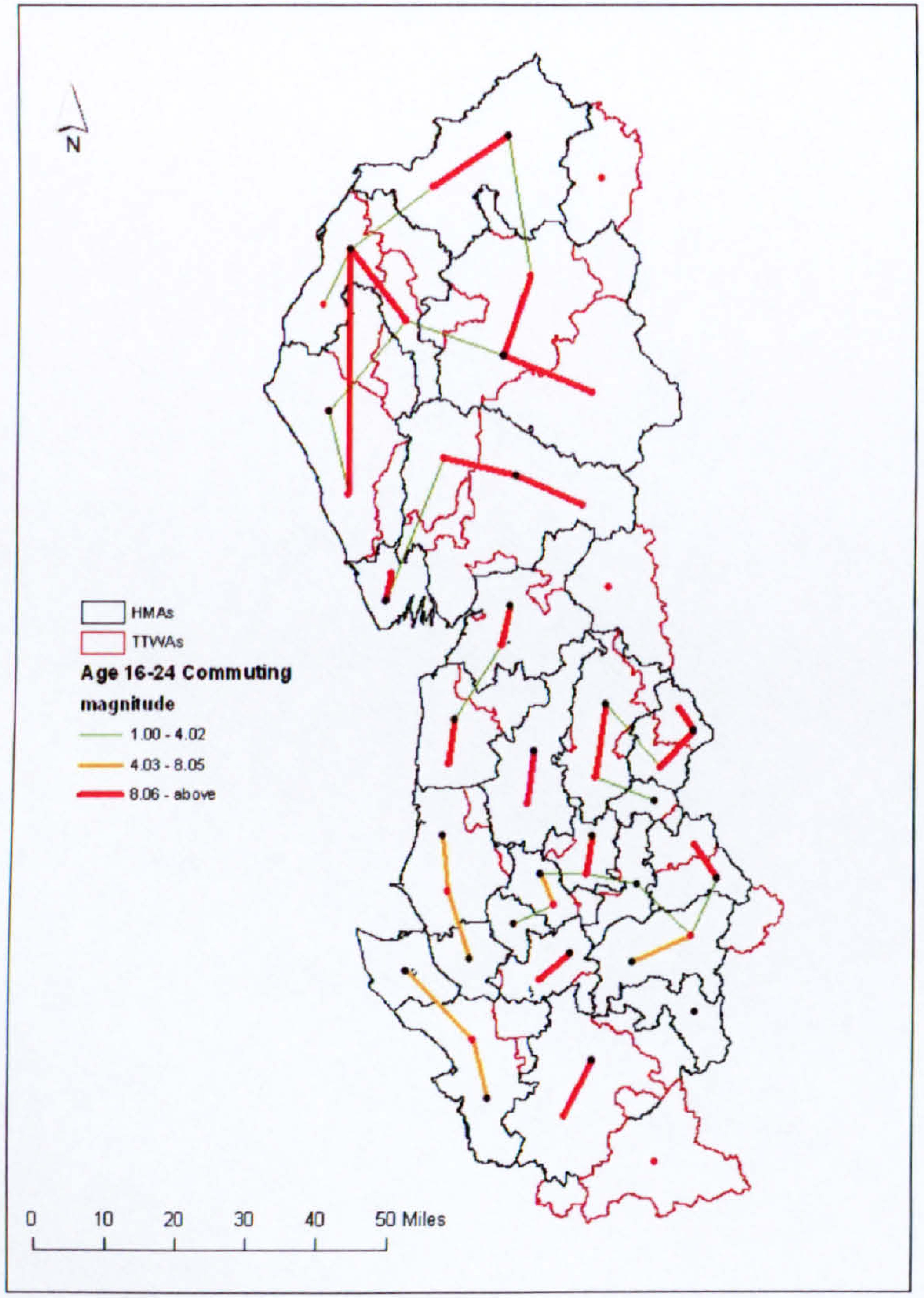


Figure 7.32: Commuting for all Workers Aged 25-34

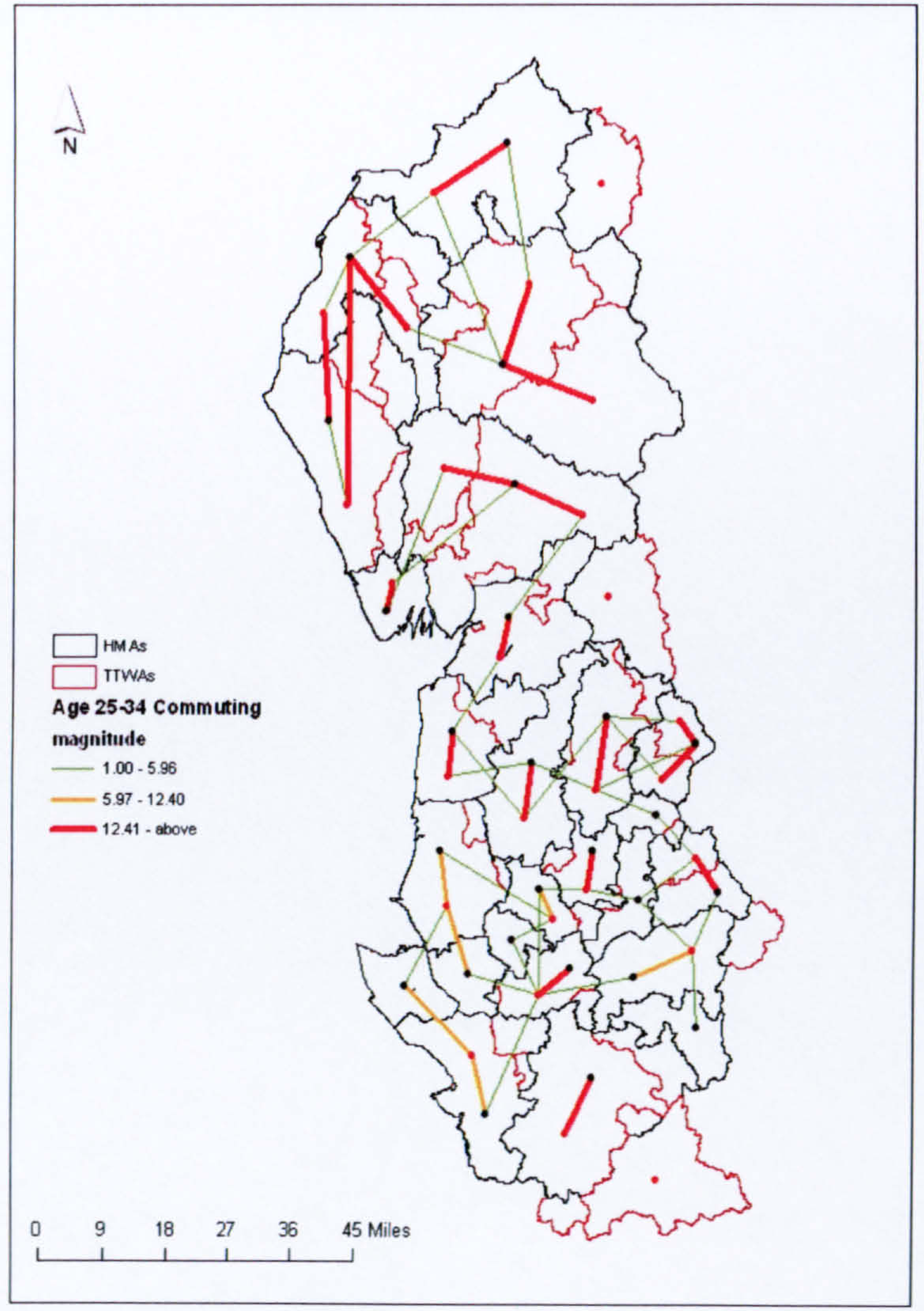


Figure 7.33: Commuting for all Workers Aged 35-59

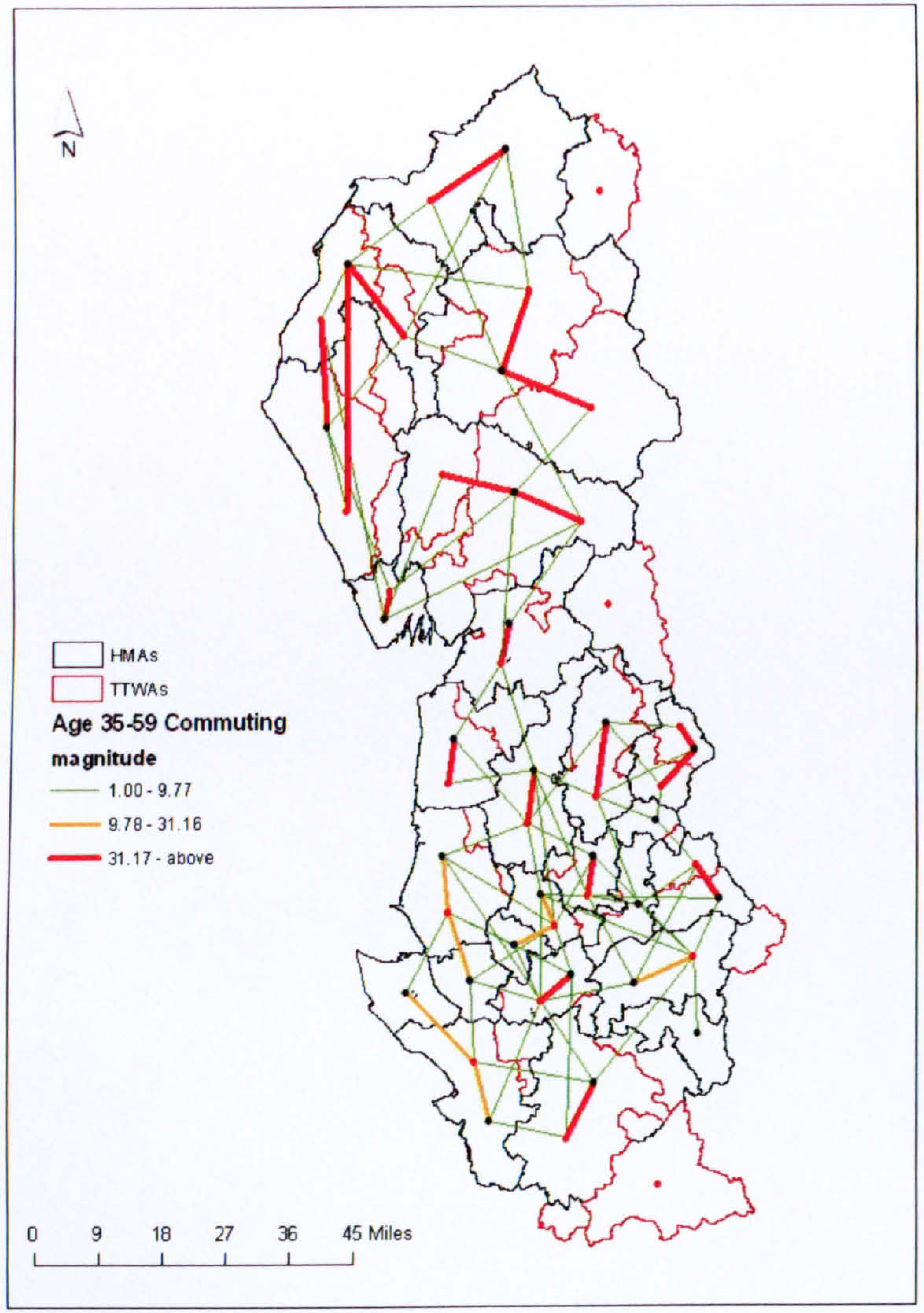


Figure 7.34: Commuting for all Workers Aged 60-74

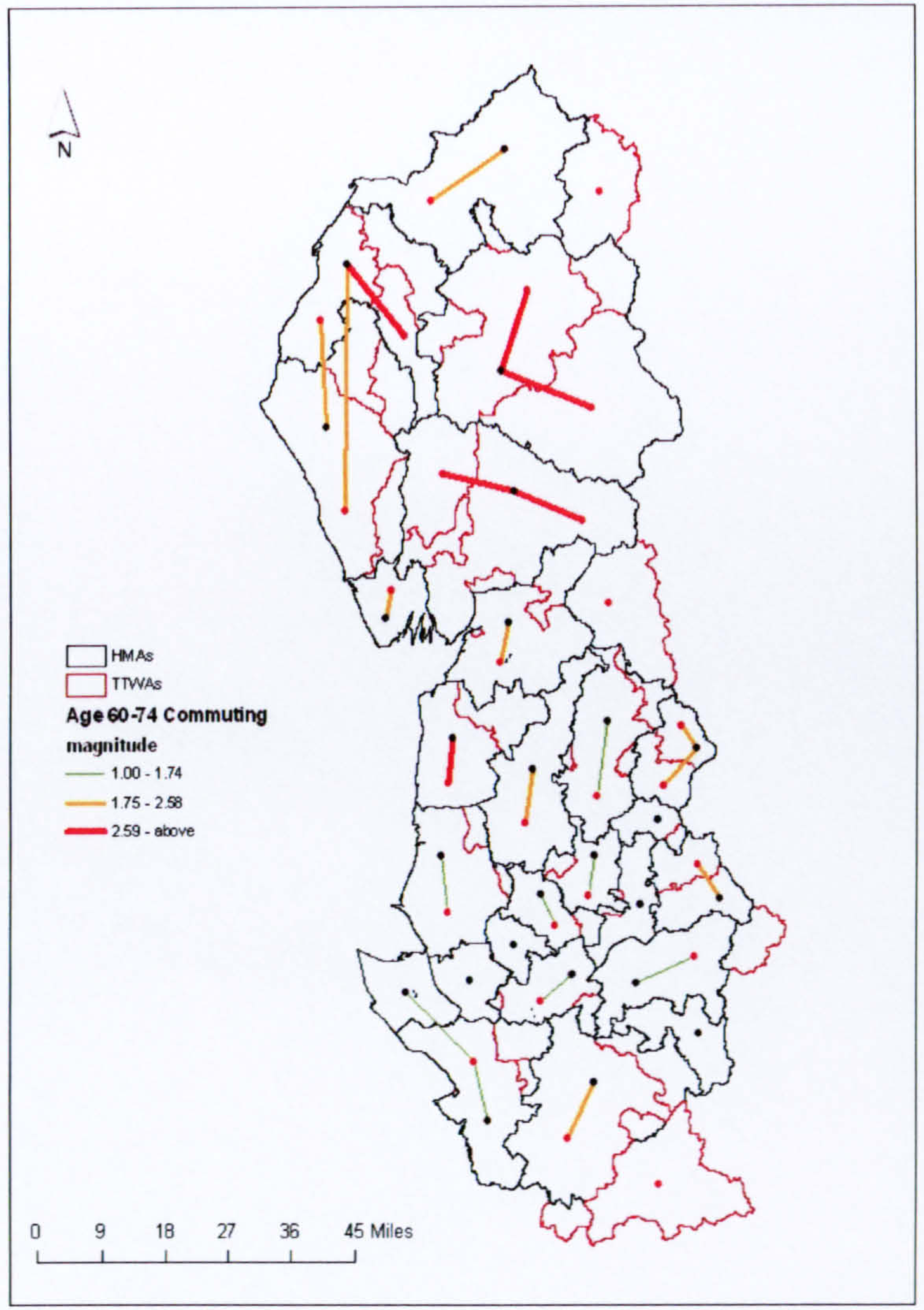


Figure 7.35: Commuting for all Full-Time Male Workers

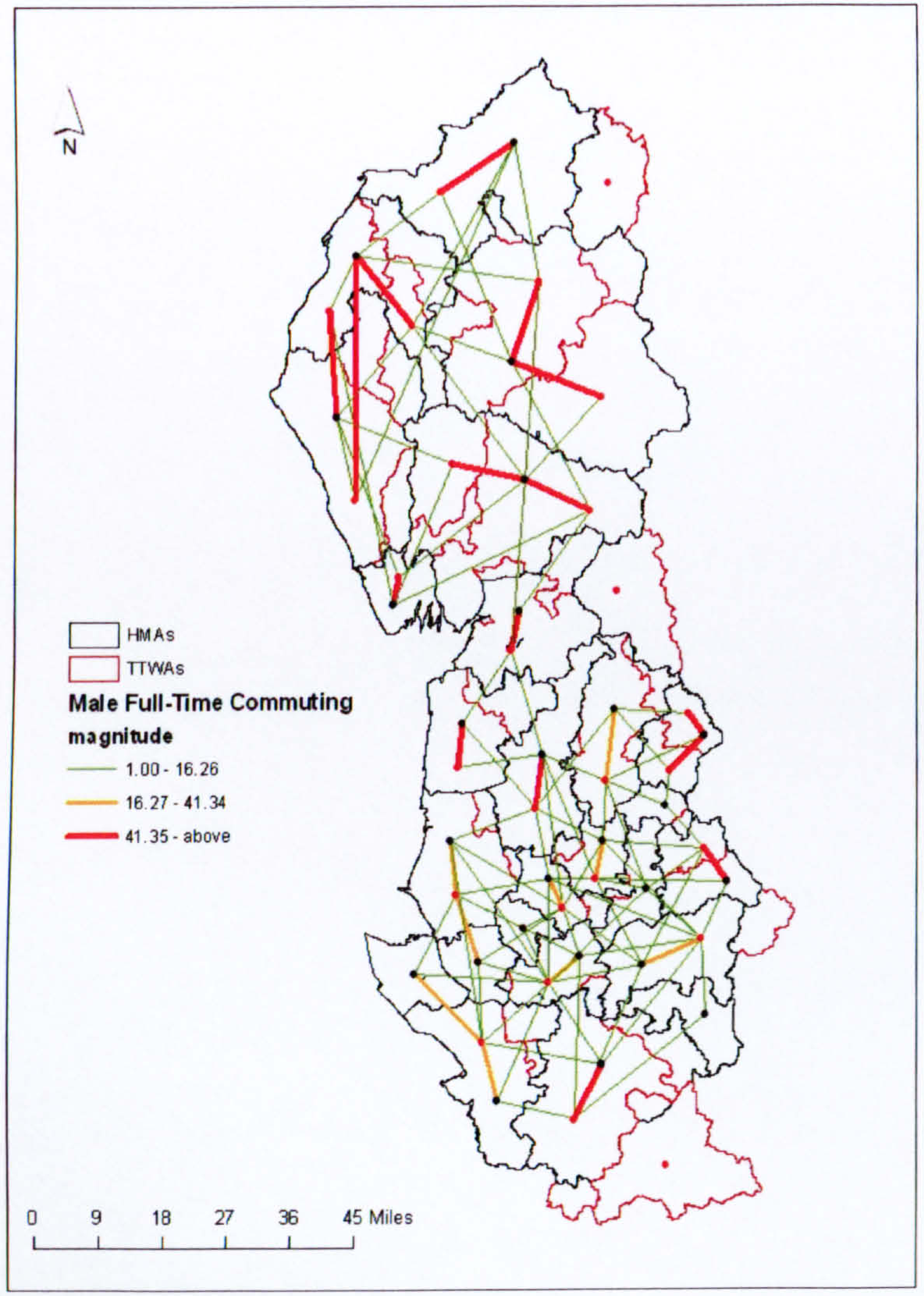


Figure 7.36: Commuting for all Full-Time Female Workers

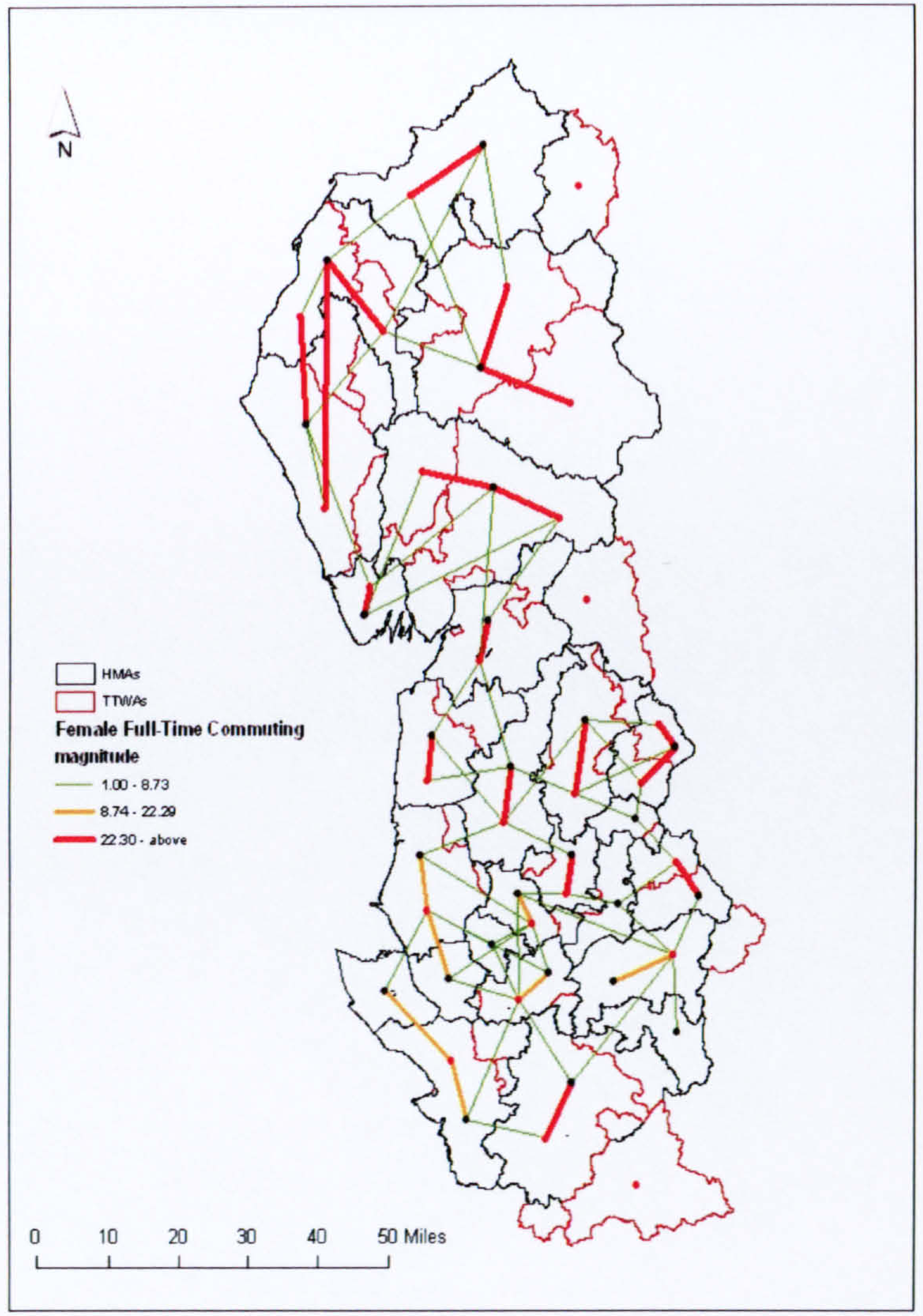


Figure 7.37: Commuting for all Part-Time Male Workers

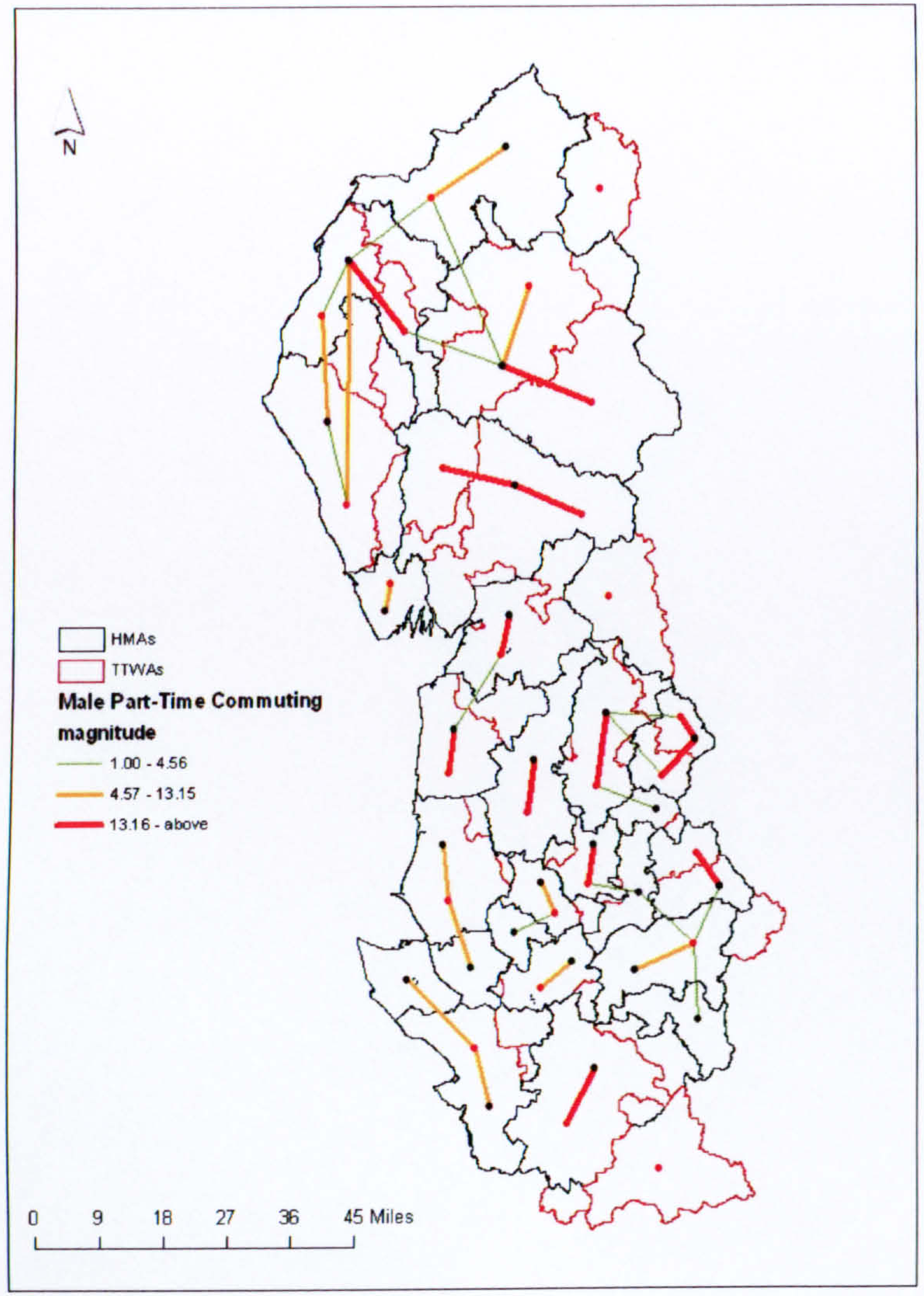


Figure 7.38: Commuting for all Part-Time Female Workers

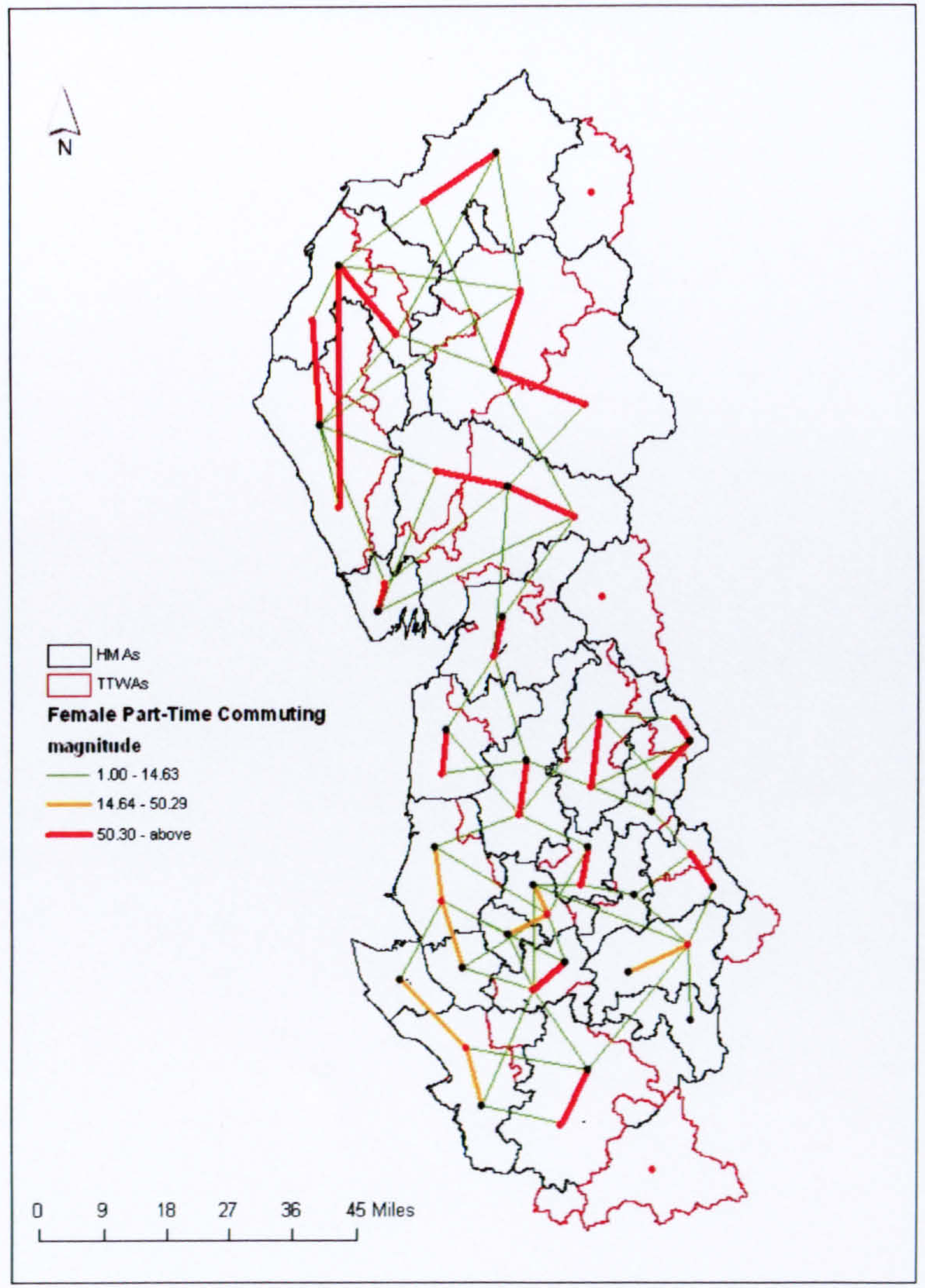


Figure 7.39: Commuting for Higher Managerial and Professional Workers

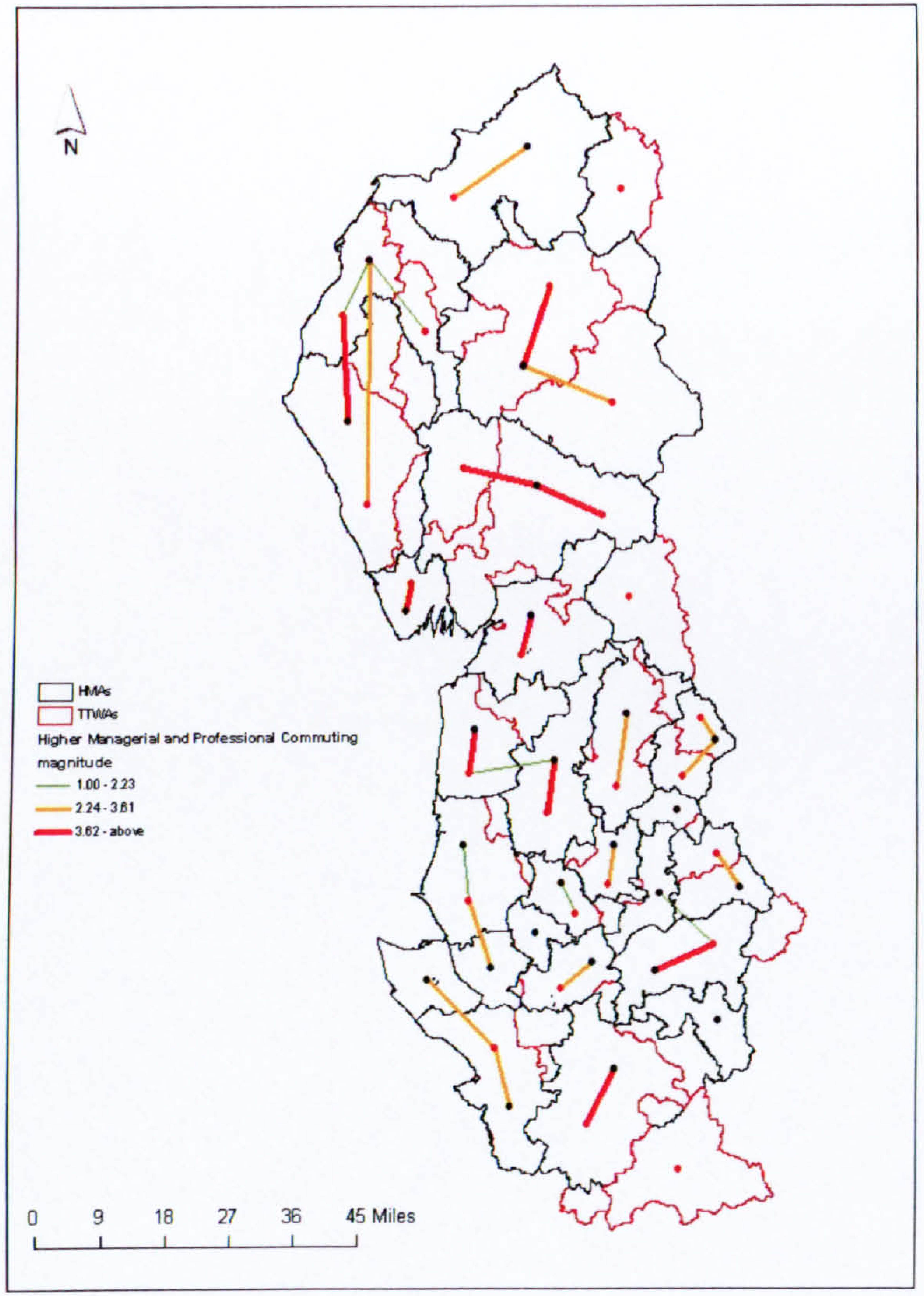


Figure 7.40: Commuting for Lower Managerial and Professional Workers

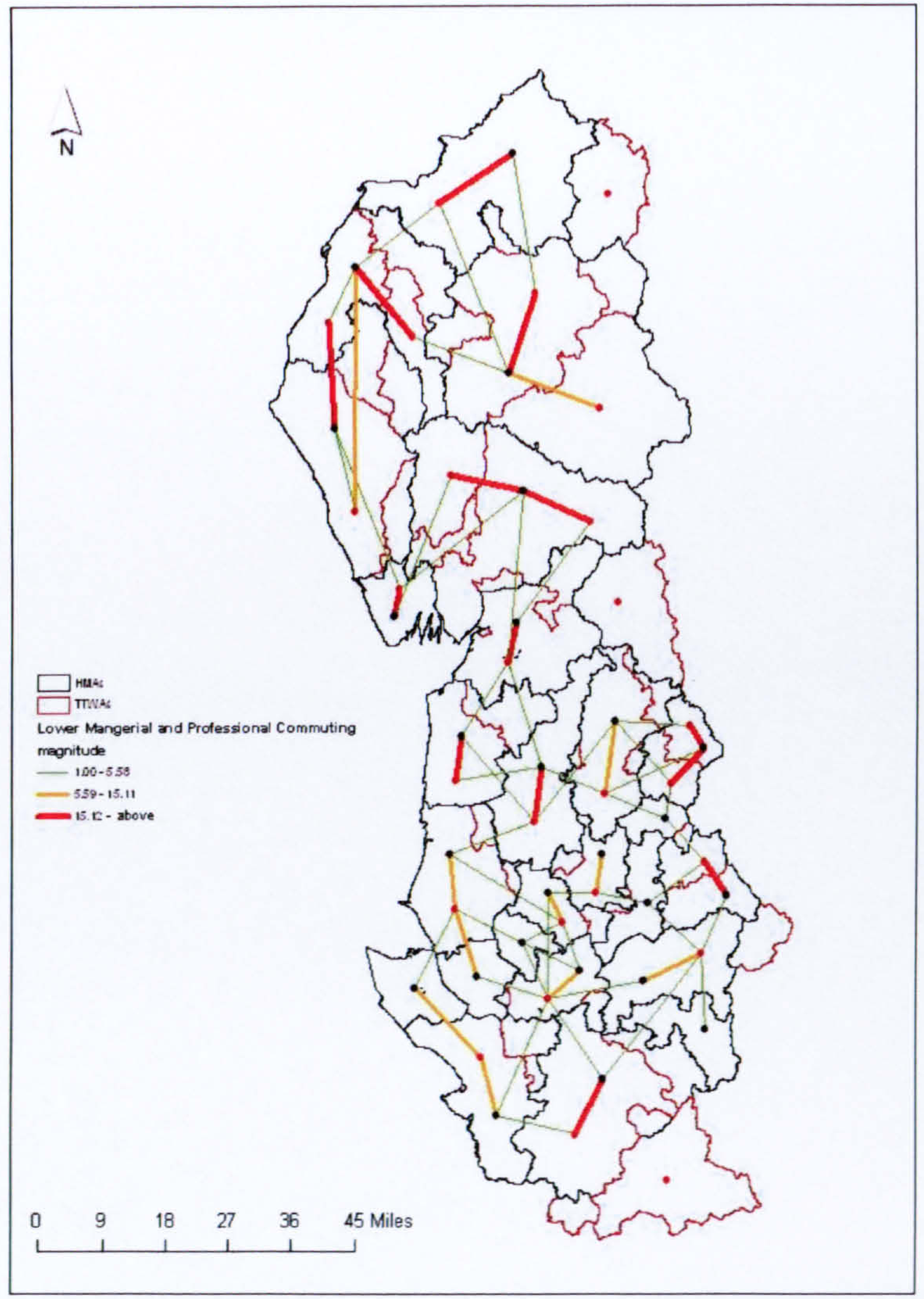


Figure 7.41: Commuting for Intermediate Workers

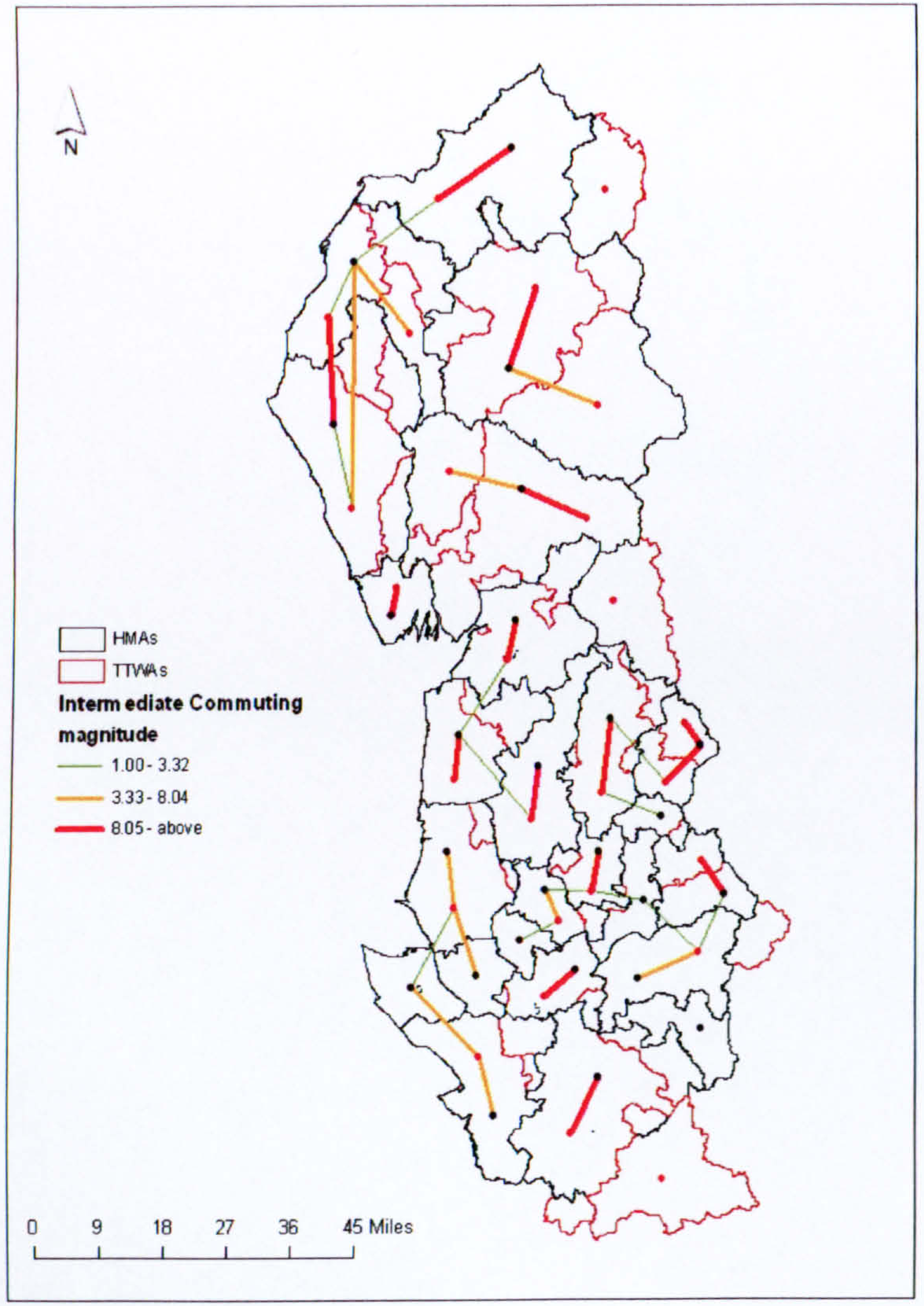


Figure 7.42: Commuting for Lower Supervisory and Technical Workers

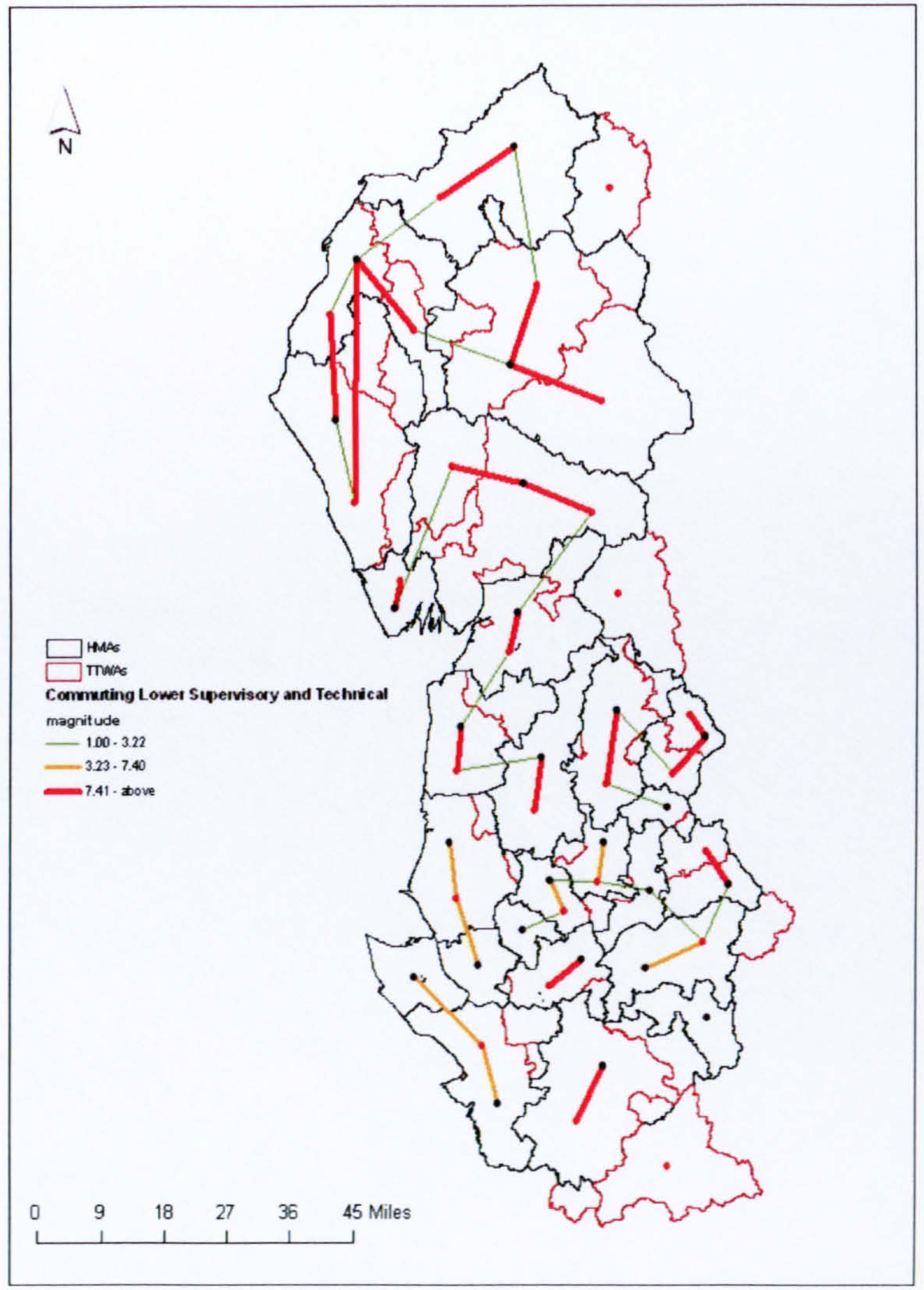


Figure 7.43: Commuting for Small Employers and Own Account Workers

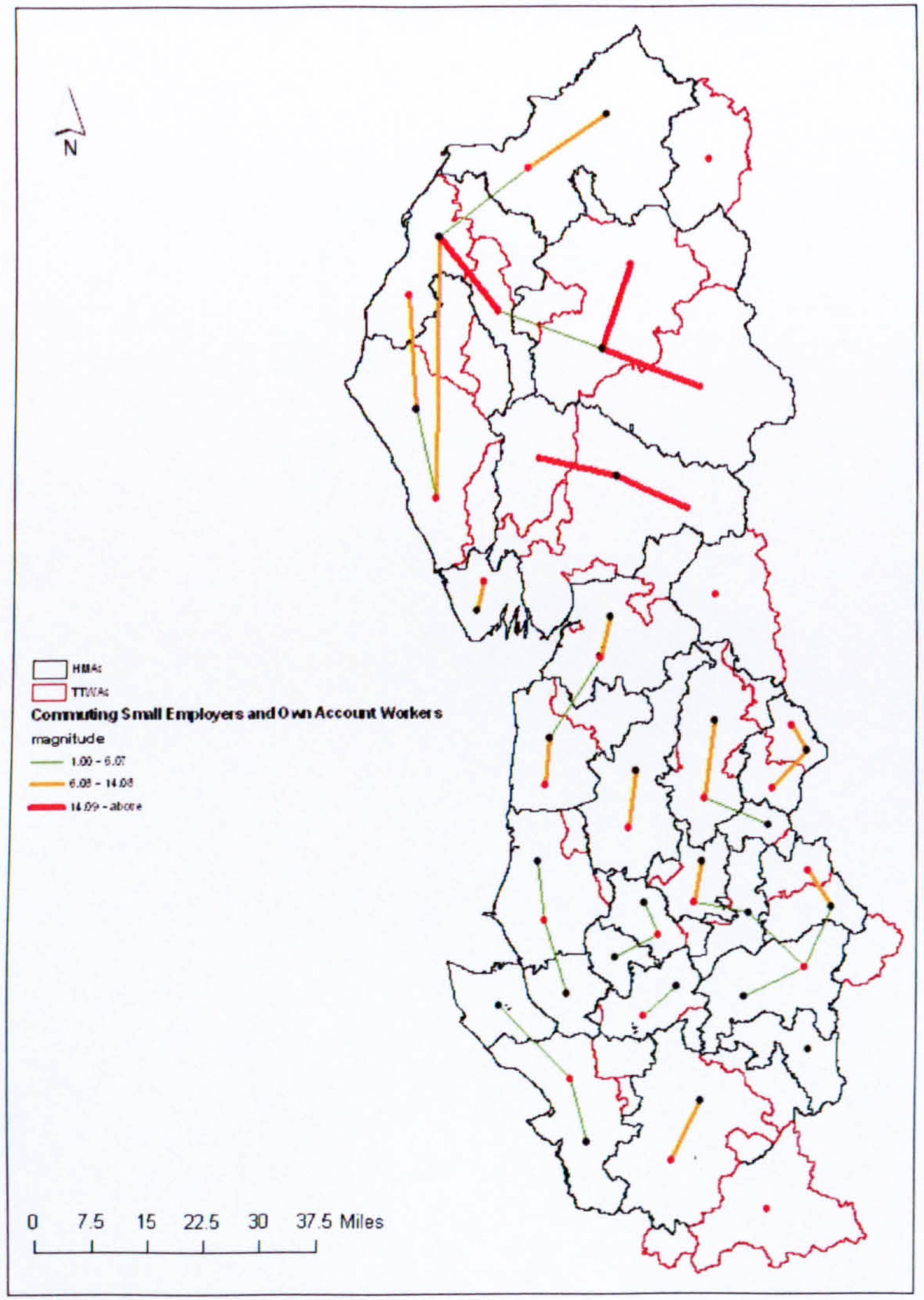


Figure 7.44: Commuting for Semi-Routine Workers

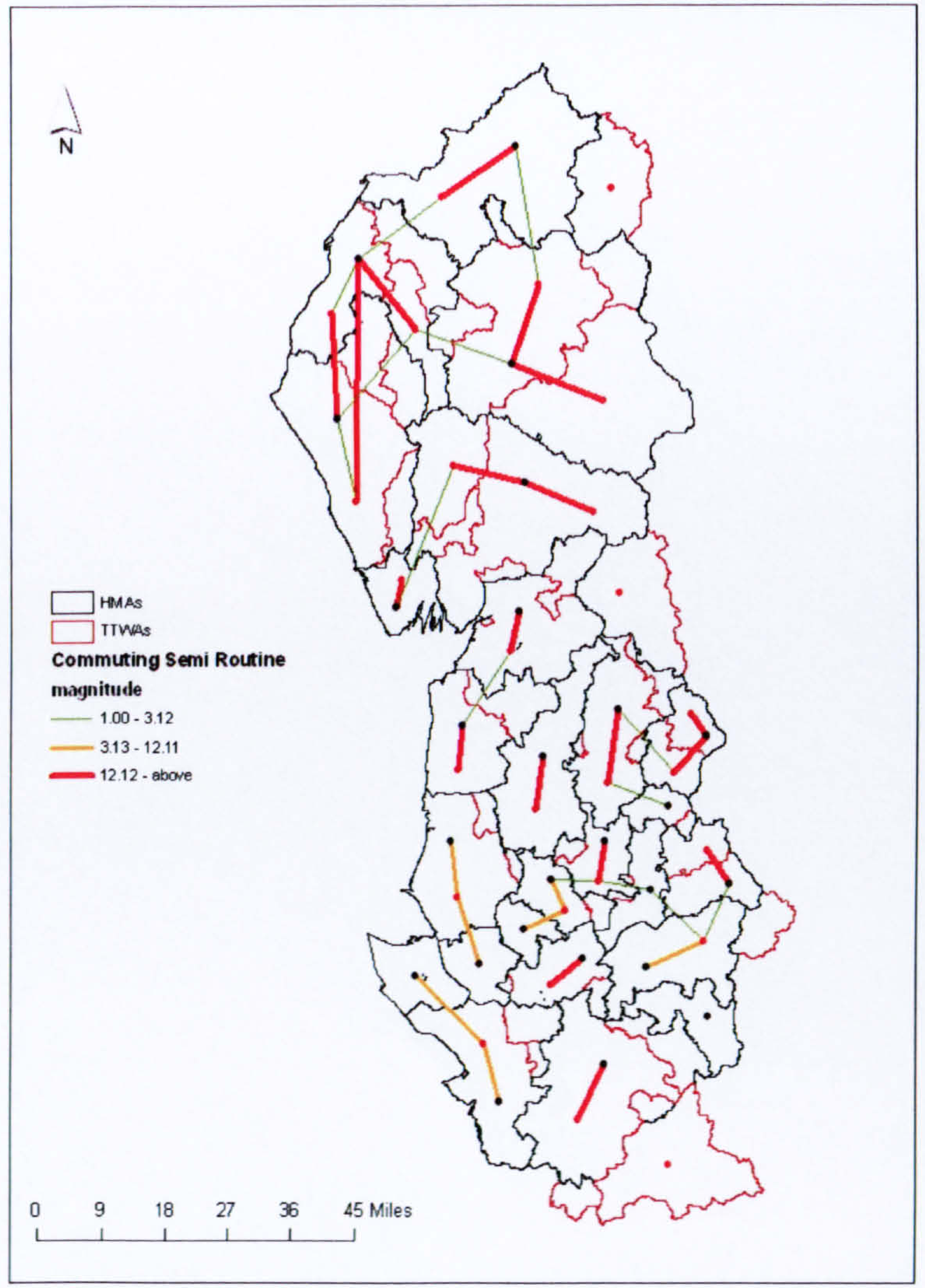


Figure 7.45: Commuting for Routine Workers

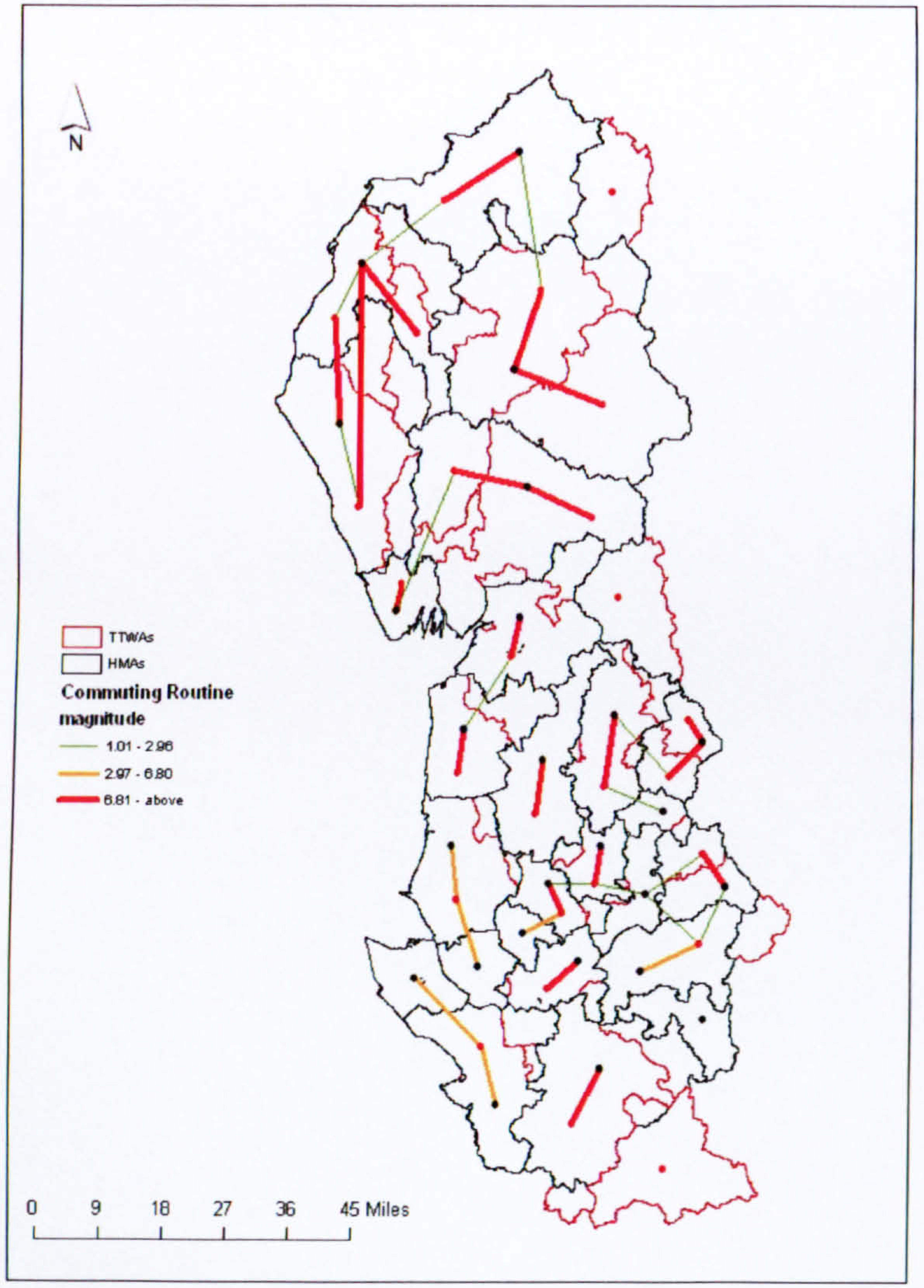


Figure 7.46: Commuting Flows by Car

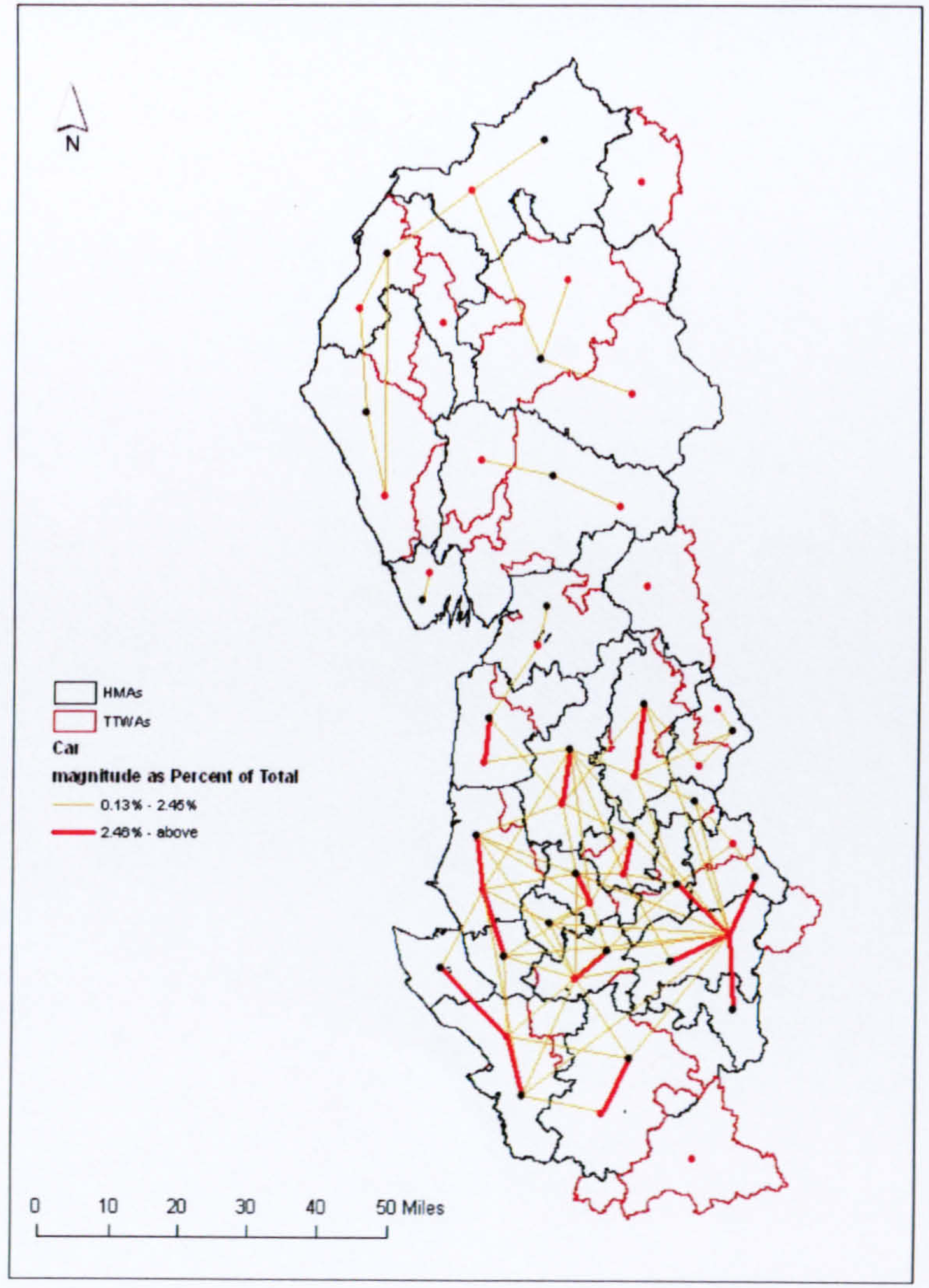


Figure 7.47: Commuting Flows by Train

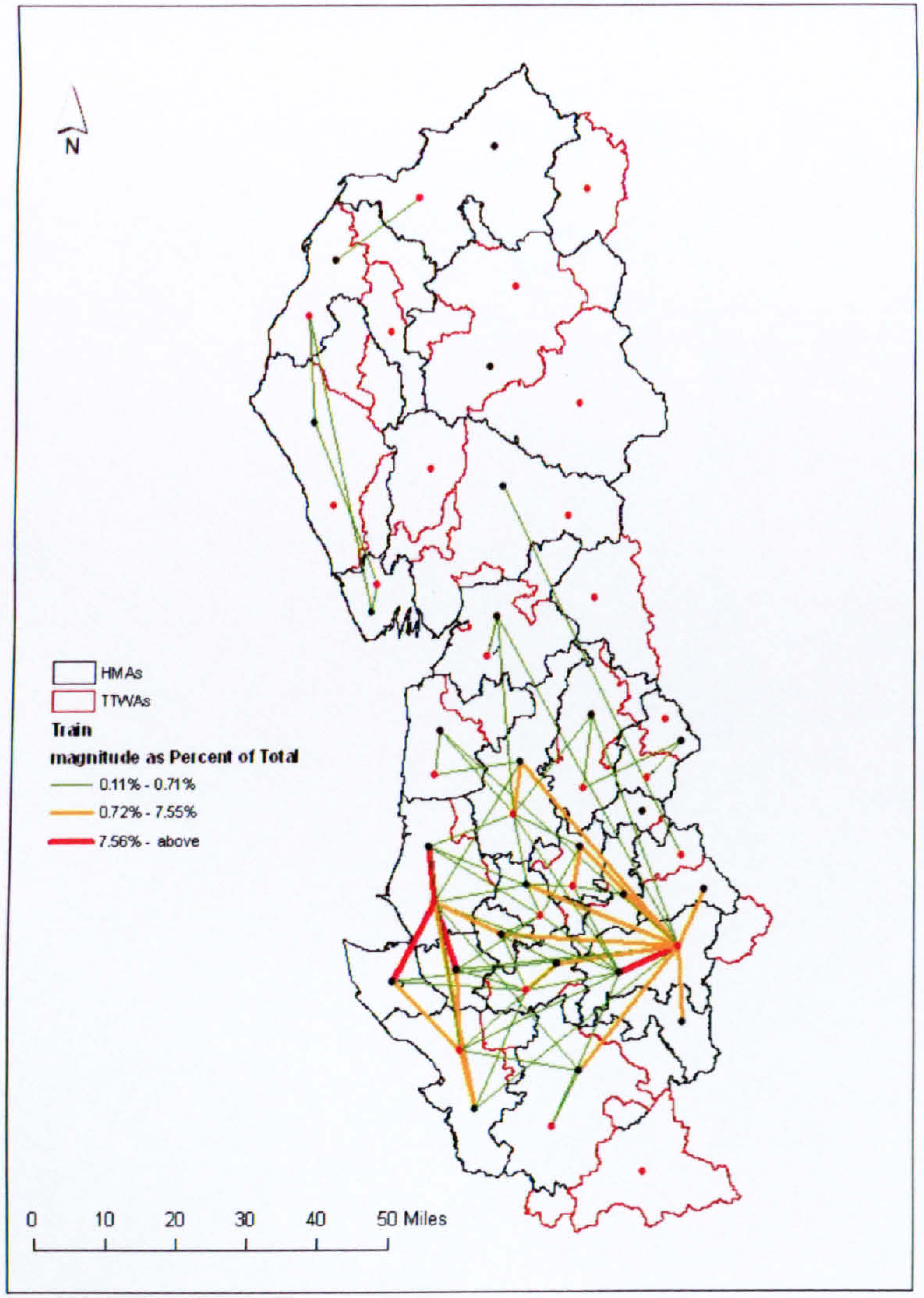


Figure 7.48: Commuting Flows by Bus

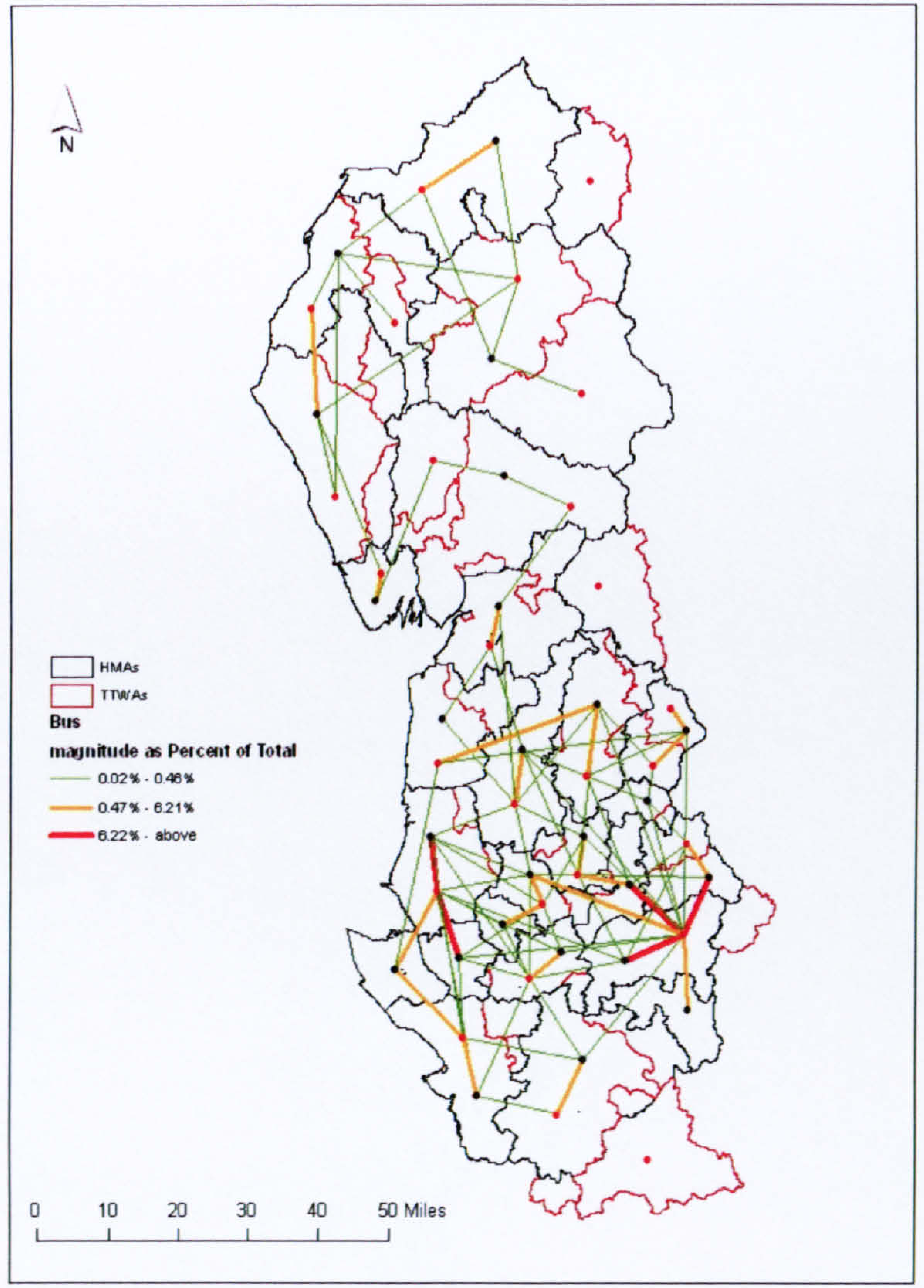


Figure 7.49: Commuting Flows by Foot

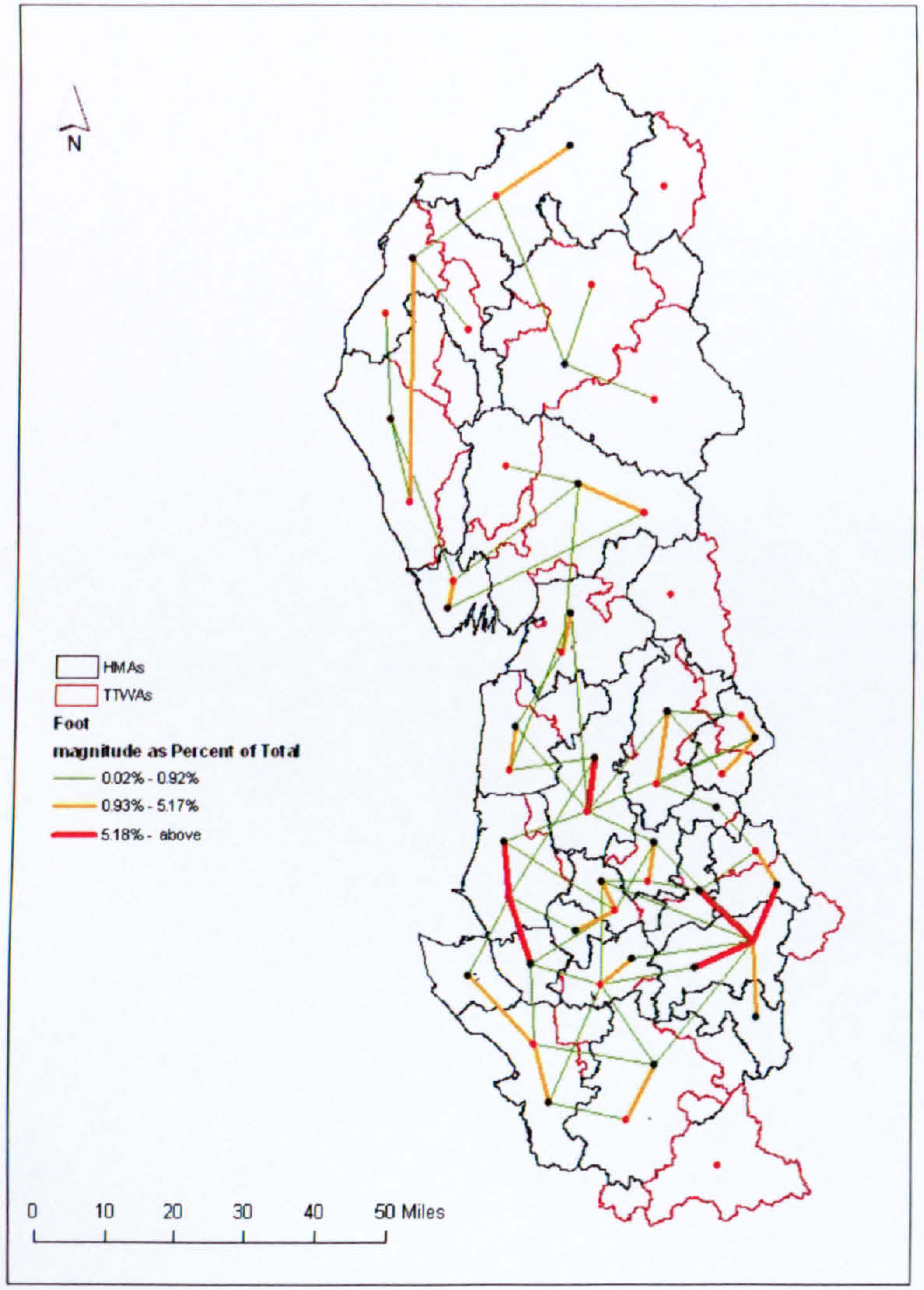
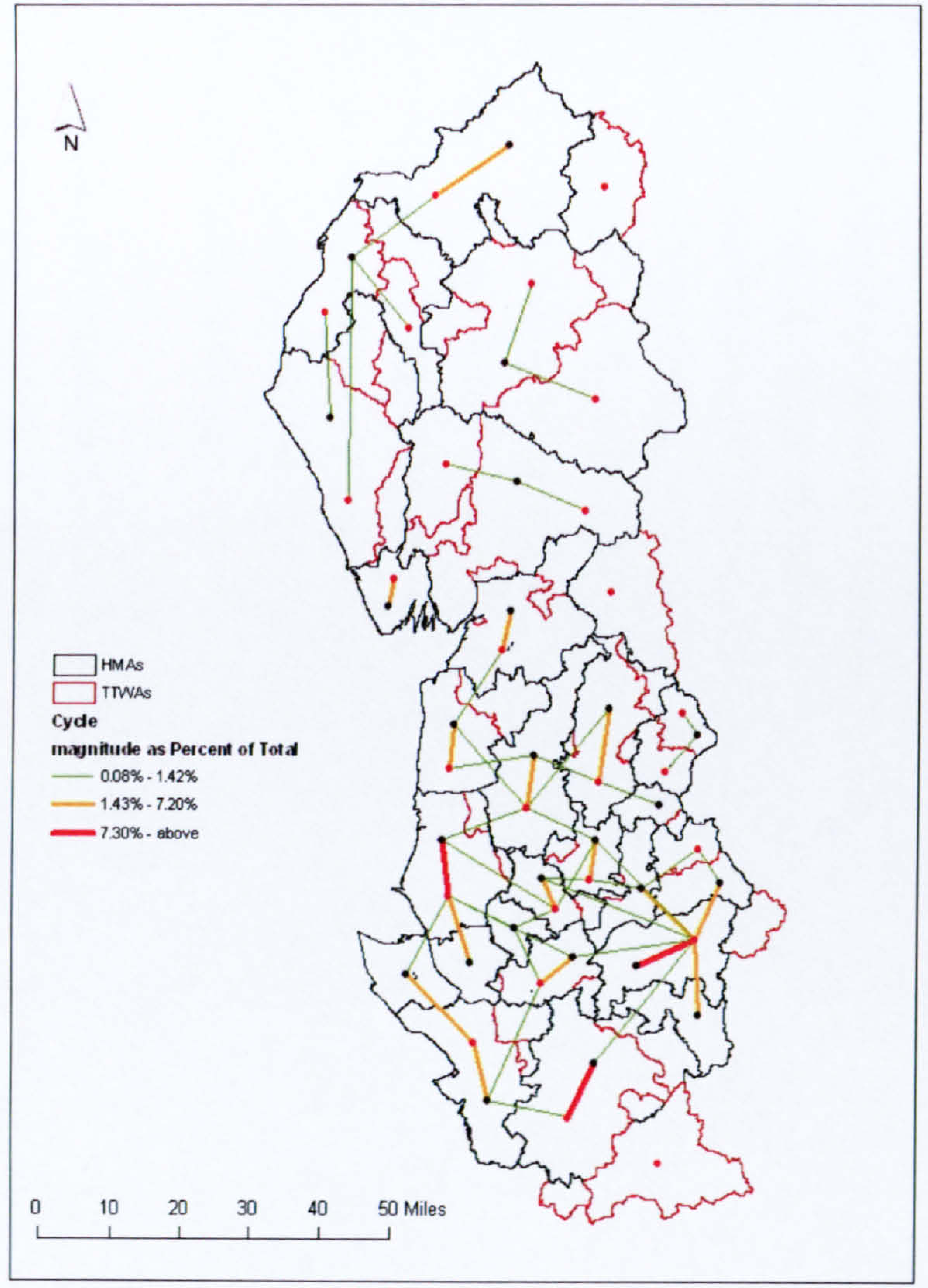


Figure 7.50: Commuting Flows by Bicycle



Part Five: The Influence of 'Place Factors' on the Interaction of Housing and Labour Markets

Three key processes have been identified as influencing the dynamics of the interaction of housing and labour markets: (1) the decentralisation of population and employment, (2) spatial structure, and (3) the jobs-housing balance. The issues of decentralisation and spatial structure have assumed a central focus in research in both the UK and US, due to their impact on commuting. The jobs-housing balance has also been a significant focus in the US, however, there is mounting uncertainty as to the relevance of the jobs-housing balance for commuting, which has been exacerbated by deficiencies in the methods applied to calculate the quantitative balance between jobs and housing. Thus, the following analysis focuses on decentralisation and spatial structure to explore the underlying effects of such 'place factors' on the nature of the interaction of housing and labour markets.

Population and Employment Decentralisation

Traditionally, people would live in urban residential locations and commute to jobs located in the CBD and inner city. However, since the 1970s there has been a trend, which has seen people leaving traditional residential locations in the city to live in suburban locations, small towns, villages, and rural areas. In conjunction, there has been a decentralising process associated with employment, which has seen employment opportunities moving to suburban and non-urban locations (Gillespie, 1999; O'Sullivan, 1999). In relation to population migration, such trends reflect changes in residential location preferences as people seek more space and a better quality of life in suburban and non-urban locations (Rogerson *et al*, 1989; Green, 1997; Rogerson, 1999; Wong, 2001; Senior *et al*, 2004). The decentralisation of employment reflects the impacts of deindustrialisation, and the constraints imposed by lack of space for expansion in urban locations (Boon, 2003). Thus, the recent trend has been for businesses to locate in areas traditionally associated with residential land use. The result of this has been the decline of employment and rise of unemployment in inner city areas, and the concurrent growth of employment in suburban and non-urban locations (DoE, 1977; Owen *et al*, 1986; Lawless, 1995; Breheny, 1999b; Gillespie, 1999).

The consequence of the diversification of residential and employment locations has been the emergence of increasingly complex commuting patterns, which are characterised by traditional commuting to the CBD, but also non-traditional commuting patterns that do not necessarily include the CBD as a destination (Van der Laan, 1998; Wong, 2002). It is these complex relationships between different residential and workplace locations that underpin the dynamic nature of the interaction of housing and labour markets.

Thus, exploring the impact of population and employment decentralisation is a valuable process in understanding the dynamic nature of housing and labour market interaction. However, Gordon (1988) highlights that exploring such issues is complicated by the uncertainty surrounding the adoption of an appropriate spatial scale at which to measure the processes. In addition, identifying the dynamics of the relationships between residential and workplace locations is dependent on the adoption of an appropriate definition of different area types.

The OPCS urban areas definition of local authority area types has been used in the past to measure decentralisation (e.g. Champion *et al*, 1998; Allinson, 2005). However, this approach does not lend itself to this research because the housing and labour markets adopted in this research do not correspond with local authority boundaries. Therefore, an alternative scale and definition is required. The approach adopted here draws on the official urban-rural classification (Bibby and Shepherd, 2004), which classifies wards into urban, town and fringe, and village and dispersed area types (see Chapter 4). The fact that the HMA and TTWA definitions adopt wards as basic data units prompted the adoption of the ward based classification. However, the standard three-way classification fails to distinguish city centre and town centre locations, which was overcome by defining additional city centre and town centre locations (see Appendix A for the method).

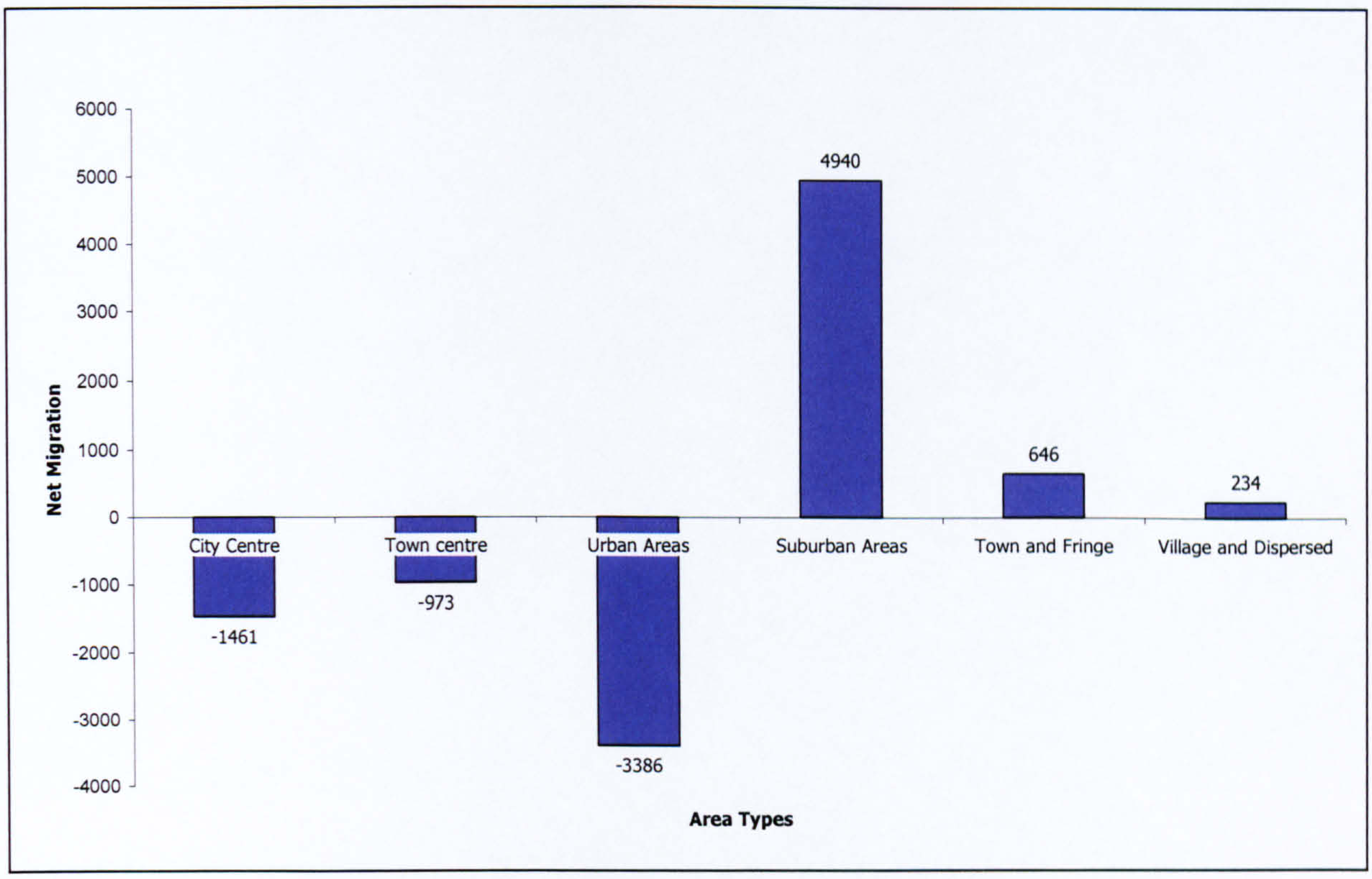
Finally, the broad urban category defined by Bibby and Shepherd (2004) is disaggregated to distinguish between urban and suburban categories using geodemographic descriptors of ward types derived from the People and Places typology (Batey and Brown, 2004). This resulted in a six-way ward classification of area types (Table 7.11) (Appendix A). The need to adapt the classification reflects the inherent difficulties associated with urban-rural definitions (see Coombes, 2004).

Table 7.11: Ward Area Type Descriptors

Type Descriptor	No Wards	Source of Type	Area Type Definition
Village and Dispersed	142	Bibby and Shepherd (2004)	Original Area Type Retained
Town and Fringe	104	Bibby and Shepherd (2004)	Original Area Type Retained
Suburban Area	329	Bibby and Shepherd (2004)/People and Places Geodemographic Classification	Isolation of 'suburban' areas within Bibby and Shepherd (2004) 'urban' category based on satisfying the condition that more than 65 per cent of the ward population is located in adapted People & Places Trees (Batey and Brown, 2004) that are judged to be largely suburban in character
Urban Area	405	Bibby and Shepherd (2004)	
Town Centre	18	Author	(see Appendix A for method)
City Centre	7	Author	(see Appendix A for method)

The disadvantage of the classification is that it is specific to the 2001 ward geography and to the composition of the 2001 wards. Therefore, it cannot be used to establish change in patterns of population and employment between different Censuses. However, past research highlights that the North West has experienced significant changes in population and employment composition of urban and non-urban locations. Indeed, Wong and Madden (2000) highlight that suburban, small towns, and rural locations in the region on average gained population between 1990 and 1991. In contrast, the metropolitan and larger urban areas tended to experience net loss of population to non-urban locations. An analysis of 2001 SMS data at ward level using the area type classification reveals similar trends. Indeed, the analysis highlights that city centre, town centre, and urban areas experienced net out-migration between 2000 and 2001, whilst suburban areas, town and fringe, and village and dispersed locations experienced net in-migration during the same period (Figure 7.51).

Figure 7.51: Net Migration for Different Area Types in the North West (2001)



Source: 2001 SMS (Table MG201)

An analysis of the composition of different area types in relation to population reveals that slightly less than half of the population of the North West (47.7 per cent) live in urban areas, while 37.4 per cent are located in suburban areas, with town and fringe locations accounting for 6.9 per cent, and village and dispersed for 5.5 per cent. In contrast, city centre and town centre locations account for less than 3 per cent of the region's population between them. However, an analysis of net migration between different area types reveals a trend in which population is flowing down the urban hierarchy (e.g. urban to suburban, suburban to town and fringe, town and fringe to village and dispersed) (Table 7.12). The analysis reveals that city centre locations are losing population to all area types, especially urban and suburban locations, which contrasts to the experience of town centre locations, which are gaining population from all area types with the exception of urban areas. Urban areas are losing population to suburban and town and fringe locations but are in balance with village and dispersed locations. Suburban locations are losing population to town and fringe and village and dispersed locations but are gaining population from city centres and urban areas. Town and fringe locations are losing population to village and dispersed locations but gaining from all other area types (especially suburban areas) with the exception of town centre locations. Village and dispersed locations are gaining from all area types with the exception of urban (balanced) and town centre locations to which they are losing population.

Table 7.12: Net Migration between Different Area Types in the North West

Area	City Centres	Town Centres	Urban Areas	Suburban Areas	Town and Fringe	Village and Dispersed
City Centres	0	-21	-736	-584	-77	-43
Town Centres		0	-1620	359	68	207
Urban Areas			0	-5669	-74	1
Suburban Areas				0	-655	-307
Town and Fringe					0	-92
Village and Dispersed						0

Source: 2001 Census of Population: SMS (Table MG201)

In relation to employment in the North West, Wong *et al* (1999) highlight that metropolitan and larger urban areas in the region experienced significant losses of employment between 1981 and 1991 whilst small towns and rural areas experienced significant increases in employment levels. Although it is not possible to explore compositional change in employment for different area types because of changes to ward geographies, it is possible to determine the employment composition of different areas in 2001 (Table 7.13). The analysis reveals that slightly less than half of the region's employment is located in urban areas (47.2 per cent), which reflects the historical importance of urban areas for industrial and manufacturing in the region (Bristow, 1987; Clark *et al*, 1992; Wong *et al*, 1999). However, 27 per cent of employment is located in suburban areas, which reflects the process of employment decentralisation in the region. In contrast, town centre, city centre, town and fringe, and village and dispersed locations account for much lower levels of employment when compared to urban and suburban areas.

Table 7.13: Employment Concentrations of Different Area Types in the North West

Area Type	Total Employment	% Total Employment in North West
City Centre	251,878	8.7
Town centre	184,309	6.3
Urban Areas	1,370,491	47.2
Suburban Areas	783,148	27.0
Town and Fringe	166,354	5.7
Village and Dispersed	146,638	5.1
Total	2,902,818	100.0

Source: 2001 Census of Population: Table UV28 – Economic Activity (Workplace Population)

The decentralisation of population and employment is likely to impact on the nature of the interaction of housing and labour markets in the region, and the implications of decentralisation can be explored using the developed classification and the 2001 SWS ward level commuting flows. The wards were classified according to the six-way classification and then allocated to an origin HMA and destination TTWA. The ward level commuting flows were then aggregated to determine the volume of commuting between residential area types in origin HMAs and workplace area types in destination TTWAs based on the classification. The benefit of such an approach is that it allows the interaction of different area types to be explored in the context of whether the interaction is between area types of adjacent or non-adjacent housing and labour markets.

The analysis of the interaction of adjacent housing and labour markets reveals that all area types have relatively high levels of commuting between the same types of area, suggesting that a high proportion of people are locating in the same type of residential location as their workplace location (Table 7.14). However, urban residential locations represent the dominant source of workers for all workplace locations and in particular, suburban workplace locations. Indeed, the dominant interaction is between urban and suburban locations, represented by high levels of commuting between urban residential locations and suburban workplace locations, and suburban residential locations and urban workplace locations. This contrasts with the traditional idea that city centre locations are the dominant destination for commuting from urban and suburban locations. Significantly, along with city centre residents, the main sources of city centre workers are urban residential locations (69 per cent), and suburban residential locations (14.3 per cent), however, commuting to the city centre represents a low proportion of out-commuting from urban (6.5 per cent), and suburban (5.4 per cent) locations. Interestingly, urban areas represent important workplace locations for workers living in village and dispersed locations, and a similar proportion of workers living in urban areas commute to village and dispersed workplace locations, representing a balanced urban-rural interaction. However, a key trend in the commuting patterns is the relationship between town and fringe locations, urban areas, and town centres. Indeed, 60 per cent of workers living in town and fringe locations commute to town centre locations, and of all workers commuting into town centre locations, 44.7 per cent originate in town and fringe residential locations. Although commuting to town centre locations represents a small proportion of outgoing commuting from urban areas, it represents 42.8 per cent of all commuting into town centre locations. This suggests that employment decentralisation has benefited town centre locations. Overall, the analysis demonstrates that different types of residential and workplace locations are linked through the process of commuting and these relationships ultimately underpin the interaction of the sub-regional housing and labour markets in the region.

In relation to the interaction of non-adjacent housing and labour markets, there is much more variation in the nature of the interaction of different area types (Table 7.15). However, urban areas represent the dominant source of workers to all types of workplace locations and the dominant destination for workers from all types of residential locations. In addition, suburban workplace locations attract relatively high proportions of workers from all types of residential locations in non-adjacent HMAs. As such, the interaction of non-adjacent housing and labour markets is characterised by a loose relationship between residential and workplace location area types.

Table 7.14: Commuting Flows Between Different Residential and Workplace and Area Types – Interaction of Adjacent Housing and Labour Markets

Workplace Area Type **Residential** Area Type	**City Centres**	% In-Commuting	**Town Centres**	% In-Commuting	**Urban Areas**	% In-Commuting	**Suburban Areas**	% In-Commuting	**Town & Fringe**	% In-Commuting	**Village & Dispersed**	% In-Commuting	**Total**	% Out-Commuting
City Centres	**17431**	10.8	**1324**	0.4	**22229**	1.4	**2881**	1.0	**865**	1.0	**791**	0.8	**45521**	1.8
% Out-Commuting	38.3		2.9		48.8		6.3		1.9		1.7		100.0	
Town Centres	**88**	0.1	**7890**	2.3	**5763**	0.4	**652**	0.2	**63**	0.1	**220**	0.2	**14676**	0.6
% Out-Commuting	0.6		53.8		39.3		4.4		0.4		1.5		100.0	
Urban Areas	**111343**	69.0	**147502**	42.8	**1287962**	81.9	**121258**	40.3	**26111**	29.2	**24605**	24.7	**1718781**	66.9
% Out-Commuting	6.5		8.6		74.9		7.1		1.5		1.4		100.0	
Suburban Areas	**23045**	14.3	**30253**	8.8	**191823**	12.2	**156809**	52.1	**8326**	9.3	**12645**	12.7	**422901**	16.5
% Out-Commuting	5.4		7.2		45.4		37.1		2.0		3.0		100.0	
Town and Fringe	**4161**	2.6	**153927**	44.7	**35555**	2.3	**9352**	3.1	**46460**	52.0	**7079**	7.1	**256534**	10.0
% Out-Commuting	1.6		60.0		13.9		3.6		18.1		2.8		100.0	
Village and Dispersed	**5192**	3.2	**3378**	1.0	**29260**	1.9	**10126**	3.4	**7525**	8.4	**54471**	54.6	**109952**	4.3
% Out-Commuting	4.7		3.1		26.6		9.2		6.8		49.5		100.0	
Total	**161260**	100.0	**344274**	100.0	**1572592**	100.0	**301078**	100.0	**89350**	100.0	**99811**	100.0	**2568365**	100.0
% Total In-Commuting	6.3		13.4		61.2		11.7		3.5		3.9		100.0	

Source: 2001 Census of Population SWS (Table W201)

Table 7.15: Commuting Flows Between Different Residential and Workplace and Area Types – Interaction of Non-Adjacent Housing and Labour Markets

Workplace Area Type Residential Area Type	City Centres	% In-Commuting	Town Centres	% In-Commuting	Urban Areas	% In-Commuting	Suburban Areas	% In-Commuting	Town & Fringe	% In-Commuting	Village & Dispersed	% In-Commuting	Total	% Out-Commuting
City Centres % Out-Commuting	**236** 4.2	1.3	**750** 13.3	1.7	**3536** 62.9	1.5	**641** 11.4	1.3	**253** 4.5	1.0	**208** 3.7	1.3	**5624** 100.0	1.5
Town Centres % Out-Commuting	**143** 8.4	0.8	**209** 12.2	0.5	**908** 53.2	0.4	**241** 14.1	0.5	**149** 8.7	0.6	**58** 3.4	0.4	**1708** 100.0	0.4
Urban Areas % Out-Commuting	**11636** 4.6	66.0	**31762** 12.4	71.3	**162195** 63.4	69.3	**32126** 12.6	64.8	**11337** 4.4	46.0	**6577** 2.6	40.8	**255633** 100.0	66.1
Suburban Areas % Out-Commuting	**3252** 4.5	18.4	**7896** 11.0	17.7	**43640** 60.9	18.6	**9720** 13.6	19.6	**4604** 6.4	18.7	**2568** 3.6	15.9	**71680** 100.0	18.5
Town and Fringe % Out-Commuting	**1264** 4.2	7.2	**2220** 7.4	5.0	**14021** 46.5	6.0	**4041** 13.4	8.2	**6251** 20.7	25.4	**2346** 7.8	14.6	**30143** 100.0	7.8
Village and Dispersed % Out-Commuting	**1102** 5.0	6.2	**1726** 7.9	3.9	**9808** 44.9	4.2	**2813** 12.9	5.7	**2029** 9.3	8.2	**4357** 20.0	27.0	**21835** 100.0	5.6
Total % Total In-Commuting	**17633** 4.6	100.0	**44563** 11.5	100.0	**234108** 60.6	100.0	**49582** 12.8	100.0	**24623** 6.4	100.0	**16114** 4.2	100.0	386623 100.0	100.0

Source: 2001 Census of Population SWS (Table W201)

Spatial Structure

The analysis of decentralisation reveals a complex and dynamic interaction between housing and workplaces located in different types of residential and employment locations, which has affected the nature of the interaction of sub-regional housing and labour markets. Previous studies have explored the impact of spatial structure on commuting, particularly in relation to commuting distance and time. The value of the ward-based classification has been demonstrated in relation to decentralisation, and it offers significant advantages in exploring the effect of spatial structure on commuting. The relationship between different residential and workplace locations and commuting distance is explored using the Spearman Rank Correlation for both the home and work-end trips of the commuting process (residential population for home-end and workplace population for the work-end). The commuting distance bands from the 2001 census for residential and workplace populations are classified into short distance (less than 2 kilometres to less than 5 kilometres), medium distance (over 5 kilometres to less than 20 kilometres), and long distance (20 kilometres and over). This means that the effects of different types of residential and workplace locations on different commuting distance trends can be explored to a greater extent than simply using the individual distance bands provided through the Census.

Table 7.16 explores the relationship between residential area types and commuting distance to work. The analysis reveals a number of interesting trends. Urban areas exhibit a medium positive correlation with short distance commuting and medium negative correlations with medium and long distance commuting. Residents of urban areas tend to undertake extensive short distance commuting and undertake significantly fewer medium and long distance commutes (Gordon *et al*, 1989) reflecting the close proximity of jobs, housing and services in urban areas (Schwanen *et al*, 2002).

Table 7.16: Correlation between Residential Area Type and Commuting Distance

Distance ***Area Type***		Short Distance	Medium Distance	Long Distance
City Centre	Rho Sig (2-tailed)	.097** .002	-.109** .001	.027 .399
Town centre	Rho Sig (2-tailed)	.142** .000	-.120** .000	-.092** .004
Urban Areas	Rho Sig (2-tailed)	.502** .000	-.334** .000	-.530** .000
Suburban Areas	Rho Sig (2-tailed)	-.085* .034	.073* .031	.097** .002
Town and Fringe	Rho Sig (2-tailed)	-.259** .000	.189** .000	.233** .000
Village and Dispersed	Rho Sig (2-tailed)	-.445** .000	.280** .000	.443** .000

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=1006)

Residents of village and dispersed locations are more likely to engage in long and medium distance commuting than short distance commuting, which is reflected by the medium negative correlation with short distance commuting and the medium positive correlation with long distance commuting. This mirrors the finding of Coombes *et al* (1996) who found that short distance commuting in rural and outer suburban wards is often low whilst long distance commuting is high. This reflects the fact that rural areas can be reliant on urban areas for employment (Monk *et al*, 2000; Hodge *et al*, 2002; Moss *et al*, 2004), and for rural residents lengthening the commute is often required to access employment opportunities (Coombes *et al*, 1996).

The relationship between workplace location and commuting is explored in Table 7.17. The analysis reveals that urban areas predominantly attract workers from nearby residential locations, which is reflected in the medium positive correlation with short distance commuting. This tends to reflect the integration of residential and workplace locations in urban areas. In contrast, village and dispersed locations have a medium negative correlation with short distance commuting, suggesting that rural areas attract non-local workers.

Table 7.17: Correlation between Workplace Area Type and Commuting Distance

Area Type	***Distance***	Short Distance	Medium Distance	Long Distance
City Centre	Rho	-.0.39	.102**	.115**
	Sig (2-tailed)	.213	.000	.000
Town centre	Rho	.185**	.044	.019
	Sig (2-tailed)	.000	.162	.805
Urban Areas	Rho	.442**	.037	-.113**
	Sig (2-tailed)	.000	.238	.000
Suburban Areas	Rho	-.060	-.122**	-.054
	Sig (2-tailed)	.056	.000	.086
Town and Fringe	Rho	-.161**	.039	.067
	Sig (2-tailed)	.000	.215	.034
Village and Dispersed	Rho	-.465**	.034	.138**
	Sig (2-tailed)	.000	.282	.000

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=1006)

However, the analysis also reveals a degree of uncertainty surrounding the nature of the relationship between commuting distance and certain residential and workplace area types. In particular, city centres, town centres, and suburban areas, as residential and workplace locations, have ambiguous relationships with commuting distance. The analysis would seem to suggest that the workers living in these locations commute across a wide range of distances whilst as workplace locations these areas attract workers from across a range of distances. This suggests that short, medium, and long distance cross-commuting is important as a mechanism for balancing these residential and workplace locations.

The analysis can be extended to explore the effect of population and employment density on commuting distance. A number of studies have explored the impact of residential population density on commuting but there is sparse evidence of the effect of local employment density on commuting (Stead and Marshall, 2001). As such, the residential population and local employment density levels were calculated and classified into high, medium, and low densities by using the median and 33.3 and 66.6 percentiles, and the previously classified distance categories for the home-end of the home-work trip were retained for the analysis. The effect of population and employment density on commuting is explored through bivariate Spearman Rank Correlation. Table 7.18 explores the relationship between population density and commuting distance of local residents. The analysis reveals that low population density has a medium negative correlation with short distance commuting and medium positive correlations with medium and long distance commuting, suggesting that low population densities tend to result in extended commuting for resident workers. In contrast, high population density has a medium positive correlation with short distance commuting and medium negative correlations with medium and long distance commuting suggesting that high population densities result in shorter commutes, which is supported by findings from a number of previous studies (see Steiner, 1994; Naess, 1995; Naess and Sandberg, 1996; Banister *et al*, 1997). Higher density areas reflect urban areas, and the shorter distance commuting in higher density areas is likely to reflect the fact that residential and workplace locations tend to be compacted in urban areas, whereas in lower density areas (rural and town locations) residential and workplace locations tend to be more dispersed (Schwanen *et al*, 2002).

Table 7.18: Correlation between Population Density and Commuting Distance (home-end)

Population Density	***Distance***	Short Distance	Medium Distance	Long Distance
Low	Rho Sig (2-tailed)	-.547** .000	.384** .000	.513** .000
Medium	Rho Sig (2-tailed)	.058 .067	-.017 .537	-.094** .003
High	Rho Sig (2-tailed)	.490** .000	-.368** .000	-.421** .000

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=1006)

Table 7.19 explores the relationship between employment density and commuting distances of local residents. It reveals very similar trends to the relationships found in relation to population density. Areas of low employment densities attract workers travelling medium and long distances, reflected by the medium negative correlation with short distance commuting, and medium positive correlations with medium and long distance commuting. However, areas of high employment densities result in more extensive short distance commuting, and lower levels of medium and long distance commuting, which is reflected in the medium positive correlation with short distance commuting, and medium negative correlations with medium and long distance commuting.

Table 7.19: Correlation between Employment Density and Commuting Distance (work-end)

Distance / *Employment Density*		Short Distance	Medium Distance	Long Distance
Low	Rho	-.552**	.381**	.519**
	Sig (2-tailed)	.000	.000	.000
Medium	Rho	.088**	-.058	-.065*
	Sig (2-tailed)	.005	.065	.039
High	Rho	.464**	-.323**	-.454**
	Sig (2-tailed)	.000	.000	.000

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=1006)

The analysis was further extended to explore the impact of population and employment density on commuting at sub-regional level. The average densities of the 25 HMAs and 23 TTWAs were calculated and classified into high, medium, and low densities. Distance bands for each of the HMAs based on distance travelled by resident population and distance bands for each of the TTWAs based on distance travelled by workplace population were calculated. These were then classified into short, medium, and long distance commuting. Spearman Rank correlation was again adopted to explore the impact of decentralisation at sub-regional level.

The effect of population density on commuting by resident workers of the HMAs is explored (Table 7.20). It reveals that low population density results in longer distance commuting, reflected in the medium negative correlation with medium distance commuting and the medium positive correlation with long distance commuting. However, high population density has a medium positive correlation with medium distance commuting and a medium negative correlation with long distance commuting. As such, low population density at sub-regional level tends to result in longer distance commuting whilst high population density tends to result in shorter distance commuting and a reduction in long distance commuting.

Table 7.20: Correlation between Population Density and Commuting Distance (sub-regional level)

Distance / ***Population Density***		Short Distance	Medium Distance	Long Distance
Low	Rho	-.150	-.462*	.376*
	Sig (2-tailed)	.473	.020	.038
Medium	Rho	.030	.042	.190
	Sig (2-tailed)	.888	.910	.362
High	Rho	.125	.452*	-.571**
	Sig (2-tailed)	.552	.023	.003

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=25)

Table 7.21: Correlation between Employment Density and Commuting Distance (sub-regional level)

Distance / ***Employment Density***		Short Distance	Medium Distance	Long Distance
Low	Rho	-.641*	-.314	.556**
	Sig (2-tailed)	.001	.145	.006
Medium	Rho	.702**	-.303	-.516*
	Sig (2-tailed)	.000	.160	.012
High	Rho	-.083	.606**	-.021
	Sig (2-tailed)	.708	.002	.925

Notes: * Significant at 0.05 ** Significant at 0.01 (For all cases N=23)

The effect of employment density on the commuting distance of the workplace population of the TTWAs was also explored (Table 7.21). The analysis reveals that low employment density tends to result in low levels of short distance commuting and high levels of long distance commuting reflected in the high negative correlation with short distance commuting and medium positive correlation with long distance commuting. Medium employment density results in short distance commuting, reflected in the high positive correlation with short distance commuting and a medium negative correlation with long distance commuting whilst high population densities have a high positive correlation with medium distance commuting.

Discussion and Conclusion

In this chapter, the interaction of housing and labour markets has been explored in the context of North West England. The chapter is divided into five constituent parts, and addresses the research questions posed in objectives two and three.

The first part of the analysis examines the spatial intersection of the sub-regional housing and labour markets in the region, and thus addresses the first research question of objective two, to what extent do different sub-regional housing and labour markets intersect and what is the nature of the intersection of different housing and labour markets? The analysis highlights the existence of a high degree of variability between the boundaries of the HMAs and those of the TTWAs serving the same geographical area. In classifying the spatial intersection of the HMAs and TTWAs, the analysis reveals that there are eight possible types of spatial relationships underpinning the interaction of housing and labour markets. The significance of the analysis is that it highlights the complex nature of the spatial relationship between housing and labour markets in the region. In spite of the problems associated with the 1991-based TTWAs, the analysis reveals the danger of accepting without question TTWAs as approximations to housing markets and vice versa. Although the spatial intersection of the HMAs and TTWAs is likely to be improved when 2001-based TTWAs are delineated, the complexity of the spatial relationship of housing and labour markets is unlikely to be fully captured by the current reliance on TTWAs or local authority boundaries. Such an approach is likely to result in unexpected planning and policy outcomes related to housing and labour markets and misspecification of the nature of the interaction of the two markets.

The second part of the analysis explores the patterns of commuting between the sub-regional housing and labour markets. In doing so, it addresses the second research question in objective two, to what extent is incoming commuting to TTWAs and outgoing commuting from HMAs concentrated within specific market areas? The analysis highlights the complexity of the commuting process in the region. Commuting has a two-fold character, outgoing commuting and incoming commuting. Of all outgoing commuting, half originates in just seven HMAs whilst half of all incoming commuting is concentrated into just three TTWAs. The disproportionate concentration of incoming and outgoing commuting within a minority of housing and labour markets reflects the relative importance of the main urban areas as locations for both residential and workplace activity. In particular, the housing and labour markets with high concentrations of commuters tend to coincide with the cores of city-regions and their hinterlands identified in the second North West RES (see NWDA, 2006), whilst housing and labour markets with lower concentrations of commuters, tend to be those located in smaller urban and rural locations. This reflects the fact that larger urban areas have the capacity to accommodate higher levels of residential and employment opportunities when compared to smaller urban and rural locations.

The analysis of commuting patterns in the region indicates a number of interesting trends and patterns and in doing so addresses the third research question in objective two, what trends and patterns are evident in the nature of commuting between sub-regional housing and labour markets in the North West? The analysis highlights that housing and labour market interaction is characterised by high levels of commuting between geographically coincident housing and labour markets, and much lower levels of commuting between non-adjacent housing and labour markets. First order flows connect adjacent housing and labour markets, second order flows connect both adjacent and non-adjacent housing and labour markets, and third order flows tend to connect non-adjacent markets. This supports the assumption that the *majority* of workers will commute to labour markets that are relatively close to their housing market (Lowe, 1998), which suggests that the residential and workplace locations of the majority of workers are in a state of equilibrium (Kain, 1962; Van der Laan *et al*, 1998).

However, the analysis also highlights that a *minority* of workers do not conform to the practice of 'live local, work local'. This is reflected in part by the nature of the second order flows but certainly by the much more diverse nature of the third order flows. Although the rational commuter will attempt to minimise commuting costs (Kain, 1962), a practice that is generally borne out in the interaction of housing and labour markets in the region, the analysis suggests that factors other than commuting costs effect the balance of home and work (Rogerson *et al*, 1989; Green, 1997; Rogerson, 1999; Senior *et al*, 2004). Individuals and households locate in a housing market that meets their needs and preferences, determined by factors such as life-cycle stage, income, employment opportunities, housing attributes, neighbourhood quality, and accessibility to family and services (Bourne, 1981; DTZ Pieda, 2004b). In contrast, businesses locate in an area where the correct mix of factors such as land, labour, capital, and infrastructure exist, and where the benefits gained from clustering and knowledge driven competitive advantage provide the greatest opportunities for profitability (Wong *et al*, 2000; Boon, 2003). Thus, housing and labour market interaction is shaped by the competing perspectives that drive residential and business location decisions and the need for individuals and households to balance their residential and workplace locations through complex and multi-dimensional trade-offs (Green, 1997). As a result, these trade-offs create friction in the way that housing and labour markets interact, and such trade-offs tend to be embodied in longer distance commuting and ultimately in commuting between non-adjacent housing and labour markets.

The third part of the analysis explores the trends in commuting distance in the region, and thus addresses the fourth research question of objective two, what trends are evident in the distance travelled to work in the North West? The vast majority of commuting trips tend to be relatively short in distance, usually between 2 and 5 kilometres in length. As distance from the destination TTWA increases, so the propensity for interaction decreases, reflecting the fact that distance is a derived utility that workers seek to minimise (Dijst and Vidakovic, 2000). The increasing flexibility of labour markets means that homeworking has emerged as the ultimate commuting minimisation strategy, particularly in rural locations where residential and workplace locations tend to be dispersed (Moss *et al*, 2004). However, the analysis also reveals that 12 per cent of workers from the residency end, and 10.5 per cent from the workplace end of the home-work trip commute over 20 kilometres to work and over 6 per cent commute over 30 kilometres. The implication of this is that a minority of workers endure longer and more geographically diverse commuting regimes as a result of substituting migration with longer-distance commuting, reflecting the influence of dual-career households, the outcome of the trade-off between residential and workplace locations, and household decision-making processes (Green, 1997; Green *et al*, 1999). However, the diverse nature of commuting also owes much to the high levels of car usage in the region, which enables workers to travel longer distances to work (Levinson, 1998; Axhausen *et al*, 2001). The processes responsible for lengthening the journey-to-work, notably population and employment decentralisation, changing residential and workplace location strategies, and the rise of alternative household types, are likely to sustain the current reliance on the car in the interaction of housing and labour markets and ultimately enable more workers to travel longer distances to work in the future.

The fourth part of the analysis explores the influence of 'people' factors on the interaction of adjacent or non-adjacent housing and labour markets in the region. Thus, the analysis addresses two research questions posed in objective three. The first research question is what influence do the demographic characteristics of workers have on commuting between adjacent and non-adjacent housing in the North West? The second research question is what influence do socio-economic characteristics of workers have on commuting between adjacent and non-adjacent housing and labour markets in the North West?

The analysis reveals a number of interesting trends in the composition of the commuters in the region. Whilst the interaction of adjacent housing and labour markets is composed of comparative levels of male and female commuters, twice as many males commute to non-adjacent housing markets when compared to females. This tends to reflect the fact that women have shorter journeys to work than men. In relation to age, the majority of commuting between adjacent and non-adjacent housing and labour markets is composed of middle age group workers. A high proportion of workers in the region are between the age of 25 and 59 (middle age group), which accounts for the dominance of this group in relation to both adjacent and non-adjacent interaction. However, in relative terms the younger and older workers are less willing to commute to non-adjacent housing markets when compared to middle age workers.

In relation to employment status, full-time workers account for the highest levels of commuters in adjacent and non-adjacent interaction with three times as many full-time workers travelling between adjacent housing and labour markets and five times as many between non-adjacent markets. Although the gender composition of full-time commuters involved in adjacent interaction is comparable, the analysis highlights that two-thirds of full-time workers commuting between non-adjacent housing and labour markets are male.

However, in relation to part-time commuters, one-fifth of all commuting in the region is comprised of part-time female commuters. The analysis highlights that there are almost five times as many part-time female workers commuting between adjacent housing and labour markets as part-time male commuters, and three and a half times as many commuting between non-adjacent markets, reflecting the growth in female part-time employment (MacDonald, 1999)

The analysis also indicates that intermediate and lower socio-economic workers tend to dominate adjacent housing and labour market interaction whilst the composition of commuters in relation to non-adjacent interaction are comparable between higher managerial and professional workers and intermediate and lower status workers. This reflects the fact that high status workers tend commute further than lower status workers (Hanson and Pratt, 1995).

In addition, access to a car has important implications for the interaction of housing and labour markets. Whilst twice as many people commute by car between adjacent housing and labour markets, over four-fifths of workers commute between non-adjacent housing and labour markets by car. Such trends are significant in that access to a car increases the area over which people search and access employment (Coombes and Raybould, 2001).

The analysis is significant in that it reveals that housing and labour market interaction at sub-regional level is influenced by the composition and characteristics of workers in relation to both adjacent and non-adjacent interaction. The traditional understanding of the interaction of housing and labour markets, based on the three-way relationship between the variables of male wage earners, full-time employment, and housing tenure (Randolph, 1991), underestimates the complexities involved in the interaction of the two arenas. Changes in the economic and social fabric of society have meant that the traditional three-pronged conceptualisation of housing and labour market interaction must be replaced by a much broader and integrative understanding of the interaction of housing and labour markets, which recognises the influence of different demographic and socio-economic characteristics on commuting. However, the major limitation of the analysis of the 'people' factors is that it is unable to explore all of the variables that were considered in Chapter 2 to influence the commute due to a paucity of appropriate data (e.g. tenure, household type, and ethnicity). Therefore, in order to better understand the impact of particular demographic and socio-economic characteristics on the interaction of housing and labour markets a more comprehensive range of commuting datasets is needed in the future.

The fifth part of the analysis explores the influence of 'place' factors on the interaction of housing and labour markets in the region, and thus addresses two research questions posed in objective three. The first question is what effect does population and employment decentralisation have on the nature of commuting between different residential and workplace locations, and how does the process affect sub-regional housing and labour market interaction? The second question is what effect does spatial structure have on commuting, and how does spatial structure affect sub-regional housing and labour market interaction?

The process of decentralisation is identified as a key factor underpinning the nature of housing and labour market interaction. Through migration and employment data from the 2001 Census, the analysis reveals that population and employment is distributed across the range of area types most notably in urban and suburban locations. However, the 2001 migration data illustrates that suburban residential locations gained significant levels of population, and that town and fringe, and village and dispersed locations also made gains. In contrast, urban areas, town centres, and city centres witnessed a decline in population. In addition, the analysis of employment distribution reveals that over three-quarters of employment activity, is concentrated in urban and suburban areas, a quarter of which is now concentrated in suburban locations.

The process of decentralisation has had a significant impact on the nature of the interaction of housing and labour markets in the North West. The dominant relationship in the region is between urban and suburban residential and workplace locations. The traditional importance of city centres as employment locations has been significantly reduced, whilst town centres provide important locations for employment particularly for workers living in town and fringe locations. In addition, although rural locations are relatively self-contained in terms of employment and residential activity, there is an important urban-rural dynamic in the region. There is evidence that people living in rural areas are reliant on urban areas for employment; however, there is also evidence that rural locations provide important employment opportunities for urban dwellers, and this is supported by the balanced levels of incoming and outgoing commuting between the two area types. The analysis highlights that decentralisation is an embedded spatial process in the North West, and as such, it is reasonable to assume that decentralisation will continue to underpin the interaction of housing and labour markets in the future, in spite of the recent emergence of policy agendas charged with reversing the decentralisation process (Breheny, 1999d; Gillespie, 1999). On the basis, that decentralisation is set to continue unabated in the short to medium term (Butt, 1999), it is reasonable to assume that the complex commuting patterns between different residential and workplace locations currently underpinning sub-regional housing and labour market interaction will continue and more than likely intensify as decentralisation progresses and general mobility increases.

The nature of commuting and the associated patterns and trends in the commuting process are dependent on the spatial distribution of housing and jobs (Ma and Banister, 2006). Short distance commuting is associated with living and working in urban areas, and longer distance commuting tends to be associated with living and working in rural locations. However, interestingly, the relationship between commuting distance and suburban residential and workplace locations was relatively difficult to interpret. Where statistically significant correlations were recorded, the correlations tended to be extremely weak. In relation to density, high residential densities tend to be associated with short distance commuting whilst lower population densities tend to result in longer distance commutes.

The implication of the analysis is significant. Having established that the decentralisation process is embedded in the North West, the analysis suggests that as population and employment decentralise to lower density areas average commuting distances might be liable to increase further. Indeed, a number of studies have found that decentralisation has increased commuting distances and times as a result of dispersed commuting patterns and cross-commuting (Crampton, 1990; Clark and Kuijpers-Linde, 1994; Merriman and Hellerstein, 1994; Cervero and Wu, 1998; Van der Laan, 1998; Artis *et al*, 2000). Although the analysis indicates that this is likely be the case in relation to town and fringe and village and dispersed locations, the relationship between suburban locations and commuting distance is ambiguous. However, this reflects the fact that suburban locations attract and source workers locally but also across a wide geographical area, and this appears to be reflected in the results obtained in the analysis of the relationship between population and employment density and distance. The corollary of this is that the complex commuting patterns associated with decentralisation across all area types look set to be complemented by a lengthened commute at least in the short to medium term. The only obvious countervailing pressures to lengthening commuting patterns are the growth of part-time employment and increased homeworking but their effects on overall commuting lengths is uncertain.

Given the lack of research that has been undertaken in relation to housing and labour market interaction the chapter has attempted to consolidate a range of theoretical, methodological, and analytical issues to provide a comprehensive analysis of housing and labour market interaction in the North West. The dominant feature of the analysis is the level of complexity involved in the interaction of housing and labour markets, and the importance of analysing such issues holistically. From a spatial planning perspective, the analysis provides important intelligence on the nature of housing and labour market interaction and the key processes shaping the geography of housing and jobs in the region. To date, such an analysis has been lacking, and whilst exploratory in nature, the analysis provides an important springboard for further investigation into housing, labour markets, and the processes through which the two arenas are connected.

CHAPTER 8
CONCLUSIONS AND POLICY IMPLICATIONS

Introduction

This chapter provides some concluding comments, explores the key findings of the research, and explores the policy implications of the research. The thesis explores the daily interaction of sub-regional housing and labour markets in North West England by combining housing and labour market conceptualisation and identification with an analysis of the process of commuting between the two market types. The understanding of the interaction of the housing and labour markets is complemented with an examination of the 'people' and 'place' factors that serve to structure the interaction of the housing and labour markets in the region. The research has important implications not only in terms of the theoretical advances offered, but also as a source of intelligence for policymakers. First, the main findings of the research are synthesised; second, policy implications are explored and recommendations proposed; and finally the limitations of the research are addressed and suggestions for future research are made. In considering the main findings of the research, the implications for policy, and in making policy recommendations, the chapter addresses the three research questions posed in objective four.

Housing and Labour Market Interaction: Key Research Findings

The purpose of this section is to synthesise the research findings, and in doing so addresses the first research question in objective four, what are the key findings of the research? The policy context (Chapter 3) illustrates that the interaction of housing and labour markets is central to a number of key processes and issues such as the North-South divide, decentralisation, and cross-boundary spatial processes, but that policy has tended to be driven by an overly macroeconomic and fragmented conceptualisation of the housing-labour market relationship. However, the current lack of understanding of housing and labour market interaction owes much to the paucity of basic intelligence regarding the geography of housing and jobs. Whist researchers have tended to pursue more fashionable lines of inquiry (Gillespie, 1999), work exploring the spatial distribution of housing and jobs has been partial (Breheny, 1999b) and the analysis of the interaction of the two arenas has been fragmented (Allen and Hamnett, 1991b; Wong, 2002). Since the late-1990s, effort has been made to engage in such debates; however, the development of an integrated and effective policy agenda to tackle such issues continues to be hindered by a lack of basic intelligence regarding housing, labour markets, and the processes that characterise their interaction.

The lack of basic intelligence and the deficiency of the modelling approach in explaining housing and labour market interaction support the development and adoption of an alternative conceptualisation and methodology to provide a much needed evidence base to inform current research and policy agendas. The review of the literature in Chapter 2 established the theoretical context for the research and integrated the different strands of unconsolidated literature in order to develop a theoretical framework regarding housing, labour markets, and the factors that serve to shape their interaction. This laid the foundation for the development of a systematic framework to explore the interaction of housing and labour markets at sub-regional level. The framework is founded on the basis that the interaction of housing and labour markets on a daily basis can only be understood holistically through an understanding of the spatial and structural elements of housing, labour markets, and the process of commuting. As such, a three-step process was developed through which to explore the interaction of the markets. Step 1 seeks to conceptualise and delineate housing and labour markets at sub-regional, which is complimented by Step 2 which seeks to establish the nature of commuting between the markets, and Step 3 seeks to determine the influence of 'people' and 'place' factors on the interaction of the housing and labour markets. The framework, therefore, contends shifting the focus on housing and labour market interaction away from the traditional modelling tradition towards an evidence-based approach which can be used to generate research intelligence.

A key assumption underpinning the research was that in order to understand the interaction of housing and labour markets it was necessary to identify separate housing and labour markets. Previous research has tended to rely on the TTWA framework and administrative boundaries to conceptualise and empirically analyse the relationship between housing and jobs at sub-regional level. However, this reliance on convenient boundaries detracts from the understanding of housing and labour market interaction and is likely to result in misspecification of the interaction of housing and labour markets. TTWAs have long been established as the official approximations to labour markets in the UK. The current TTWAs were delineated in 1998 based on commuting data from the 1991 Census of Population (Coombes and ONS, 1998) and these TTWAs continue to provide the most readily available approximations to local labour markets in the UK. As such, there were clear benefits in retaining the 1991-based TTWAs as approximations to labour markets for this research. However, there were a number of issues that needed to be addressed with respect to retaining the current TTWAs. First, the 1991 Census is clearly outdated and is superseded by the 2001 Census of Population. Second, between the 1991 and 2001 Censuses, changes in commuting in the region are likely to have altered the extent and self-containment levels of the TTWAs (e.g. Coombes *et al*, 1985; Coombes and Casado-Diaz, 2005). Indeed, Wong (2002) highlights that increasingly complex commuting patterns have resulted in a significant reduction in the number of TTWAs from the original 642 to 334 (1981-based) to the current 308 (1991-based). Third, the TTWAs were delineated using a 10 per cent sample of commuting flows from the 1991 Census. Fourth, the 1991-based TTWAs were constructed using the 1991 administrative ward geography and so, the TTWAs are unlikely to have remained unaffected by changes to ward geography between 1991 and 2001.

The validity test that was adopted revealed a number of important insights into the functioning and current condition of the North West TTWAs. Indeed, the TTWAs all contain a resident workforce in excess of 3,500 workers, and 19 of the 23 TTWAs contain a resident population exceeding 20,000 workers. Thus, the analysis revealed that all of the TTWAs pass the working population criteria and in this respect offer decent approximations to local labour markets. However, eight of the TTWAs failed to meet the self-containment threshold established in relation to the self-containment and working population trade-off. Four of the TTWAs had job foci in Cumbria and four had job foci in northern Manchester or Lancashire. The analysis suggested that extended commuting patterns have resulted in a loss of self-containment in certain TTWAs (Coombes and Casado-Diaz, 2005). In addition, population decentralisation, economic restructuring, and housing market changes are the likely contributors to the failings of the Lancashire and northern Manchester TTWAs whilst housing market failure, economic restructuring, population mobility, and issues of housing affordability and second homeownership are likely contributors to the failing of TTWAs in Cumbria. Whilst the limitations of retaining the 1991-based TTWAs are clearly evident, the majority of the TTWAs retained a relatively high level of commuting self-containment including those that failed the self-containment measure (statistical meaningfulness), as well as continued policy relevance, which supported the adoption of the 1991-based TTWAs as approximations to labour markets in this research. However, the analysis is significant for two main reasons. The first is that it reveals the pressing need to improve the TTWA delineation process, particularly the time lag between the publishing of commuting flow data and the publishing of revised TTWA boundaries. The second is that the approach adopted provides a methodology that can be used in the future by policymakers to overcome the cyclical time gap between the publishing of new census data and the availability of newly defined TTWAs.

In contrast to the TTWA framework, the HMA framework has until recently received relatively little attention in research agendas, the result of which is a paucity of basic intelligence into the nature and functioning of housing markets at sub-regional level in the UK. Although the Scottish policy agenda has prompted recent advances in the HMA framework, with the exception of a limited number of instances (e.g. DTZ Pieda, 2004a; Bibby, 2005; Coombes and Champion, 2006; Coombes *et al*, 2006), the focus on HMAs in England has been limited. The dearth in the understanding of housing market functioning in the UK owes much to the acceptance of local authority administrative boundaries as approximations to local housing markets (Jones, 2002). However, changes have taken place in the administrative, planning, and policy landscapes in England over recent years, which have highlighted the pressing need to adopt an approach to conceptualise and identify housing markets at sub-regional level which does not rely on the use of convenient administrative boundaries and which incorporates economic reasoning. The research developed a conceptual and methodological framework for the delineation of economically driven housing markets that are free of the constraints of local authority geography.

The approach recognised the need to reflect the strong relationship between home and work through commuting and migration, while acknowledging the significance of 'search', the process used by prospective migrants at the first stage of the migration process when searching for a new property. The analysis clearly illustrates the value in delineating functional housing markets as opposed to relying on convenient boundaries. The analysis of the final HMAs revealed that all of the HMAs had a supply and demand-side self-containment exceeding 70 per cent, reflecting the high internal coherence of the HMAs. When comparing the HMA and local authority and TTWA boundaries, the analysis revealed a marked difference between the two geographies, suggesting that unquestioned acceptance of local authority boundaries as approximations to local housing markets is likely to result in incomplete intelligence on sub-regional housing markets, and unreliable housing market analyses, which echoes the findings of Jones (2002).

The value in identifying separate housing and labour markets is clearly reflected in the intelligence generated in relation to housing and labour market functioning in different areas. However, the delineation of separate housing and labour markets also provides the means to explore the interaction of functional housing and labour markets. The notable feature of the analysis was the complex nature of the interaction of the housing and labour markets in the region. A key aspect of this relationship is the spatial connection between housing and labour markets in the form of commuting. A number of methods have been developed to reduce the complexity of origin and destination matrices. However, such methods have been criticised for relying on arbitrary values in determining cut-off thresholds for different flow magnitudes (e.g. dominant flows or second order flows). Therefore, the *flow standardisation method* was developed to reduce the complexity of the origin and destination matrix. The method provided a way of identifying statistically significant cut-off thresholds for the commuting flows in an origin and destination matrix, which is an important development because although previous methods are capable of identifying dominant flows, they are inefficient at identifying second and third order flows. The analysis of commuting patterns in the region indicated that housing and labour market interaction is characterised by high levels of commuting between geographically coincident housing and labour markets, and much lower levels of commuting between non-adjacent housing and labour markets. Indeed, first order flows connect adjacent housing and labour markets, second order flows connect both adjacent and non-adjacent housing and labour markets, and third order flows tend to connect non-adjacent housing and labour markets.

The relatively self-contained nature of the interaction of housing and labour markets in the region is reflected in the analysis of the distance travelled to work for the resident population of the HMAs and workplace population of the TTWAs. The majority of commuting trips are of relatively short distances across the region in relation to both the residential and workplace ends of the home-work trip. Indeed, 46 per cent of commuting is less than 5 kilometres in length for resident and workplace populations, 24 per cent of commuting is less than 2 kilometres in length from the HMAs, and 25 per cent of commuting to the TTWAs is less than 2 kilometres in length. In addition, just 27 per cent of commuting is over 10 kilometres from the residency end and 23 per cent in relation to commuting at the workplace end of the home-work trip. Thus, as distance from the destination TTWA increases so the propensity for interaction decreases, which highlights that the majority of workers will seek to minimise the distance they travel to work (Spence and Frost, 1995; Rouwendal and Nijkamp, 2004; Shearmur, 2006). Longer-distance commuting of between 20 kilometres to over 60 kilometres tends to be uncharacteristic of commuting in the region. HMAs with above average longer distance commuting (over 30 kilometres) tend to be those HMAs and TTWAs surrounding the metropolitan areas, located in the urban-industrial belt and in Cheshire and south Lancashire.

However, despite the acceptance that people seek to minimise the length of their journey-to-work, the analysis revealed that 12 per cent of workers from the residency end, and 10 per cent from the workplace end of the home-work trip commute over 20 kilometres to work and over 6 per cent commute over 30 kilometres. This supports the contention of Green *et al* (1999) who argue that a minority of workers endure longer and more geographically diverse commuting regimes as a result of substituting migration with longer-distance commuting, reflecting the outcome of the trade-off between residential and workplace locations, and household decision-making. The diversity in the nature of commuting tends to reflect the dominance of the car in the region, particularly in that the car is the dominant mode for connecting both adjacent and non-adjacent housing and labour markets.

Thus, the analysis suggested that at sub-regional level, the established assumption that commuters tend to travel to their nearest labour market holds true. Indeed, over two-thirds of commuters travel to adjacent labour markets illustrating that housing markets tend to supply labour to a limited number of local labour markets. In addition, the analysis indicated that the residential and workplace locations of the majority of workers are in a state of equilibrium (Kain, 1962; Van der Laan *et al*, 1998). However, although the rational commuter will attempt to minimise commuting costs, the analysis suggested that issues other than commuting costs affect the balance of home and work (Rogerson *et al*, 1989; Green, 1997; Rogerson, 1999; Senior *et al*, 2004). This is illustrated by the fact that a minority of workers commute beyond their local labour market to work. Previous research illustrates that factors such as life-cycle stage, income, employment opportunities, housing attributes, neighbourhood quality, and accessibility to family and services (Bourne, 1981; Green, 1997; Jarvis, 1997; DTZ Pieda, 2004b) influence residential and workplace location strategies. In addition, businesses have been shown to locate in an area where the benefits gained from clustering and knowledge driven competitive advantage provide the greatest opportunities for profitability (Wong *et al*, 2000; Boon, 2003). Thus, housing and labour market interaction is influenced by a range of issues and processes, which have the effect of complicating the nature of the home-work link, in particular, 'people' and 'place' factors.

The analysis of 'people' factors explored the differences in the composition of commuters in the context of the interaction of adjacent and non-adjacent housing and labour markets. Whilst gender is acknowledged as a key influence on the nature of commuting in previous research, the analysis revealed that there was no significant difference in the gender composition of commuting flows between adjacent housing and labour markets. However, there was a significant difference in the gender composition of the flows between non-adjacent housing and labour markets with higher proportions of men travelling between non-adjacent markets than women.

In relation to age, the analysis revealed that the composition of commuters between adjacent and non-adjacent housing and labour markets contained a significantly greater proportion of middle-aged workers when compared to younger and older workers. Thus, the analysis highlights that in relative terms, the younger and older age groups are less willing to commute to non-adjacent labour markets when compared to the middle-age groups reflecting the bi-modality associated with age and commuting (McQuaid, 2003).

In relation to employment status, the analysis highlighted that full-time workers account for the highest levels of commuting in relation to both adjacent and non-adjacent interaction when compared to part-time workers (e.g. Hanson and Pratt, 1995; MacDonald, 1999; Benito and Oswald, 2000). However, higher numbers of full-time male workers commute between adjacent and non-adjacent housing and labour markets, when compared to female full-time commuters. However, there are much higher levels of part-time female workers commuting between adjacent and non-adjacent housing and labour markets when compared to male part-time workers. This reflects the general dominance of women in part-time work.

The analysis highlighted that all socio-economic groups play a significant role in local interaction but that commuting between adjacent housing and labour markets is especially important for lower status workers. In contrast, the analysis revealed that higher status workers have a greater propensity to commute to non-adjacent housing markets than lower and intermediate status workers (Green *et al*, 1986; Turok, 1999).

The significance of the analysis is that it reveals that the interaction of housing and labour markets is influenced by the characteristics of commuters. However, more importantly, it illustrated that the traditional three-way conceptualisation of housing and labour market interaction understates the complexities involved in the interaction of housing and labour markets. The corollary of this is that the influence of demographic and socio-economic characteristics of commuters is generally overlooked in the policymaking process.

The analysis of 'place factors' explored the influence of employment and population decentralisation, and spatial structure on commuting. The analysis revealed that population and employment decentralisation have resulted in population and employment being distributed across the range of residential and workplace area types in the region, and in particular within urban and suburban locations. The analysis of adjacent interaction highlights that all area types have relatively high levels of commuting between the same types of area, suggesting that a high proportion of people are locating in the same type of residential location as their workplace location. However, urban residential locations represent the dominant source of workers for all workplace locations and in particular suburban workplace locations, and the dominant interaction occurs between urban and suburban locations. In relation to non-adjacent interaction, there is much more variation in the nature of the interaction of different area types. However, urban areas are the dominant source of workers to all types of workplace locations and the dominant destination for workers from all types of residential locations. In addition, suburban workplace locations attract relatively high proportions of workers from all types of residential locations in non-adjacent HMAs. Thus, employment and population decentralisation have resulted in much more dispersed distributions of employment and population in the region, which is reflected in the complex interaction between different types of residential and workplace locations.

The analysis of spatial structure indicated that short distance commuting is associated with living and working in urban areas, whilst longer distance commuting tends to be associated with living and/or working in rural locations. However, interestingly, the relationship between commuting distance and suburban residential and workplace locations was relatively difficult to interpret. Where statistically significant correlations were recorded, the correlations tended to be extremely weak. This would seem to suggest that suburban locations continue to exhibit diverse commuting adjustment mechanisms in order to balance home and workplace locations, particularly because of change to urban form and the spatial mismatch of jobs and housing through decentralisation (Artis *et al*, 2000). In addition, the analysis revealed that high residential densities tend to be associated with short distance commuting whilst lower population densities tend to result in longer distance commutes. This trend is evident in the ward level and sub-regional level analyses. Significantly, the relationship between spatial structure and commuting tends to reflect the findings of a number of studies. In particular, it supports the contention that higher density areas, which tend to be urban areas, support shorter distance commuting, whilst lower density areas, which tend to be small town and rural areas, support longer distance commuting (see Gordon *et al*, 1989; Coombes *et al*, 1996; Banister *et al*, 1997; Cervero and Wu, 1997).

Significantly, the analysis of the 'place' factors indicates that the complex commuting patterns between different residential and workplace locations currently underpinning sub-regional housing and labour market interaction will continue and more than likely intensify as decentralisation progresses. In addition, the complex commuting patterns associated with decentralisation across all area types look set to be complimented by a lengthened commute at least in the short to medium term.

Policy Implications

The research poses a number of interesting policy implications for policy. The purpose of this section is to address the second research question in objective four, what are the policy implications of the research for housing, labour markets, and their interaction? The interaction of housing and labour markets has acquired a relatively narrow and fragmented focus within national and regional policy agendas in the UK, in spite of the fact that housing and labour market interaction is a key process shaping the spatial structure of cities and regions (Wong *et al*, 2000). The policy review in Chapter 3 highlighted that the government's understanding of housing and labour market interaction is embedded in an overly macroeconomic framework based on the view that housing markets hinder labour mobility. This view is particularly evident in recent government policy. Indeed, the Barker review (2004) argues that there is a pressing need to address the issue of housing supply in the UK in order to reduce the instability and volatility of housing markets. The suggestion is that constraints imposed on labour mobility by housing can be removed by improving the functioning of housing markets. The key messages emerging from the sustainable communities agenda, PPS 3 *(Housing)*, and the urban renaissance agenda also echo this macroeconomic viewpoint. It would be shortsighted to suggest that such a perspective holds little or no relevance to understanding the interaction of housing and labour markets; clearly, the relationship between housing and labour markets and the mobility of labour is a key process shaping housing and labour market interaction (Owen and Green, 1989). However, the problem with such a perspective is that it fails to adequately capture all of the complex issues that shape the interaction of the two arenas. The narrow viewpoint means that housing and labour market interaction has been and continues to be inadequately addressed within national and regional policy agendas. However, the findings of this research offer a number of implications for current policy in relation to housing, labour markets, and their interaction.

The research illustrates the value in adopting a national HMA framework to compliment the established TTWA framework. Whilst the TTWA framework has long been accepted as the official labour market framework (Coombes *et al*, 1989), local authority boundaries and TTWAs have long been accepted as approximations to housing markets. However, Jones (2002) highlights that local authority boundaries and TTWAs have little functional meaning within the housing system. The consequence of this is that there is a dearth of understanding of housing market functioning and there has until recently been no systematic research to define sub-regional housing markets. The research undertaken in this thesis has important implications for policymakers in that it provides a conceptual framework and methodology that can be applied to delineate functional and economically driven housing markets for specific regions or alternatively on a national basis. The value of the approach is that the HMA framework developed is consistent with the requirements set out in the *Housing Market Assessment Manual* (DTZ Pieda, 2004b), which is intended to be used by local authorities to guide housing market assessment exercises for the purpose of generating intelligence and developing housing and planning policies.

For policymakers, HMAs would provide a geography within which to analyse housing market functioning and would help reduce the problems associated with reliance on administrative boundaries particularly in relation to compiling housing market data and importantly in relation to supplying housing through the RSS (ODPM, 2005c). If applied widely through a national HMA delineation exercise, the resulting system of HMAs would enable the assembly of housing market statistics on a more meaningful basis than is currently the case. Indeed, HMAs could provide functional areas for allocating housing based on the estimation of supply, demand, and need at sub-regional level. In addition, a national system of HMAs would support the calculation of population projections at three scales, the regional, sub-regional (in the form of HMAs), and local authority levels, as opposed to the current regional and local authority figures.

The assessment of housing demand at the sub-regional level could be facilitated and housing provision estimates allocated to sub-regional level could, in turn, be calculated for local submarkets embedded within sub-regional HMAs. Submarket research has tended to focus on the economic structure and operation of submarkets through static cross-sectional studies. Consequently, examination of structural change over time has been underdeveloped, leading to assumptions that submarkets have greater fluidity than HMAs. However, Jones *et al* (2003) found that, in Glasgow between 1984 and 1997, submarkets remained relatively stable, supporting the argument for disaggregating sub-regional housing demand forecasts to submarket level. This approach would improve the economic basis of housing provision and the monitoring of housing market operations, particularly supply, demand, and need at sub-regional and local levels. This would be useful in urban areas where the dynamics of housing demand and supply are particularly complex (Jones *et al*, 2003). In addition, the planning system could accommodate the multilayered approach to housing provision at sub-regional level through the RSS and at local level through the Local Development Frameworks (LDFs).

However, such an approach would have to rely on the process being overseen by a regional level actor. In 2003, Regional Housing Boards were established across the English regions to ensure the delivery of policies outlined in the sustainable communities agenda (ODPM, 2003) and for preparing Regional Housing Strategies as a basis for strategic housing investment in England. The Housing Boards are comprised of representatives from regional and sub-regional organisations, such as Regional Development Agencies and Government Offices for the Regions. The Barker review concluded that the current method for assessing housing need is inadequate (Barker, 2004), which has prompted the government to consider combining the Regional Housing Boards and Regional Planning Boards to improve the process of planning for housing. This would offer a significant opportunity for improving the current process through which housing is provided in England at regional, sub-regional, and local levels. Thus, from a policy perspective, the delineation of a system of functional and economically driven housing markets offers a number of possibilities for improving the current process through which planning for housing is undertaken.

A further implication of the research is that it illustrates the variance in the structural characteristics and performances of housing and labour markets between different areas, and strengthens the view that the government's macroeconomic perspective regarding housing, labour markets, and their interaction is unlikely to capture the complex processes taking place at sub-regional and local levels. Indeed, identifying the unique features of housing and labour markets is a valuable exercise if housing and labour market policies are to be developed with respect to local needs. However, in order to inform the development of locationally specific housing and labour market policies, policymakers need to have relevant and current intelligence on the nature of housing and labour market operations (Green, 1995; DTZ Pieda, 2004b), which can be used to compare housing and labour market performance over time and between places (e.g. Jones, 2004).

However, the problem is that currently no system exists at regional level that would allow the efficient monitoring of housing and labour markets to be undertaken over time at different spatial scales. Instead, as illustrated in this research, the monitoring of housing and labour markets would be forced to rely on a variety of data sources to build up a composite view of the condition of the markets, which creates problems of comparability. Thus, the research illustrates that ideally, housing and labour market policymaking should be based on the output of a Local Information System (LIS), which is defined as '...a complex of people, equipment, and processes which interact to produce information and intelligence from data to assist in decision-making' (Hasluck, 1989:9). Essentially, the LIS would collect and analyse relevant data related to housing and labour markets, which could then be used by policymakers to inform policy. Regional Observatories (ROs) provide the obvious body to undertake the collection and analysis of the housing and labour market data because the ROs are already charged with collecting research intelligence for each of the English regions to inform regional strategies. However, the value of such an approach lies in the fact that if the variables were collected consistently on a national basis (maybe collected based on government guidance), the benchmarking of indicators could be undertaken, which would facilitate comparability over time and between places (e.g. Jones, 2004). However, in order for such an exercise to be undertaken, challenges associated with gathering appropriate data, in terms of scale, access, and focus, and the creation of meaningful indictors would have to be overcome (e.g. see Hasluck, 1989; Wong, 2002; DTZ Pieda, 2004b; Wong, 2006).

Thus, the research illustrates the value of delineating two separate functional geographies for housing and labour markets, and the importance of monitoring housing and labour market functioning for policy making. However, it also demonstrates the value in delineating HMAs to compliment TTWAs in order to understand the interaction of the two markets at sub-regional level. Indeed, Wong *et al* (2006) highlight the need for better intelligence on spatial processes in order to inform spatial planning policy and this issue has become even more relevant in recent years with spatial planning achieving statutory status in the UK.

The research illustrates the complexity of the interaction of housing and labour markets. The analysis of commuting between different area types reveals that the interaction of home and jobs is far more complicated than the access-space model suggests. Commuting patterns have diversified and the length of the commute has increased with the majority of workers travelling to workplaces outside the CBD. Recent government policies, notably the urban renaissance agenda and sustainable communities plan, have attempted to address the balance between housing and jobs with the aim of improving the self-containment of local areas and to achieve a reduction in the length of the journey-to-work. However, the problem is that because such polices attempt to address the issue from a macroeconomic perspective, they do not acknowledge the range of other factors that underpin the commuting process. In particular, the characteristics of workers living in different areas is a key factor in determining the interaction of housing and labour markets and as the workforce becomes increasingly professionalised, the complexity of the commuting process is likely to increase. In conjunction with this, a general increase in mobility has allowed people to take up jobs over much wider areas (Gordon, 1999). The fact that the government is crouching on the belief that similar housing and job levels in the same localities will lead to better self-containment and lower commuting levels (ODPM, 2003) seems to be naïve. This is clearly reflected in the fact that settlements with similar levels of housing and jobs, unless very large, are no more likely to have journey-to-work self-containment or shorter average trip lengths than settlements with no such balance (Breheny *et al*, 1998; Breheny, 1999d).

This issue is also framed by the fact that the macroeconomic viewpoint adopted by the government in relation to housing and labour market interaction fails to acknowledge that residential and workplace location decision-making is driven by factors other than proximity to workplace locations (e.g. Rogerson *et al*, 1989; Filion *et al*, 1999; Wong, 2001; Senior *et al*, 2004). Similarly, businesses location decision-making is driven by traditional considerations of land, labour, capital, infrastructure, and location, which are key factors in achieving profitability (Wong, 1998b). The trade-off between residential and workplace location decision-making has contributed to an increasingly complex commuting culture. However, a key process that is reflected in the interaction of the HMAs and TTWAs is the 'roots effect' phenomenon where households adopt a fixed residential location and cope with job changes through longer distance commuting (Green *et al*, 1999). These processes are fundamental in driving the decentralisation process and ultimately drive the interaction of housing and labour markets. However, the fact that the government's understanding of residential and in particular business location decision-making is poor means that such issues and their effects on commuting have been overlooked in recent government policy agendas (Boon, 2003).

A key assumption driving the urban renaissance agenda is the belief that decentralisation has fuelled longer commuting journeys, as a result of workers travelling longer distances to cities. However, the problem with the urban renaissance agenda and its strategy for reducing commuting by integrating housing and jobs is that because both population and jobs have decentralised, many of the work trips are now between non-urban residential and workplace locations. The analysis of the relationships between commuting distance, density, and area type reveals that commuting tends to be shorter in urban areas in relation to both the home and work-end of the trip, whilst commuting in non-urban locations tends to be long distance. This is clearly illustrated in the analysis of commuting in the North West, but the urban renaissance agenda is likely to be relatively inefficient at tackling decentralisation and commuting because it overlooks the interaction of non-urban residential and workplace locations.

Thus, the prospect of planning for housing, jobs, and commuting is becoming increasingly problematic. The irony of this lies in the fact that the sustainable communities and urban renaissance agendas require that policymakers do more to tackle the problems holistically. Whilst new housing supply at local authority level reflect figures generated through household projections, the ability of policymakers to determine the required level of job growth for additional housing is difficult. This is particularly relevant in relation to the sustainable communities agenda. In the South East and London, areas have been identified to accommodate housing and job growth to create '...attractive places in which people will positively choose to live and work' (ODPM, 2003:46). This sentiment is also reflected in the philosophy underpinning housing market renewal in the north. However, although the new housing development in the South East is likely in the short-term to alleviate some of the housing pressure in the region, the fact that the South East is a highly mobile region casts doubt on the likely effectiveness of the growth areas for integrating housing and jobs and increasing self-containment. As Gordon (1999:182) comments, 'one particular feature of a great metropolitan region such as the South East is that 'the people' don't necessarily live and work in the places'. In contrast, the success of the housing market renewal areas is dependent in the ability of policymakers to generate job growth locally because many of the areas of housing decline correspond with areas of economic and labour market decline (Bramley and Pawson, 2002). However, there is no guarantee that if jobs are generated these will be suitable to the skills of the local workers or that jobs will be taken up locally (Immergluck, 1998; Shuttleworth *et al*, 2000). However, the analysis undertaken in this research illustrates that at sub-regional level, there continues to be a high degree of work trip self-containment, and as such, the sub-regional level would provide policymakers with a manageable and realistic focus for managing housing and labour market interaction and commuting in a car dependent society.

However, in order to better address the issue of housing and labour market interaction it is clear from the policy review that the fragmentation that currently characterises housing and labour market issues in national and regional policy must be addressed. The inadequacy of PPS 3 *(Housing)* and PPS 11 *(Regional Planning)* at integrating housing and labour market issues makes the prospect of the development of adequate planning policy agendas to address housing and labour market interaction unlikely under the current system. In addition, the fact that the delivery mechanisms for housing and employment at regional level, specifically the RSS and RES, exhibit similar fragmentation makes the prospect for the development of more 'joined-up' policy at regional level equally questionable. This is particularly significant in relation to the sustainable communities agenda, which requires the integration of housing and employment issues. However, the potential success of the agenda would appear to be in doubt because the delivery mechanisms for housing and employment operate relatively independently. Whilst strides have been made in recent years to incorporate spatial planning into the UK planning system, the fact that the current system is inadequate at addressing spatial issues, including housing and labour market interaction, suggests that recent calls for the development of an integrated Spatial Planning Framework for the UK are entirely justified (see Alden, 1999; Wong *et al*, 2000; Wong, 2002).

Policy Recommendations

Following the policy implications debate, a number of policy recommendations are outlined as a basis for informing future policy. This addresses the third research question in objective four, what policy recommendations might be extracted from the research as a basis for informing future policy?

Recommendation One: There is a pressing need to explore the potential for developing a national HMA framework to compliment the TTWA framework. PPS 11 *(Regional Planning)* identifies HMAs as a means through which to tailor housing 'provision' to the requirements of specific areas. The *Housing Market Assessment Manual* (DTZ Pieda, 2004b) is an important tool for assessing the nature of HMAs; however, because it is a guidance document it does not advocate an explicit approach that should be adopted to identify HMAs. A nationally accepted delineation framework underpinned by consultation with local authorities and housing professionals would provide a means for identifying functional and economically driven sub-regional housing markets, which could be used in the housing planning process.

Recommendation Two: Policymakers need to recognise the potential offered in the development of Local Information Systems with respect to housing and labour markets within Regional Observatories. Currently, housing and labour market data is spread across a range of data sources and this makes collection and analysis difficult and time consuming for policymakers. The collection of regionally specific housing and labour market data by Regional Observatories through a consistent national data collection process would improve current intelligence of regional housing and labour markets and would allow comparability of housing and labour markets nationally.

Recommendation Three: Further emphasis needs to be placed on the sub-regional scale as a focus for exploring and addressing spatial processes. Although the sub-regional scale currently offers as many disadvantages as advantages to spatial planning (see Roberts and Baker, 2004), the analysis indicates that the sub-regional scale offers opportunities to address key spatial processes that are currently inefficiently addressed by the exclusive focus on local areas (i.e. the urban focus).

Recommendation Four: Policymakers need to recognise that the macroeconomic perspective that currently underpins the understanding of the interaction of housing and labour markets cannot sufficiently address the complexities associated with the interaction process. Future policies need to recognise the role played by residential and business location decision-making in the interaction of housing and labour markets. In addition, research highlights that commuting and migration are influenced by the characteristics of workers and for policies to be effective in addressing the interaction of housing and labour markets, these underpinning 'people' factors need to be more effectively incorporated into future policy agendas.

Recommendation Five: The focus of the urban renaissance agenda needs to be extended to recognise the interrelationships that exist outside of urban areas. Whilst there is no doubt that urban areas are key economic drivers and central nodes in the migration and commuting processes, the fact that the focus of the urban renaissance agenda does not extend beyond the 'urban' means that important processes and issues underpinning housing and labour market interaction are missed through the policy agenda. What is needed is a more holistic policy framework that recognises the interdependencies of urban and non-urban areas (e.g. see Caffyn and Dahlstrom, 2005).

Recommendation Six: Policymakers at national and regional level need to explore the potential avenues for better integration of housing and employment issues in national planning policy agendas and importantly within the delivery mechanism through which housing and employment is delivered. These mechanisms include the RSS, RES, and transport planning policies. Without better integration of the delivery mechanisms, it is questionable as to the extent to which housing and labour market interaction can be adequately addressed by policy at national or regional levels.

Recommendation Seven: The fact that the current system is inadequate at addressing spatial processes suggests that there is a pressing need for policymakers to explore further the potential for developing an integrated Spatial Planning Framework for the UK. The Royal Town Planning Institute (RTPI) provides a body through which integrated research might be undertaken to inform such a debate.

Limitations of the Research

The research has been successful in providing theoretical and empirical contributions to a relatively little understood process. However, the research also has a number of limitations that need to be acknowledged. The first limitation is that there is currently a lack of empirical and theoretical research focusing on housing and labour market interaction. The corollary of this is that the thesis began by drawing extensively on research from across a range of disciplines and research areas. On the one hand, this improved the scope of the research but on the other hand, it also leaves the thesis open to criticisms of eclecticism in relation to the consideration of different theoretical and methodological issues.

Second, the conceptual framework was developed through the review of the literature, and this subsequently guided the empirical aspects of the thesis. As such, the understanding of housing and labour market interaction developed through this research reflects a certain theoretical and methodological perspective. Had an alternative theoretical approach been adopted the understanding of housing and labour market interaction developed would have altered. Therefore, it is important to acknowledge the theoretical perspective underpinning the research.

Third, the research relied extensively on 2001 Census data and whilst it is a comprehensive data source, there are problems with the Census, which are explored in Chapter 4. In addition, the analysis was unable to go 'beneath' the secondary data. In other words, the analysis adopts a broad perspective and is unable to explore underlying issues such as those relating to commuting, and residential and workplace location decision-making, which might have been explored by a narrower and more localised analysis allowing primary data to be collected to compliment secondary data. This would have been particularly advantageous in relation to understanding the processes involved in balancing residential and workplace locations by different household members (e.g. Green, 1997), the dynamics involved in household location strategies (e.g. Jarvis, 1999), and location considerations of businesses (e.g. Wong, 1998b). However, although these are important limitations, the resource constraints imposed on the research (time and money in particular) meant that it was unlikely that all of these issues would have been incorporated into a single study. Indeed, this issue highlights the need for the development of a more consolidated research agenda, which would allow such issues to be more comprehensively explored.

The fourth limitation that needs to be acknowledged is the fact that the research adopted the 1991-based TTWAs despite highlighting the problems associated with retaining the TTWAs. Coombes and Casado-Diaz (2005) compare 2001 commuting patterns to the current TTWAs and highlight the lengthening of commuting since 1991. The analysis of the TTWAs in Chapter 5 highlighted that certain TTWAs (e.g. Windermere; Burnley; Nelson and Colne) are potential candidates for being integrated within wider labour markets because of changes in commuting patterns.

The fifth limitation is that the use of estate agents in the process of delineating HMAs opens the approach up to criticism surrounding the subjectivity of the HMA delineation process. The positive and negative aspects of using estate agents in the delineation process were acknowledged in Chapter 6, and these positive and negative issues were constants throughout the delineation process. A methodology that relies entirely on delineating HMAs based on a self-containment measure would address the criticism of subjectivity. However, the consultation process was extremely beneficial for understanding the form and functioning of housing markets in particular areas, and this would have been lost had an approach based solely on self-containment been adopted. In relation to the HMAs, there is also the fact that their boundaries are confined to the North West and this fails to acknowledge the importance of cross-boundary spatial processes in sub-regional housing market functioning. This issue could be addressed by extending the delineation process beyond the North West to incorporate other regions in a further study.

The sixth limitation reflects the lack of available data to sufficiently explore all aspects of the housing and labour market interaction process (see Wong, 1998a). This issue is particularly relevant in relation to the analysis of the 'people' factors. The review of the literature illustrated a range of demographic and socio-economic characteristics that influence the nature of the commute.

However, comprehensive commuting datasets for variables such as ethnicity, household type, and housing tenure are unavailable, and as such, these variables were not considered in the analysis. Access to datasets such as the British Household Panel Survey (BHPS) and Sample of Anonymised Records (SARs) (3 per cent sample for 2001 Census) allow such issues to be explored for a sample of the UK population (e.g. Bramley *et al*, 2006). However, because these datasets are not specific to particular areas, it is not possible to take account of specific ethnic or household characteristics in the interaction process. Indeed, for such issues to be incorporated into wide scale analyses a broader range of datasets across a range of spatial scales is needed. In principle, such datasets could be supplied through the Census in the same form as the current disaggregated SWS and SMS datasets.

Directions for Future Research

Throughout the thesis, it has been reiterated on a number of occasions that housing and labour market interaction is a little understood, yet significantly important process that is currently shaping cities and regions (Wong *et al*, 2000). Through an exploratory study, this thesis has attempted to engage with some of the debates and issues surrounding the daily interaction of sub-regional housing and labour markets. However, through the course of the research a number of potential avenues for future study have emerged.

The first obvious direction for future research is the optimisation of the HMA framework. Indeed, the framework developed in this research contrasts significantly to the HMA methodologies adopted in other studies (e.g. Jones, 2002; Bibby, 2005; Coombes and Champion, 2006). Currently the general HMA approach is in its infancy in relation to theoretical and methodological developments. Therefore, it is important to test and refine the theoretical and methodological components in order to develop an optimal framework. Indeed, there are a number of issues, which would benefit from deeper consideration in future research. The HMAs delineated in this study relied on seed wards around which the HMAs formed. However, the framework would benefit from exploring the effects of adopting a non-seed approach and allowing the natural evolution of HMAs (see Coombes and Champion, 2006). This would be particularly useful in polycentric areas where there is likely to be a close association between particular urban nodes (e.g. see Van der Laan and Schalke, 2001). There is also the need to explore the effect of adopting alternative self-containment thresholds on the delineation of the HMAs. In addition, the contrast between urban and rural areas has been highlighted and consideration needs to be given to the potential for incorporating a self-containment trade-off into the HMA procedure to reflect urban and rural contrasts, similar to the trade-off adopted in the TTWA framework.

A second direction for future research involves extending the HMA approach. The HMAs delineated in this research are based on the aggregation of inter-ward migration data. However, the availability of disaggregated 2001 Census migration datasets opens up the possibility of delineating HMAs for specific sub-group populations. The ward level datasets, which include moving groups by tenure, age, gender, and family status, are attractive datasets for developing disaggregated HMAs. The pursuit of these possibilities would enable the analysis of sub-group housing market features and processes that could inform policies to target specific population sub-groups. This reflects similar arguments raised in relation to TTWA delineation for different population subgroups based on socio-economic and demographic characteristics (Green *et al*, 1986; Coombes *et al*, 1988; Casado-Diaz, 2000). In addition, the framework adopted in this research can be replicated to delineate aggregated and disaggregated HMAs for other regions.

In relation to the interaction of the housing and labour markets, there are a number of potential avenues for future research. The study focuses on the process of commuting in the interaction of housing and labour markets. However, an obvious direction for future research is to extend the examination to take account of other processes shaping the relationship between housing and labour markets. Such analyses might include exploring the impacts of migration, trade-flows, business mobility, or service provision on housing and labour markets, and the way that they interact. Indeed, Wong *et al* (2006) highlight the need to develop our understanding of spatial processes in order to inform spatial planning policy. However, the paucity of dynamic data means that the analysis of such issues is restricted and will continue to be restricted until comprehensive datasets, which allow such processes to be explored, are complied and released at finer spatial scales. In addition, the analysis explores the process of housing and labour market interaction at sub-regional level; however, policymakers would benefit from understanding housing and labour market interaction at finer spatial scales, particularly the urban level. Whilst previous urban-based research has tended to explore the process of commuting to the city centre from surrounding areas, the analysis of housing and labour market interaction could explore the interaction between different housing submarkets and workplace locations at urban level.

One of the criticisms of the research is that it is unable to get 'beneath' the statistics to explore the processes shaping the interaction of the markets. However, the analysis of the interaction of the markets undertaken here could be complimented by a study that explores issues such as residential, workplace location, and commuting decision-making at household level in order to 'humanise' the secondary commuting data. This would be particularly important for informing current policy agendas, which at present are driven by a macro-economic conceptualisation of the interaction of housing and labour markets and fail to consider the issues driving housing and labour market interaction at the micro-level.

A further direction for future research is to extend the analysis of the 'people' and 'place' factors to consider the effects of additional processes on housing and labour market interaction. This might include exploring issues such as the effect of deprivation and the spatial mismatch of housing and jobs on housing and labour market interaction (Coombes and Raybould, 2001). Recent work has illustrated that commuting is an important mechanism for overcoming labour market decline (Bailey and Turok, 2000), and this focus might be extended to explore commuting as a coping mechanism for people living and or working in low demand housing areas and areas where housing affordability is an issue. Indeed, this is particularly relevant in relation to the current sustainable communities and urban renaissance agendas. In addition, future research might extend the analysis of the decentralisation process to explore the characteristics of migrants moving between different residential locations and commuters travelling between different residential and workplace locations through the disaggregated SMS and SWS datasets. This would further inform the understanding of the nature of the decentralisation process underpinning the interaction of the sub-regional housing and labour markets.

Concluding Comments

From the outset of the research, it is highlighted that housing and labour market interaction is a relatively recent development in a continuing academic and policy debate that has traditionally considered housing and labour markets in isolation from one another (Hanson and Pratt, 1988; Allen and Hamnett, 1991b; Wong, 2002). The link between home and work has long been recognised (Hanson and Pratt, 1988). However, our understanding of the home-work link has become relatively static and narrowly focused on the urban level (see Horner, 2004). This is reflected in the dominance of the access-space model over the last thirty years and the emergence of the polycentric model over the last decade in particular. Such models have provided and continue to provide important theoretical and empirical insights into the functioning of urban areas. However, the traditional modelling approaches have failed to capture the complexities associated with the process of housing and labour market interaction (Van der Laan *et al*, 1998; Wong, 2002), which has been compounded by a lack of quality data to allow the modelling of such processes (Wong, 1998a). In addition, the extension of commuting patterns, the increasing disintegration of home and work, and the recognition of the mediating role of the household in structuring the interaction means that the processes inherent in housing and labour market interaction have not been adequately captured by the narrow focus on residential and workplace location trade-off at urban level.

In order to understand the interaction of housing and labour markets it is important to recognise the multi-scalar nature of the interaction and the dynamics of the processes involved, particularly commuting, migration, and the role played by 'people' and 'place' factors (Owen and Green, 2005). In addition, whilst the home-work link at household (Green, 1997; Jarvis, 1999), urban, and regional levels (Eliasson *et al*, 2003) has been acknowledged *to an extent*, the sub-regional level has been neglected. However, the rise of the sub-regional level in planning and policy agendas means that there is a pressing need to engage in debates surrounding such processes at the sub-regional level

(Roberts and Baker, 2004). The research undertaken in this thesis is exploratory; however, arguably the most significant outcome of the research is the finding that housing and labour market interaction requires a more structured and explicit focus in academic and policy circles. Without such a focus, the interaction of housing and labour markets will continue to be inadequately addressed within national and regional policy agendas. Thus, the issues raised in the thesis are intended to provide a stimulus for further academic and policy debate over housing, labour markets, and their interaction as well as their role in the future of spatial planning in the UK.

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Appendix A

Adapting the Urban-Rural Classification

Adapting the Urban-Rural Classification

The disintegration of residential and workplace locations through employment and population decentralisation and increasing levels of car ownership has resulted in alternative types of commuting patterns complimenting the traditional pattern of commuting from urban and suburban areas to city centres (Van der Laan, 1998; Wong, 2002). The official urban-rural classification (Bibby and Shepherd, 2004) has been identified as a tool through which to analyse the different patterns of commuting between different types of residential and workplace locations, in order to elucidate the nature of the interaction between housing and labour markets. However, a negative aspect of the classification is that it does not identify city centres or the town centres of urban areas outside the city centre because the *urban* category includes all settlements, which have a population of 10,000 people or more. Therefore, it was necessary to adapt the official urban-rural classification to include city centre and urban town centre categories in order that both traditional and non-traditional patterns of commuting can be identified.

However, it is remarkably difficult to find a widely utilised method, which has been consistently applied to delineate city centre and town centre boundaries (Alperovich, 1982)[27]. A successful and long-standing method, which has been used to identify CBDs in both monocentric and polycentric modelling is the employment density function (see McDonald, 1987; McDonald and McMillan, 1990; McMillan, 2003). This is based on the assumption that in the monocentric model, all employment is concentrated in the CBD and that in the polycentric model, a CBD exists, where employment values are high, but which is complimented by subcentres surrounding the CBD (Anas *et al*, 1998). Therefore, it is reasonable to assume that the city centres and urban town centres will retain a significant proportion of employment opportunities. It was decided that employment density provides a useful approximate indicator of city centres and urban town centres. However, one problem with simply using the highest density peak to identify city and urban town centres is that there is no established value above which an area or group of areas can then be considered a 'city centre' or 'town centre'.

[27] A number of approaches have been applied in specific and detailed studies of city centres, such as land-uses, floor space indices and gross rateable values (Carter and Rowley, 1966).

Therefore, the method for identifying approximate city centres and town centres in this research has been developed to provide an approach, which standardises the identification of the two locations based on employment densities. The approach contains two core components: 1) city centres and town centres should be composed of base units with *statistically significant employment densities* and; 2) city centres and town centres should be composed of either a *single base unit or a group of contiguous base units.* The approach can be used to identify statistically significant employment densities, and is calculated in three steps:

1. Calculate the employment density values at the desired level of spatial unit (in this case wards).
2. Ascertain that the density values are normally distributed at the 5% confidence level using the Kolomogorov-Smirnov (K-S) test for normality. If the distribution does not conform to a normal distribution, transform the employment density values through logarithmic transformation to convert the values to a normal distribution.
3. Convert the employment density values (or logarithmically transformed employment densities) into z-scores. Identity those locations that have *exceptional* concentrations of employment by identifying z-scores of 1.65 for town centres and 2.33 for city centres. The 1.65 level represents the 95 per cent level of statistical significance and the 2.33 value represents the 99 per cent significance level for a one-tailed test[28]. A one-tailed test is adopted because it is likely to prove less restrictive in identifying areas with lower employment densities. It is assumed that CBDs of larger cities will have significantly higher proportions of employment concentrated in its boundaries than town centres, which is why two different significant levels are adopted. Those base units that have a z-score of 1.65 or above are classed as 'town centres' and those base units with z-scores of 2.33 or above are classed as 'city centres'. In areas where one base unit exceeds the 99 per cent significance level (2.33 or above) but a contiguous base unit only exceeds the 95 per cent

[28] If a one-tailed test is adopted it is only the upper-tail of the distribution curve that is of interest. Therefore, all z-scores will be positive values whereas in a two-tailed test negative values would also be used.

significance level (1.65) then the lower density base unit is removed because it does not meet the requirement that base units or contiguous base units have statistically significant employment concentrations. Indeed, in such circumstances, the lower density base unit is likely to reflect the influence of the city centre on surrounding areas rather than being part of the city centre itself. In relation to identifying city centres and town centres, z-scores allow those wards that have statistically significant employment densities to be identified as opposed to identifying city centres and town centres based on an arbitrary cut-off value.

The first stage of the approach was to calculate the employment densities for all the urban wards in the North West defined by the official-urban rural classification. The employment densities were calculated by dividing the number of workers in each ward (workplace population) by the size of the ward in hectares, an approach recommended by MacDonald (1987) when identifying employment subcentres. However, it was recognised that by using the z-scores as a means of identifying statistically significant employment densities that the areas with the highest employment concentrations would bias the results because of the effect that the high concentrations would have on the mean and standard deviation. Therefore, during the first stage it was decided to split the wards into sub-regions and to calculate the employment concentrations of wards as individual sub-regions. Therefore, the wards of Lancashire, Cumbria and Cheshire were divided into their sub-regions. However, due to the nature of the M62 corridor, particularly with the 'blurring' at the boundaries of Greater Manchester and Merseyside, it was decided to calculate the values for the metropolitan areas of the region together (i.e. the urban-industrial sub-region adopted during the research).

In relation to the second stage, the density values were subjected to the Kolomogorov-Smirnov test (K-S test). The K-S test compares the values in the sample to a normally distributed set of values with the same mean and standard deviation. If the test is non-significant ($p > .05$) the distribution of the sample is likely to be normal. If the test is significant ($p < .05$) then the distribution differs from the normal distribution (Field, 2005). The results of the tests for each sub-region are presented in Table A.1.

Table A.1: The Kolomogorov-Smirnov (K-S) Test for Normality for each Sub-Region

Sub-Region	**Statistic**	**Degrees of Freedom**	**Significance**
Cumbria	.194	64	.000
Lancashire	.231	221	.000
Urban-Industrial Belt	.230	366	.000
Cheshire	.270	108	.000

The results highlight that the density values are not normally distributed. In relation to the urban-industrial, the employment density value *D* (366) = 0.30, *p* < .001 were significantly non-normal[29]. This was also the case in relation to Cheshire (*D* (108) = 0.27, *p* < .001), Lancashire (*D* (221) = 0.31, *p* < .001), and Cumbria (*D* (64) = 0.19, *p* < .001).

Thus, the second stage was to standardise the employment densities by converting the employment density values logarithmically, to ascertain a normal distribution for all of the sub-regions. The third stage was to convert the logarithmically transformed values into z-scores.

The approach identified 32 wards that met the 1.65 cut-off value. Of these, 7 wards met the 2.33 cut-off value. Interestingly, the approach was successful in that it identified two contiguous wards above the 2.33 cut-off value that formed Liverpool's city centre and two that formed Manchester's city centre. It also identified 1 ward above the 2.33 cut-off value that formed Chester's city centre, 1 that formed Preston's city centre and one that formed Lancaster's city centre. One of the issues raised earlier was the problem of identifying a ward above the 2.33 cut-off value which theoretically forms a city centre but a contiguous ward failing to meet the cut-off value and falling into the urban town centre category. This was the case in relation to Liverpool, Manchester, Chester, and Preston. Liverpool had two additional wards above the 1.65 cut-off contiguous to the wards that exceeded the 2.33 cut-off value, Manchester had an additional 3 and

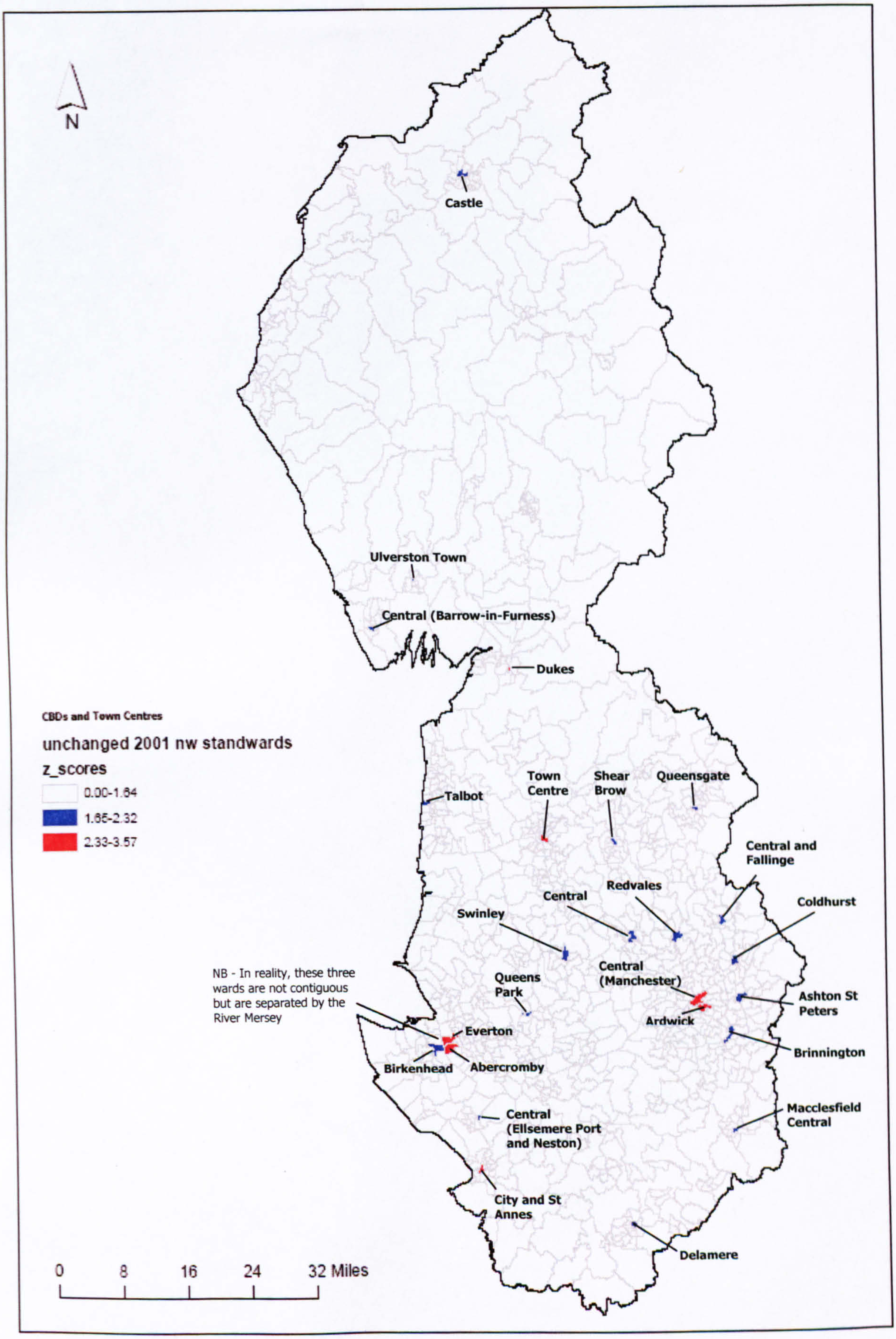
[29] *D* is the test statistic for the K-S test and the bracketed number is the degrees of freedom (*df*) from the output table (Field, 2005).

Chester and Preston had an additional 1 ward each respectively. As such, in line with the framework outlined earlier, those wards were removed and only the wards that exceeded the 2.33 cut-off value were retained. The final identification of the city centres and urban town centres is outlined in Table A.2 and Figure A.1. The final area-based classification adopted in the research is outlined in Figure A.2.

Table A.2: Standardised Employment Density Values after Logarithmic Transformation for Wards Exceeding the 1.65 and 2.33 Cut-Off Values (one-tallied)

Sub-Region	Ward Name	Associated Urban Area	Logarithmically Transformed z-Scores	Classified as CBD or Town Centre
Metropolitan Areas	Birkenhead	Birkenhead (Merseyside)	1.82	Town Centre
	Abercromby	Liverpool	2.51	**City Centre**
	Everton	Liverpool	3.19	**City Centre**
	Queen's Park	St Helens	1.66	Town Centre
	Swinley	Wigan	1.94	Town Centre
	Central	Bolton	2.12	Town Centre
	Redvales	Bury	1.70	Town Centre
	Central and Fallinge	Rochdale	2.17	Town Centre
	Coldhurst	Oldham	1.97	Town Centre
	Ashton St. Peters	Tameside	1.83	Town Centre
	Brinnington	Stockport	1.69	Town Centre
	Central	Manchester	3.57	**City Centre**
	Ardwick	Manchester	2.33	**City Centre**
Cheshire	Delamere	Crewe	1.87	Town Centre
	Macclesfield Central	Macclesfield	2.30	Town Centre
	City and St Annes	Chester	2.69	**City Centre**
	Central	Ellesmere Port and Neston	1.77	Town Centre
Lancashire	Talbot	Blackpool	2.22	Town Centre
	Town Centre	Preston	2.44	**City Centre**
	Shear Brow	Blackburn	2.13	Town Centre
	Queensgate	Burnley	1.66	Town Centre
	Dukes	Lancaster	2.63	**City Centre**
Cumbria	Central	Barrow-in-Furness	1.77	Town Centre
	Ulverston Town	Ulverston	1.78	Town Centre
	Castle	Carlisle	1.88	Town Centre

Figure A.1: Location of City Centres and Town Centres



Notes: Red wards denote city centres, and blue wards denote town centres.

Figure A.2: Final Area Based Classification