EARLY CAREER ARTICLE

Changing home-to-work travel in England and Wales

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In the UK, functional city-regions are usually determined by travel-to-work areas (TTWAs): discrete bounded areas defining a threshold for self-containment for commuters. Since their establishment in the 1980s, changes in commutes have pushed TTWA boundaries further. This can only be observed through historic comparison at the sub-regional level, which has not been possible due to data limitations. By systematically analysing commuting patterns between 1981 and 2001 using geographically consistent data, this paper looks at longer-term socio-economic dynamics affecting the structure of city-regions. The findings are critical in anticipation of updated TTWAs based on 2011 Census commuting data.

Keywords: polycentric regions; regional planning; commuting; travel-to-work area; UK Census; England and Wales

Introduction

This paper examines the effects of socio-economic change on the evolution of functional regions in England and Wales between the censuses of 1981 and 2001 (the most recent available data). The analysis provides an overview of how recent socio-economic changes have affected the journey-to-work flows within and between published travel-to-work areas (TTWAs) corresponding to the two census years. Since their establishment in the 1960s, TTWAs have provided a steady stream of information on functional regions in England and Wales with snapshots on settlement patterns corresponding to each census year. TTWAs have been used in empirical work as they are considered to be a reliable regional representation for statistical and econometric analysis. However, in their current form TTWAs do not reflect the subtleties resulting from socio-economic changes, thus reducing the significance of statistical measures in empirical work and limiting the effectiveness of policy targeting these regions. This paper aims to illustrate the implication of the changing socio-economic structure in England and Wales for the design of TTWAs to be derived from the most recent UK Census conducted in 2011.

Changing travel-to-work areas in England and Wales

Functional urban representations are an essential part of spatial analysis as they bring to light dynamics that are not easily discernible. These representations have a long history that dates back to 1885 and have continued to maintain the attention of researchers (for an overview, see Rae, 2009). The most commonly used representation of functional regions in the UK is TTWAs (Figures 1 and 2) published by the Office for National Statistics (ONS).

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The creation of TTWAs was based on the identification of a core economic area and a functional region. The functional region was designated by using commuting data. The daily commute to work has been a crucial element of labour research, both in forming the backbone of the most prevalent market area definitions but also for providing a means of adjustment between local labour markets (Gordon, 2003). TTWAs differ from analytical approaches used in academic research mainly due to the need for identifiable bounded regions. For any TTWA there has to be a defined centre where all flow terminates; the origins of these flows have to be in a distinct region that surrounds that centre. However as researchers have pointed out, the diverging experiences of various

Figure 1. Average travel distance to work 1981 map. © Crown Copyright/database right 2010. An Ordnance Survey/EDINA supplied service.
labour groups in the post-industrial economy have decreased the relevance of a unified labour market (Hanson & Pratt, 1992; Hincks, 2012; Jones, Williams, Lee, Clayton, & Morris, 2008; Turok, 1999). Although the quest for a more comprehensive labour representation is longstanding (Goldner, 1955), the importance of geographical diversification on the establishment of wages and the spatial dynamics of labour markets has not been fully picked up by the economic research community (Combes, Overman, Duranton, & Venables, 2006). However, assuming a single market definition excludes overlapping conditions such as adjacent centres, clusters or polycentric structures, which are becoming more prevalent within the post-industrial economy, this paper looks at the
complex nature of functional relationships underlying commuting patterns that would necessitate the adoption of a more detailed and flexible representation for TTWAs.

The complexity of commuting patterns within TTWAs can be seen from the average travel distance to work maps for 1981 (Figure 1) and 2001 (Figure 2), which were created by calculating distances using origin–destination tables at ward level for the 1981 and 2001 UK Census Interaction Datasets. The dataset is part of a consistent set of 8800 statistical wards across England and Wales that have been created by the Centre for Interaction Data Estimation and Research (CIDER) to compare census interaction data for 1981, 1991 and 2001 (ONS, 2007). In order to compare both census years, the 1981 map uses data that were recalculated for 2001 statistical wards by CIDER. These maps overlay TTWAs for 1981 and 2001 on top of average travel distances to employment locations within each statistical ward. The maps show the extent of changes in commuting distance between the two years, which appears as a general increase in commuting distance across England and Wales. The changes in TTWA boundaries demonstrate that they have increased in size to accommodate this increase. When the maps are compared it can be observed that the average commute has increased mainly in medium-sized settlements. Moreover in 1981, short-distance commutes (less than 10 km) occurred in wards all across the country, whereas in 2001 these short commutes were found in fewer wards and appeared mainly in the centre of metropolitan areas. Overall, the distance to work has increased between 1981 and 2001, although this increase has not been uniformly distributed across space. These findings have important implications for the calculation of boundaries for TTWAs. Within the current definition the ONS determines the functional area by specifying a uniform threshold for self-containment. However, the use of a single self-containment value for all the UK would not reflect the diversification of commuting distances that is seen in 2001.

As a particular example, when the number of TTWAs in the London region for 1981 and 2001 is observed it can be seen that the number of TTWAs has decreased in 2001 with London appearing as a single, large TTWA. If commuting distances have continued to increase around metropolitan areas in the decade to 2011, this effect could be felt in settlements surrounding London, such as Reading. As a result, the Reading TTWA region may disappear and be ‘captured’ by a much larger London TTWA. This would have important implications for policy since it would greatly increase the size of the labour market and include multiple administrative areas within one region. The impression given by the average travel distance to work maps is that England and Wales have assumed a more diverse settlement pattern, where individual characteristics of settlements are becoming more important in the determination of their functional roles. This is especially the case for settlements surrounding metropolitan areas, which are not only strengthening their ties with the metropolitan areas but also individually increasing their draw for workers. If this trend continues to 2011, one would expect to see more polycentric functional regions with fuzzy boundaries.

**Changes in commuting distance ranges**

The functional structure of settlements has changed between 1981 and 2001 as a result of the general shift of commuting towards longer-distance commutes. However, there is another trend that is also affecting settlements: the increasing range of commutes adopted by a growing number of workers. The complexity resulting from a widening range of commuting distances has broken down the rigid structure of home and work
locations. This can be observed by looking more closely at the commuting profiles for two different occupational groups between 1981 and 2001.

Figure 3 shows the probability density graphs for average commuting distance for (1) All Workers, (2) Professional Occupations\(^2\) and (3) Material Processing Occupations\(^3\) from the 1981 and 2001 censuses. The occupational classifications have changed from 1981 to 2001, thus the comparison would solely be applicable amongst the two occupations for each census year. In the probability density graphs in Figure 3 the mode is the value with the highest probability. As the graphs measure average commuting distance in each ward, the mode indicates the average distance that appears most frequently across statistical wards in England and Wales. The ranges demonstrate average commuting distances to work in each ward, so a range of 35 km means that the average commuting distances for all wards differ by 35 km across the country. These are not absolute values so there will be wards with actual commuting ranges that are much higher than this value (e.g. 100 km) so it is important when referring to the graphs to keep in mind that a range in averages translates into much higher absolute ranges of commuting. The function for destination probability densities for all workers has shifted to the right from 1981 to 2001 demonstrating that the average commuting distances have increased. The mode for all commuters has increased by 49%. The range of average distance from work has increased by 13%. Thus, commuting distance and commuting range for all workers has increased. Even though the definitions for Professional and Material Processing Occupation groups of the occupation have changed between 1981 and 2001, the distance profiles for the two years for each occupational group show similar characteristics. The average commuting distance to work for Material Processing Occupations changed very little between the two census years (a value close to 7.5 km), whereas the average commuting distance for Professional Occupations increased from 8

Figure 3. Comparison of 1981 and 2001 probability distributions.
to 11 km, an increase of nearly 38%. This is an important finding due to changes in the share of each occupation in the workforce. Whereas the percentage of Material Processing Occupations in the workforce is substantially lower in 2001 (around 8%) than in 1981 (23%), the share of Professional Occupations has changed to a far lesser extent, falling from 14% to 11%. Initial 2011 Census results show that this divergence has become even more marked, with Material Processing Occupations falling slightly (to 7.2% of the employed workforce) and Professional Occupations rising to 17.5%.

In addition, current research on flexible work practices, i.e. working from home, telecommuting, part-time and flex-time work, shows that these practices are gaining wider acceptance amongst employers in industries that can accommodate such arrangements and are favoured by employees in professional occupations. These practices may well increase commute distances and affect home and job location preferences. Although it is not possible to determine what percentage of the representative occupations within this paper take part in such schemes, studies have shown that managerial, professional and technical occupations have had a more significant contribution to flexible work practices than manual workers (Felstead, 2012). The commuting profiles clearly demonstrate that Professional workers have widened and lengthened their commuting distance, while Material Processing workers have maintained their average commuting distance but have increased the range of their commuting distance in 2001. If this trend continues to 2011, coupled with the increasing divergence in workforce share between the two occupational groups, then a larger proportion of workers can be expected to have a wider range of commuting distances and longer average commutes to work.

Detailing the commuting distances by occupational group is important in understanding the shifts in settlement patterns between 1981 and 2001. First, the analysis shows that the labour market has shifted in favour of Professional workers. Commuting distance profiles demonstrate that whereas Professional Occupations have had access to jobs over a wider range of distances with higher commuting averages, thus expanding local and regional linkages, Material Processing Occupations were employed at a more restricted range of distances within close proximity to their homes. These shifts signify that there now exist exclusive spatial realities for different segments of the working population. Second, the dispersion of employment and housing locations has increased the average commuting distance across England and Wales. Concurrently, because employment locations and labour pools are not concentrated in large urban centres, commuting distances have become more variable. This dynamic, coupled with forces from the labour market, may eventually break traditional ‘bounded’ regional divisions and create heterogeneous functional networks in certain areas of the country. By relaying information on differences amongst occupations, the analysis has brought to light spatial and functional divisions within the working population.

Conclusion
The changes brought by the knowledge economy have shifted the commuting preferences for some occupations over a wider spread of distances with longer distance commutes becoming more prevalent. The results indicate that ‘fuzzy’ boundaries of occupations have created a more interconnected and flexible functional region. The analysis for a period of 20 years at ward level has unearthed valuable insights into one of the more subtle but crucial socio-economic dynamics affecting settlement patterns. If the trends between 1981 and 2001 continue, it would be expected that there would be
serious consequences on the determination of functional regions based on the 2011 Census. In their current form, TTWAs do not reflect the subtleties resulting from socio-economic changes, thus reducing the significance of statistical measures in empirical work and limiting the effectiveness of policy targeting these regions.

Governments can create a comprehensive regional development policy by incorporating more refined TTWAs within economic growth measures. Within the UK context, the current shift from a government-led regional policy perspective to a public–private partnership model under the Local Enterprise Partnerships programme would require a good understanding of the local and regional labour markets to be effective. It is essential that the partners determine the most advantageous economic zone for their projects. This is especially critical for enterprise zones that fall within complex TTWAs that include a mixture of different labour groups in several economic sectors with varying geographical boundaries that overlap each other. The multilayered TTWA would reveal the real extent of intervention needed for each subsector. This would enable partners to determine potential cross-benefits between neighbouring enterprise zones. The use of a more refined definition would also help determine how the impacts of such interventions need to be assessed, especially when it comes to job and business creation. Within the changing dynamics of the labour force, an inclusive labour policy, which focuses on the diverging spatial realities of occupations, would yield a more equitable distribution of resources. An important step in achieving this would be to revise the current theoretical construct of TTWAs to address the diversity of settlement characteristics and represent the functional footprint of different occupations to reflect their specific distance profiles.

Within a broader policy context the European Union has recently announced a new harmonized definition of functional city-regions, resulting from its collaboration with the Organisation for Economic Co-operation and Development (OECD) covering 828 ‘greater cities’ in the European Union, Switzerland, Croatia, Iceland and Norway. The purpose of this new definition has been to bring together the various settlements across the OECD and the European Union under a single regional definition in order to provide for ‘cross-country analysis of cities’ (Dijkstra & Poelman, 2012). This new method proposes the definition of a city core, based on a density criterion, and a functional region for that city that incorporates surrounding settlements based on a threshold level of commuting between the localities. While commending a big step in spatial harmonization across such a wide territory, it would be beneficial to extend this definition to provide more detailed analysis of the impact of socio-economic changes on functional areas for the sampled cities. This would be an advance on the goal of attaining territorial cohesion, as charted by the European Union within the Lisbon Treaty, as well as creating a more inclusive labour force. The analysis demonstrates the potential for a revised TTWA construct for the 2011 UK Census with the possible extension to the wider European Union community as an effective tool for regional development and territorial cohesion.

Notes
1. See http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/other/travel-to-work-areas/index.html/. Retrieved July 15, 2012.
2. In the UK Census, occupation is most often determined by reference to a person’s main job at the time of reference (ONS, 2000). Professional Occupations are all workers within ‘Professional and related in education, welfare, and health’; ‘Literary, artistic and sports’; ‘Professional and related in science, engineering, technology and similar fields’ in 1981; and ‘Professional occupations’ in 2001.
3. Material Processing Occupations are all workers within ‘Materials processing: making and repairing (excluding metal and electrical)’; ‘Processing, making, repairing and related (metal and electrical)’; ‘Painting, repetitive assembling, product inspecting, packing and related’ in 1981; and ‘Process, plant and machine operatives’ in 2001.

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