



Econometric analysis of the link between public transport accessibility and employment



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ABSTRACT

Modern transport policy analysis has ceased to be mainly about transport impacts and is now focussed on the effects of provision and policy upon the operation of the economy and society. For people on the edge of the labour market, many of whom do not have access to other forms of transport, public transport is a very important source of accessibility to jobs.

This analysis addresses what we see as a key research gap in Britain - whether there is a systematic variation in the level of employment at the local level with the quality of the public transport network. To address this we apply regression analysis to explain employment as a function of accessibility and other local labour and socioeconomic variables. Our data were based on a cross-section of output areas from the English part of the 2011 Census. We found a statistically significant relationship suggesting that, all else being equal, areas with shorter public transport times were associated with higher employment levels.

1. Introduction

Modern transport policy analysis has ceased to be mainly about transport impacts and is focussed on the effects of provision and policy upon the operation of the economy and society. For people on the edge of the labour market, many of whom do not have access to other forms of transport, the bus and other forms of public transport (PT) are very important sources of accessibility to jobs. Analysis of the English National Travel Survey (Mackie et al., 2012), found that 30% of people are frequent bus users (once a week or more) with over half of 16–19 year olds and over a third of 20–29 year olds frequent bus users. 70% of those with no car available use the bus frequently compared with 20% of those with car available.

In this paper we aim to empirically model the sensitivity of employment to differences in PT accessibility. This is a relatively unexplored area in Britain with difficult data requirements but here we make use of the 2011 Census, national spatial data sources and additional data provided to us by the UK's Department for Transport (DfT) based on data published in DfT (2014a).

Our research approach is to estimate cross-sectional models of employment and PT travel times separately for each of four levels of urban density across England. Our data is generated by matching information from the 2011 UK Census at the middle-layer super output areas (MSOA) with PT accessibility data from the DfT. These data

permit us to investigate the relationship between spatial differences in PT (and car) accessibility and differences in employment rates, controlling for localised factors such as population, car availability etc.

Our work contributes to the existing research in a number of ways. First, the analysis looks at this relationship across the population at large, not just the vulnerable. We derive our results from persons living throughout England, not just in one state or region, as many other studies have done, allowing us to compare the labour supply impacts in different area types. Our findings add to the empirical evidence base for the linkage between public transport accessibility and employment to help inform UK public transport policy. Our results are potentially transferable to applications where the sensitivity of labour supply response to improvements in accessibility is required, such as in the estimation of wider economic impacts of public transport improvements. We use an Instrumental Variable approach to address the issue of causality in the relationship between public transport accessibility, car ownership and employment.

It is not the purpose of this paper to examine the appropriate context for valuing the contribution of employment to the economy. For an up to date summary of the state-of-the-art in examining the linkage between transport and the economy and its context within current appraisal practice, see Venables et al. (2014).

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2. Literature review

2.1. Introduction

The link between transport accessibility and employment has long been a policy issue and a research area in the planning, geography and transport literature. Much of the early research was linked with the spatial mismatch hypothesis. Segregation of housing by race and the increased suburbanisation of employment in the US led to difficulties for low skilled minority workers accessing employment leading to a spatial mismatch between workers and employment (Kain, 1968).

In their review of the SMH literature, Ihlanfeldt and Sjoquist (1998) list limited public transportation as a premise behind difficulties in finding work for minorities. A strand of this SMH research (Studies such as Sanchez (1999), Taylor and Ong, 1995, Kawabata (2003), Berechman and Paaswell (2001), Yi (2006)) has emerged to establish whether transport accessibility is associated with employment outcomes. Some more recent studies focus on whether the spatial mismatch problem could be addressed through improving public transport access to suburban jobs (Holzer et al., 2003, Tyndall (2017), Ong and Houston (2002)). Other studies look at impacts of improved access to both forms of transport (Cervero et al. (2002), Smart and Klein (2015) and Blumenberg and Pierce (2014)). The US based findings are clear in the importance of access to private transport but inconclusive as to the relative importance of private and public transport.

In a European context there is a different spatial distribution of residential areas. City areas are generally less dispersed with more developed public transport networks than in the US. Over the past few decades European city areas have become less compact with the city centres hosting more wealthy neighbourhoods and a higher concentration of skilled employment areas with less affluent areas and lower skilled jobs in the suburbs (Korsu and Wenglenski (2010) and Turok and Edge (1999) for the British context). In Britain this dispersion remains a lot less than in the US (Summers, 1999). Compared to the US, there are lower car ownership levels and consequently higher use and development of public transport networks (Downs, 1999). This emphasises the important role that public transport plays in facilitating employment. Houston (2005) highlights the scope for both improvements in public transport access to out of town employment sites and better access to private transport to promote employment.

In Britain there are considerably fewer studies but some limited evidence for the SMH (see McQuaid et al., 2006), based largely around segregation by skills/demographic characteristics rather than by race, ie lower skilled workers can be employed far from where they live. Houston (2005) also highlights that those in social housing are more likely to be affected by unemployment due to their lack of mobility. Patacchini and Zenou (2005) examine job search intensity using British sub-regional aggregate data and find higher commute times and lack of car access yield less search intensity. McQuaid et al. (2001) also look at job search behaviour in Edinburgh and find areas of high unemployment were typified by lower willingness to travel to work times. Fieldhouse (1999) examines the racial dimension but finds the SMH doesn't explain differences in unemployment rates amongst ethnic minorities in London. Whilst ethnic minorities were living in high unemployment areas, unemployment was a general problem for all workers in these areas and there was no evidence this was a product of the mismatch of people and jobs, but rather linked to housing, skills and demographic factors. Dujardin et al. (2008) and Gobillon and Selod (2006) find similar limited evidence of SMH in that urban employment in Brussels and Paris respectively is affected by socioeconomic factors but not by accessibility to jobs.

Studies deal with accessibility in different ways. In some studies accessibility is simply a transport measure captured by the number of public transport nodes within a particular radius (Ong and Houston (2002)) or the proximity to the nearest transport node (Holzer et al., 2003; Sanchez, 1999) or measures of route density (Rice, 2001). Other

approaches look at accessibility to jobs either by mode or on average, using average commute times (Ihlanfeldt and Sjoquist, 1991; Cervero et al., 2002; Ozbay et al., 2006; Berechman and Paaswell, 2001) or numbers of jobs within a particular public transport travel time radius (Smart and Klein, 2015; Gibbons et al., 2012). More sophisticated gravity based formulations (eg Kawabata, 2003; Yi, 2006; Sanchez et al., 2004) account for the spatial distribution of employment with an impedance measure based on travel times or costs.

A crucial aspect to such analysis is on establishing a causal relationship between accessibility and employment. Transport accessibility does not vary randomly between areas. As Tyndall (2017) observed, there is a possible codetermination between economically developed areas and areas with better public transport accessibility. However, the linkage could possibly work in reverse - Glaeser et al. (2008) observe that the urban poor without cars move to areas with better public transport access to improve their access to employment opportunities. Recent work undertaken by the What Works Centre for Economic Growth (2015) has highlighted the importance of establishing (and the current lack of) a credible evidence base on the linkage between transport and the economy. Of the six studies which passed its criteria for consideration looking at employment effects of road based projects, only two actually identified positive employment effects. They found no high quality evaluations on employment effects of rail infrastructure, trams, buses and active modes on any economic outcomes.

2.2. Public transport and employment

Public transport represents an option for improving access to employment opportunities. However, as noted by Ihlanfeldt and Sjoquist (1998), other factors such as lack of information on job availability and discrimination and lack of skills are at least as important in affecting employment levels for inner city, low income groups. Whilst there is much work in the subsequent literature on the spatial separation between jobs and homes, there is less work on the impact of commuting times or distances.

2.2.1. Public transport and local labour market outcomes

Sanchez (1999) uses a cross section of block¹ group census data and GIS to analyse the location and employment characteristics of workers with varying levels of accessibility to transit for the cities of Portland Oregon and Atlanta Georgia. He finds that transit access, but not always frequency, is a significant factor in determining average rates of labour participation of areas within these two cities.

Work by Buchanan (GLA Economics, 2009), forecasted the distribution of future employment growth in Greater London, specifically focusing on the relationship between employment and public transport and highway accessibility. Accessibility indices were calculated using a gravity model applied to zonal population and zone-to-zone generalised time measures. They found that public transport accessibility explained around 85% of employment density and conclude that employment clustering in Central London is almost entirely dependent on public transport access. However, their analysis includes no other localised explanatory factors.

Very few aggregate studies deal with the endogeneity between transport accessibility and employment outcomes. The ideal way to establish causality is to compare employment impacts in areas which have been subject to a random natural shock or policy induced 'quasi-random' change in transport accessibility with control areas which haven't had such changes in accessibility. Gibbons et al. (2012) estimate employment impacts using a panel database of employment at the ward level married to measures of road construction schemes. They deal with the issue of endogeneity by looking at the impact of these schemes in

¹ Blocks are statistical divisions of census tracts, generally defined to contain between 600 and 3000 people.

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