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First/last mile transit access as an equity planning issue ☆

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ABSTRACT

Previous studies have established that residents of low-income neighborhoods in major metropolitan areas have access to many more jobs by car than by transit. In this paper, we revisit this question and present evidence on how the mode of transit station access/egress (by walking, bicycling, or driving) can importantly influence the gap between car and transit accessibility in the San Diego region. We construct two accessibility measures to analyze low-wage job access by transit: (1) the number of low-wage jobs accessible within a 30-min commute and (2) the number of low-wage jobs within a 30-min commute adjusted by the number of potentially competing workers who live within 30 min. We then simulate several policy changes that could reduce the difference in transit vs car accessibility. Examples include using faster station access/egress modes such as bicycling and driving to or from transit stations and reducing transit service wait time. Our results demonstrate that in the San Diego region, if transit riders walk to/from transit stops, low-wage job accessibility by car is almost 30 times larger than low-wage job accessibility by public transit. We find that changing the mode of access and egress to and from stations is more effective at improving transit access to low-wage jobs than policies that reduce transit wait time or improve service headway. Given the transition of transportation to a "service" or "sharing" economy, these results have important implications for how to improve access to employment in low income neighborhoods.

1. Introduction

The transportation literature has a long history of studying access to employment (e.g., Kain, 1968; Taylor and Ong, 1995; Shen, 2001; Wenglenski and Orfeuil, 2004; Grengs, 2010) and first-last mile transit access (e.g., Chandra et al., 2013; Lesh, 2013; Wang and Liu, 2013). Perhaps surprisingly, those two topics have not been directly linked in previous research. Our contribution in this paper is to provide evidence that the mode of first-last mile access/egress can be an important tool in improving public transit's ability to provide job access. We argue that the policy and research literature has overlooked an important relationship between station or stop access/egress and the equity characteristics of transit accessibility.

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For decades, scholars have studied the equity implications of transportation access to employment (Wenglenski and Orfeuil, 2004; Kawabata and Shen, 2006, 2007). The spatial mismatch hypothesis, first conceptualized by John Kain in the 1960s, explains higher rates of African American unemployment compared to whites as a result of residential segregation that isolated African Americans in inner city ghettos distant from growing concentrations of suburban employment (Kain, 1968). Since that seminal work, decades of empirical studies have tested the impact of job access on the economic outcomes of potential workers. While early studies emphasized physical distance to employment, spatial mismatch studies since the 1990s have demonstrated the importance of travel mode in understanding inequities in job accessibility. Within the U.S. context, there is a considerable gap in the number of potential job opportunities accessible by cars and public transit (Shen, 1998, 2001; Kawabata, 2003, 2009; Blumenberg and Hess, 2003; Blumenberg, 2004; Hess, 2005; Kawabata and Shen, 2006, 2007; Grengs, 2010).

Yet while the recent literature has focused on accessibility differences across travel modes, the role of "first/last mile" transit access has not been well-addressed. Several studies have found that access/egress time accounts for a large portion of total transit travel time (e.g., Krygsman et al., 2004). Others have discussed how better access/egress mode increases transit use (e.g., Martens, 2007), which may imply the significance of improving access to transit stops/stations in increasing job accessibility. The significance of transit access/egress improvements in encouraging more active transport and reducing obesity risks is also a topic of empirical studies (Handy et al., 2002; Rundle et al., 2007). However, investigation of a direct link between transit access/egress and job accessibility is missing in the literature. In this study, we directly examine the extent to which the means of travel to and from transit stops affects transit-based job access, and in so doing we illuminate policy approaches that have been overlooked in the literature. We address two sets of questions. First, to what extent is employment access by car superior to employment access by transit in low-income neighborhoods? Second, how does the degree of disparity in job accessibility by the two modes, car versus transit, change when we improve "first/last mile" access to transit stations?

We use the San Diego region as a case study. Like many U.S. cities developed in the 20th century, San Diego is characterized by auto-oriented urban development. Its transit service is less extensive and frequent than cities such as Boston or Los Angeles, where many studies on car-transit job access disparities have taken place (Shen, 1998, 2001; Kawabata, 2003, 2009; Blumenberg and Hess, 2003; Blumenberg, 2004; Kawabata and Shen, 2006, 2007). Looking at the importance of travel mode in accessing employment in San Diego can shed light on job accessibility as an equity issue in other more typically auto-oriented U.S. cities.

To answer the first question, we use two measures of accessibility to analyze low-wage job access by transit and by car. We use the number of low-wage jobs that can be reached in a 30-min travel time, by car and transit, and the number of low-wage jobs within a 30-min commute adjusted for the number of low-income job seekers who live within 30 min of those jobs and hence who can reasonably be assumed to compete for those jobs. Throughout this paper, we focus on low-income job seekers, who are assumed to seek low-wage jobs and to be potential low-wage workers, and their access to low-wage job opportunities. Using detailed transit network data obtained from the San Diego Association of Governments (SANDAG), we decompose transit travel time to/from all census tracts in San Diego County into different components, including in-vehicle travel time, time spent waiting while transferring on transit, and time spent on accessing/egressing to/from transit stops. This allows us to explore the relative contributions of each component of total transit travel time. We model several changes to transit station access/egress modes, including assuming station access and egress by bicycling and driving, and we compare the resulting changes in the disparity between car versus transit job accessibility. We also model policies that would reduce transit service headways (increasing service frequency), and we calculate how these reductions influence the car versus transit job access gap. Our results suggest that improving first-last mile access/egress can be a more effective way to improve transit-based job access than headway reductions.

The rest of this paper proceeds in the following sections. In Section 2 we review related research. Section 3 describes the data and methods used to measure transportation access. Section 4 gives results of the accessibility measures and gives the results of our simulations of changes to transit station access/egress mode and headway reductions. Section 5 summarizes policy implications.

2. Literature review

Since Kain (1968) first proposed the spatial mismatch hypothesis (SMH), a vast literature has tested the hypothesis, and perspectives on the subject have evolved over time. Earlier studies, conducted before the mid-1990s, focused on the physical distance between jobs and the residential location of disadvantaged groups. That literature found widely divergent evidence on the impact of physical distance on employment outcomes (for a review, see Holzer, 1991). One reason for the inconsistent results from the early SMH literature is that commuting time is determined not only by the spatial distance between jobs and housing, but also by the mode of transportation (e.g. car, rail, bus, or non-motorized travel). More recent studies incorporated the role of travel modes in accessing employment opportunities (e.g., Taylor and Ong, 1995; Hess, 2005; Kawabata and Shen, 2007).

Taylor and Ong (1995) were the first to add a modal mismatch perspective to the SMH literature. The authors argued that transportation resources – e.g. access to a car versus use of transit – are key to understanding labor market outcomes among disadvantaged populations, and that the effect of transportation resources is more important than the role of spatial gaps