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Equity in transport: The distribution of transit access and connectivity among affordable housing units



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ABSTRACT

In the United States, federal agencies are required to work towards providing equal access to resources for minority and low-income populations. Access to quality public transportation is critical for mobility to many of these populations. Determining how transit service is distributed among vulnerable groups has the potential to significantly enhance policy analysis. While many measures of accessibility exist, due to the complexity of transit networks and the scale of the urban areas, limited research has been conducted on developing a tool to measure how equitable the distribution of transit access is in a region. This paper develops a comprehensive method to quantify the quality of service and accessibility at each transit node in a network, combined with an index to measure the inequity (concentration of quality service) at the micro scale. These measures are applied to the distribution of all residential housing units, a random sampling of units and U.S. Department of Housing and Urban Development subsidized units in Baltimore, Maryland; to determine if the subsidized housing programs are achieving major policy objectives of providing equitable transit access to vulnerable groups. The results show that transit connectivity and accessibility is distributed among some types of subsidized housing units more equitably than can be achieved by random sampling in the general population, but for other types, the distribution is less equitable; indicating some policies to enhance transit access among these units have not been effective. Evidence from this study suggests that developers of affordable housing and transportation planners should work together to find development locations that place more emphasis on transit locations with high connectivity rather than simply reducing distance to any transit.

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1. Introduction

One of the most important roles that public transit serves is bridging the mobility gap between captive and choice riders. To adequately work in this capacity, groups that lack private transportation must have access to high quality transit service. For many urban residents, transit operates as their only conduit to employment opportunities (Blumenberg and Ong, 2001). A lack of access to good quality transit for these individuals can result in low employment participation and long-term cycles of poverty (Sanchez, 1999, 2004). To ensure members of vulnerable groups have equal opportunities to employment, services and goods; tools are needed to measure the distribution of transit service among the population. Such a measure exists in the equity literature, but they are infrequently applied to the transportation and housing fields.

For the last several decades it has been the goal of the US federal government to decentralize concentrations of poverty,

brought on in part by past housing policies. This effort began in the 1970s with the development of a voucher program. The program, called Section 8, placed less focus on the production of affordable housing and allowed low-income residents to more freely select their residential location. A decade later congress instituted the Low Income Housing Tax Credit (LIHTC) program that offered tax breaks to developers of affordable housing. The aim of the LIHTC program was to once again encourage the production of low-income housing. Both programs, which fall under the purview of the U.S. federal Department of Housing and Urban Development (HUD), are embedded with various goals and mandates to ensure participants of each program have access to economic, social and recreational opportunities. This study examines how well these programs spatially match low-income residents with high quality public transportation access. To conduct the analysis this, a spatial distribution equity analysis tool called the Gini index is paired with a comprehensive index of transit connectivity and accessibility.

The remainder of this paper is organized into five sections. The first section presents a review of the literature followed but a description of the methodological framework developed to analyze the issue of transit connectivity, access and equity. The third section

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describes the case study area. Results of the method application are presented in the fourth section followed by conclusions, policy implications and suggestions for further research in the fifth section.

2. Literature review

There is a rich literature examining issues of equity, housing subsidies and transit service. To better deal with this complex body of literature, the review is composed of four parts. The first section offers a discussion on the general terms of equity and its use in policy. The second section covers transportation equity specifically, followed by a discussion of subsidized housing equity. The final section discusses traditional measures of transit service.

2.1. Equity

Equity issues have been examined in the literature under a variety of disciplines. A primary focus has been on the distribution of services around a region or among a population. For instance, in geography to examine the accessibility or economic activity (Keeble et al., 1982) or the distribution of particular services (Truelove, 1993). In medicine to measure the segmentation of population and its implications on healthcare services (Bloom, 2001) and the location of health care facilities among the population (Rosero-Bixby, 2004). Beckett and Koenig (2005) apply equity to the field of sociology in general, while Kokko et al. (1999) assess how equal the application of such measures have been in the literature. In economics, Atkinson (1975) formulates the classic application of equity to income distribution, and in political science it has commonly been used for welfare analysis (Maniquet and Sprumont, 2005).

Another important area of equity analysis that has received much less attention in the literature is the match between the distribution of services and the need for those services. Allard (2008) examines the distribution of social safety-net services in several cities among high and low poverty groups. The analysis reveals that accessibility to services is critical for individuals, with a service catchment area of 3 mile. However Allard also finds evidence that neighborhoods with higher poverty rates have much less access to assistance than neighborhoods with lower rates of poverty. The findings echo others that have discovered a mismatch between individual need and location of services. Grønbjerg and Paarlberg (2001) found that counties with higher poverty rates had access to fewer non-profits per capita than lower poverty counties. Archibald and Putnam Rankin (2013) in a study of 3141 US counties concluded that locations with the greatest social need often had much worse access to health care services.

Equity is divided into two types, horizontal and Vertical (Berliant and Strauss, 1985; Kakwani, 1984; Repetti and McDaniel, 1993). Horizontal equity is concerned with the proportional distribution of an attribute among similar members of a population. Vertical equity focuses on the distribution of an attribute among specific groups (Mooney, 1996). The two types of equity are much different in scope. Where vertical equity requires that different groups receive different amounts of a benefit, horizontal equity requires that within each group of similar individuals, a similar benefit be received. More broadly and in the context of transit service provision, the two types of equity work together to emphasize that transit dependent groups should have access to equal amounts of quality transit (horizontal equity) and those in society most dependent on transit in should receive more access to transit service (vertical equity) (Culyer, 2001). The concept is applied in this paper, first to measure how much transit service access low-income households have compared to the rest of the population (vertical equity) and whether transit service

access is evenly distributed among low-income households receiving a variety of subsidized housing benefits (horizontal equity).

Many studies on the broader subject of vertical equity fall into a category of equity called Environmental Justice (EJ) (Bowen et al., 1995). EJ is generally referred to as the fair involvement of low income and minority groups in a process, or assurance of equal access to equal resources for all members of the class (Capek, 1993). The ideals of EJ have been considered important at the top levels of government. In 1994 president Clinton signed Executive Order 12898, mandating:

Each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

It is within the framework of EJ that the distribution of transportation access to certain groups can be analyzed.

2.2. Transportation equity

There is a strong need for transit, especially for many vulnerable groups. Income is closely related to transit need. Many studies have found a direct and positive relationship between vehicle ownership and rising income, that is, as household income increases so do the number of vehicles owned by a household (Dargay and Gately, 1999). The inverse of this relationship has also been found, such that a reduction in household income leads to a reduction in vehicle ownership (Dargay, 2001). Paulley et al. (2006) find evidence that vehicle ownership is directly related to the demand for public transportation; the inference being that lower income families own fewer vehicles and are more reliant on public transport. Berube and Raphael (2005) find that 20% of low income households do not own a single personal vehicle, a rate that increases in urban areas with high poverty rates. Ong (1996) finds a high rate of welfare recipients lack a personal vehicle, but argues that assisting with vehicle ownership may provide the best opportunity for employment. However, there appears to be evidence that many low-income households attempt to locate near transit, where it is available. Murphy (2010) in a recent study of US Transit Oriented Developments found that nearly 50% of residents that live “[w]ithin a half mile of existing rail stations... make less than \$25,000 a year. Within a quarter mile of existing rail stations, renters make up 65% of the population.” Given low-income households’ lack of vehicle ownership, particularly in high poverty urban areas, the apparent desire to locate near transit access points and the availability of transit in many large urban areas (like Baltimore City), it would be beneficial for subsidized housing policy to direct development such that the distribution of quality transit service benefits low income households.

The distribution of access to transportation among individuals of differing economic wealth is an issue closely related to Environmental Justice. The US department of transportation (DOT) defines what constitutes EJ in the context of transportation in three parts. First “to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.” Second, “to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.” Third, “to prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations” (USDOT, 1997). The third point in this list is the one most closely related to the goals of EJ. With this directive, the USDOT has worked with many other

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