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A Study on the Impact of Transport Accessibility on the Economic Participation of People with Visual Impairments

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Abstract. Transport accessibility is a factor affecting not only everyday mobility of people with visual impairments, but also their access to education, employment, consumption and other socio-economic opportunities. Theoretically, the paper examines the effect of transport accessibility on their economic participation. Barriers in road environments, public transport and transport information raise travel costs in terms of time, money and safety, and restrict independent mobility and access to opportunities. Better transport accessibility can help to lower these costs, make independent travel possible and expand the range of accessible opportunities." It might enhance access to education and contribute to human capital accumulation, expand the spatial scope of employment opportunities and reduce commuting barriers, as well as access to consumption and other socio-economic activities. But transport is not the sole determinant of economic participation; its effects are mediated by educational attainment, vocational skills, employment conditions and social support. Accessible transport should therefore combine infrastructure, service delivery and opportunity access, with coordinated policies in education and employment to promote economic participation and social inclusion.

Keywords: Transport accessibility, Visually impaired people, Independent mobility, Economic participation, Social inclusion

1. Introduction

Transport accessibility is more than simply whether or not people can leave their homes. It determines whether an individual can fully access educational resources, enter the labor market, carry out daily consumption and even maintain social networks. People with visual impairments face problems such as discontinuous road infrastructure, difficulties in accessing information of public transport, barriers to transfers and safety risks whilst traveling, which hinder their mobility due to limitations in the access to visual information.Therefore, even when relevant opportunities for education, employment and consumption exist in an area, high mobility costs may reduce the real accessibility of these opportunities to people with visual impairment. The World Health Organization and the World Bank point out that public perception of disability is often centered on the functional limitations of the individual and ignores that environmental barriers are the main factors that prevent people with disabilities from accessing development opportunities such as education and employment [1].

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While the existing literature provides empirical evidence for the relationship between transport and economic participation of persons with disabilities, the views are quite scattered. A systematic review of 74 studies examined the impact of transport on the employment of people with disabilities across four dimensions: public transport, employment opportunities, individual factors, and social networks, finding that improvements in transport accessibility often directly affect the ability of people with disabilities to get or retain a job [2]. The same is valid for the particular group of people with visual impairments: their mobility, as far as it exists, is in fact a prerequisite for their capacity to enter and stay in the labor market. However, despite a rich literature on transport barriers, employment or social participation separately, the overall mechanism in which transport accessibility further affects economic participation of people with visual impairments through independent mobility remains under-analyzed systematically.

This paper takes a theoretical analytical perspective in which transport accessibility is treated as an important environmental factor affecting the economic opportunities of people with visual impairments. It examines the mechanisms by which transport accessibility affects education, employment, consumption and social participation via reduced travel costs, improved independent mobility and increased range of accessible opportunities. This paper seeks to build an analytical framework of "transport accessibility–independent mobility–access to opportunities–economic participation", providing a theoretical reference for understanding the economic and social value of accessible transport.

2. Transport accessibility and independent mobility for people with visual impairments

2.1. The concept and economic significance of transport accessibility

Transport accessibility measures an individual' s ability to reach desired destinations within reasonable timeframes, at reasonable cost and under safe conditions, rather than merely "the ability to move". Accessibility is determined by the transport system, land use patterns and individual time constraints and is essentially a measure of an individual's ability to access external opportunities via the transport system [3]. Education, employment, consumption and social services are largely dispersed among various spatial nodes [4]. If the time it takes to travel is too long, the cost is too high or the journey is uncertain, people tend to restrict their range of activity or even miss opportunities they might have had otherwise. Accessibility is therefore directly embedded in the processes of human capital accumulation and market participation.

The implications are especially profound for persons with visual impairments. Road signage, stop markings and interchange information are almost entirely dependent on visual presentation. Even if the transport network itself is well developed, actual accessibility will be severely compromised if this information cannot be effectively accessed.Environmental barriers in the domains of transport, information and public services are important factors constraining education, employment and social participation of persons with disabilities [1]. Thus, the evaluation of transport accessibility for visually impaired people should not be limited to the availability of accessible devices, but also to their actual effectiveness and the degree of meeting individual travel needs.

2.2. Transport barriers and travel costs for people with visual impairments

Visually impaired people face travel difficulties with infrastructure, public transport and safety. Hearing, touch, assistive technologies or help from others are often more relied on to find directions, check traffic conditions and access vehicle and stop information. Therefore, the actual cost of the same trip can be very different for people with and without visual impairments.

Interruption and obstruction of tactile paving, poor guidance at crossings, and lack of connection between accessible routes and the real road environment may increase travel time and route complexity, as well as the risks of getting lost and traffic accidents [5]. There are additional barriers with public transport, especially in terms of accessing information. Route, stop and interchange information is often presented visually and Boadi-Kusi et al. found that people with visual impairments often have difficulties identifying stops, getting route information, recognizing vehicles and making transfers [6]. Therefore, even if public transport networks are widely available in space, information barriers can restrict their actual accessibility.

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These barriers raise the total cost of travel, including time, financial, information, safety and assistance costs. Commuting for the blind may require advance planning of the route, identifying stops and coordinating transfers or assistance from other people. Higher costs of travel may thus reduce the willingness or capacity to access distant education, employment and business opportunities. Transport barriers are therefore not limited to mobility only, but can also limit participation in education, employment and consumption.

3. The mechanism through which transport accessibility influences the economic participation of people with visual impairments

The effect of transport accessibility on the economic participation of the visually impaired is not direct but is transmitted layer by layer in three stages: travel costs, ability to travel independently and the scope of opportunities available. Education, employment, and consumption are spatially dispersed activities. Whether an individual can conveniently reach them directly determines whether they can truly participate in them. Transport accessibility becomes the mediating condition that links individuals to economic opportunities.

3.1. Transport accessibility, educational opportunities and human capital accumulation

The human capital theory postulates that education enhances the knowledge, skills and labor productivity of an individual which in turn affects future employment opportunities and income levels [7]. This logic holds for visually impaired people, as long as the educational opportunities themselves are consistently accessible.

The spatial distribution of schools and training institutions is often fixed and the actual travel costs for people with visual impairments increase considerably when the transport infrastructure is poor and information on routes is hard to find, so that an educational opportunity that objectively exists may be hard to effectively utilize.Educational activities are often continuous, and require multiple trips over an extended period of time. If each trip requires extra time, money and help costs, the accumulated load of this can lessen the readiness to participate regularly; conversely, improvements to the conditions of independent travel can reduce time costs and uncertainty, helping to keep up participation in education.

Ultimately, this pathway leads to economic participation, as improved transport accessibility facilitates access to educational resources and the accumulation of knowledge and skills subsequently improves the ability to enter the labor market. Transport accessibility does not directly generate human capital, but it circumscribes the extent to which educational opportunities can be translated into effective resources for individuals and it is in this sense that its significance for long-term economic participation is to be understood.

3.2. Transport accessibility, employment opportunities and labour market participation

Participation in the economy is most directly achieved through employment [8], but the ability to secure a job is determined not only by education and vocational skills, but also by the spatial distribution of jobs and the conditions of commuting, as the number, industry and occupational type of employment opportunities vary across regions; if workers face problems in reaching a wider range of employment locations, their effective choice of jobs will be restricted accordingly.

The spatial limitations people with visual impairments experience are often quite substantial. Suitable jobs, i.e. jobs with accessible environments, assistive technology or inclusive employment practices, are not necessarily in close proximity to one's place of residence. Even if a suitable position is found, people may still be unable to accept the job if the commute involves frequent changes between transport modes, makes it difficult to identify vehicles and stops, or involves significant safety risks. Thus, transport accessibility directly determines the set of employment opportunities available to people with visual impairments.

Transport accessibility is, from the perspective of the labor market, the determinant of the effective employment radius of a worker. The more convenient the travel, the wider the spectrum of suitable jobs. The higher the travel cost, the narrower the acceptable employment range, forcing some workers to accept jobs, which are closer but do not match

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their abilities, or even to withdraw from the labor market altogether. A systematic review of disability-inclusive public transportation likewise concluded that barriers in using public transport restrict people with disabilities' access to employment, along with healthcare and education [9]. Employment, like educational activities, is not a one-time opportunity, but requires long-term, stable commuting.When the difficulties of access to information, inconvenient transfers and safety risks pile up over time, the strains of commuting can erode job stability – transport accessibility is not only about whether people can find work, but whether they can stay in that work.

The mechanism whereby transport accessibility influences labor market participation can be summarized as follows: it reduces commuting costs, broadens the range of employment opportunities and increases the likelihood of a suitable job match, thereby facilitating both the entry into and retention of employment. Rather than a condition secondary to employment, it is an important environmental variable determining whether workers can translate their human capital into actual labor market participation.

3.3. Transport accessibility, consumer participation and socio-economic activities

Furthermore, consumption, social interaction and the use of public and commercial services are equally important ways in which individuals participate in socio-economic life [10]. When transport conditions restrict the ability of visually impaired people to access shopping centres, banks, healthcare facilities and cultural venues, it is not only their quality of daily life that is affected, but also their overall level of participation in market and socio-economic activities.Consumer choice is the first area to be affected. As commercial facilities are scattered across different areas, and when the time costs, information costs and safety risks associated with travel are high, people with visual impairments often reduce non-essential trips and instead rely on closer or more familiar shopping locations, thereby narrowing the actual range of goods and services available to them; if travel conditions improve, these spatial constraints are consequently eased.

Activities such as banking, healthcare, training, and cultural and leisure pursuits are similarly characterised by spatial concentration [11], and are closely linked to livelihood security, human capital development and social connections. If transport barriers reduce the frequency with which individuals visit these venues, insufficient access to information, reduced social interaction and limited use of services will compound one another.Existing research shows that the participation rates of people with visual impairments in various social activities—such as sport, voluntary work, and cultural and educational activities—are significantly lower than those of people with normal vision [12]; this suggests that limited visual ability may weaken the connection between the individual and society through mediating factors such as the environment and participation in activities.

This process is not unidirectional: improved transport accessibility enables people with visual impairments to access public spaces and market environments more frequently, gaining exposure to a greater range of information and social resources; these resources, in turn, may feed back into their educational, employment and consumption activities, creating a cumulative effect.Overall, transport accessibility reduces the time, financial, informational and safety costs of travel, thereby expanding the capacity for independent travel and, consequently, broadening the range of opportunities in education, employment, consumption and social activities, ultimately enhancing the overall level of economic participation.

Consequently, the role of transport accessibility is not limited to improving travel conditions for people with visual impairments; it also creates the necessary conditions for their economic participation by enhancing their access to education, employment and other socio-economic resources. Thus, transport accessibility is not only a vital component of creating an accessible environment but also a key factor in promoting the social inclusion of people with visual impairments.

4. The limits of the economic effects of transport accessibility and policy implications

4.1. The limits of the role of accessibility of transport

Transportation accessibility is an important factor influencing the economic participation of people with visual impairment, but it is not the sole determining factor. Such factors as educational

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attainment, vocational skills, family support, assistive technology and the employment environment also affect the educational and employment opportunities of persons with disabilities. Therefore improvements in transport conditions mainly work by removing travel barriers and expanding the range of opportunities, but cannot directly guaranty that these opportunities will turn into real economic participation.

In addition, there are individual differences within the visually impaired community; the degree of visual impairment, age, travel experience and competence of using assistive devices may all influence the actual effectiveness of transport facilities. Geurs & Van Wee [3] suggest that accessibility is determined by a number of factors, such as transport systems, land use, individual characteristics and time constraints. Therefore, the assessment of transport accessibility for people with visual impairments should not be limited to the number of facilities and the level of coverage of the transport network, but should also include the availability of transport information, the continuity of the road environment, and the real opportunity for individuals to access education, employment and commercial services.

4.2. Synergy of transport accessibility and related policies

Coordination between transport policy and policies on education, employment and social security is needed to promote the economic participation of people with visual impairment. 1. In the transportation sector, improve barrier-free facilities on roads and in public transport and improve auxiliary services such as voice announcements and real-time information. 2. In the fields of education and employment, incorporate transport conditions in policy considerations for vocational training, employment services and job matching.Studies have shown that the employment of people with disabilities is influenced by many factors such as transport conditions, public transport services, working environment and social support [2]. Therefore, in the accessibility policies, authorities should also consider the real access to opportunities and the availability of services. In this way, the participation of the visually impaired in economic and social activities can be promoted more successfully.

5. Conclusion

The paper discusses the impact of transport accessibility on the economic participation of people with visual impairments from a theoretical perspective. In road environments, public transport and information services, transport barriers can raise the costs of time, money and safety, limiting independent mobility, areas of activity and access to socio-economic opportunities. Improving transport accessibility could reduce these costs, encourage independent travel and increase participation in education, employment and market activities. Educational accessibility contributes to the building up of human capital, employment accessibility helps labor market participation and accessible transport can also promote consumption and other socio-economic activities. Thus, the transport accessibility is an important external condition that connects people with visual impairments with socio-economic opportunities. But its effects are also mediated by educational attainment, vocational skills, employment conditions and social support. Future research could utilize survey data and empirical methods to investigate the impacts of various dimensions of transport accessibility on economic engagement, offering additional insights for accessible transport development and associated social policies.

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