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Gentrification of station areas and its impact on transit ridership

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ABSTRACT

Transit and transit-oriented developments (TODs) are gaining momentum across the globe to enable transport sustainability. However, most of these TODs are creating neighbourhood gentrification as a result of higher housing prices. Hence, the contribution of TOD policies towards sustainable transportation goals remains unclear. This paper uses Bangalore, India, as a case study to examine the effects of TOD gentrification on transit ridership. In Bangalore, station areas are witnessing the influx of large capital on condominiums, in response to TOD policies and accessibility to transit. These condominiums are expensive and attract the affluent, leading to new build gentrification. The study evaluates the impact of such new build gentrification on transit ridership. Data analysis suggests that, gentrifiers contribute significantly towards metro ridership because of the metro's high level of service (LOS). However, the other sustainable mode shares among gentrifiers are less due to poor implementation of TOD policies and the low LOS of the bus system. The study reveals that metro is attracting TOD residents, especially intermediate public transport, bus and motorbike users, whose destination are locating within walkable distance from the metro stations and the willingness to use metro is high, once the fully integrated metro network is developed. The results indicate that the transit and TOD policies in Bangalore are indeed improving transit mode shares, but to ensure equity and optimize sustainable transport mode shares, more policy interventions are required for the provision of: affordable housing and encouraging diversity in new TODs; improving neighbourhood built environment; and mode integration measures.

1. Introduction

Commitment to large scale fixed infrastructure investments, improved transit accessibility and associated transit-oriented development (TOD) policies are economically monetising and increasing housing and land cost in TODs (Hess and Almeida, 2007; Pollack et al., 2010; McIntosh et al., 2013a; Newman and Kenworthy, 2015). The poor and those belonging to low income groups often cannot afford the increased housing costs, especially where inclusive housing policies are not being implemented (Chava, 2016). Due to excluding the working class through high prices, and attracting the affluent who replace housing opportunities for the poor, most TODs are undergoing various forms of gentrification and equity issues (Lin, 2002; Kahn, 2007; Feinstein and Allen, 2008; Chapple, 2009; Grube-cavers and Patterson, 2015; Chava et al., 2017).

To draft an equitable and sustainable TOD policy, it is essential to understand the impact of this influx of wealthy residents on sustainable transportation goals and the influence of well-planned transit on the travel pattern of TOD residents. However, studies on the impact of TOD gentrification on travel behaviour have been limited to the developed

world's context and have yielded mixed results. Moreover, none of them examines the influence of well-designed mass transit on the travel patterns of TOD residents.

In developing countries, where the sustainable transport mode shares are high and vehicle ownership is low, do TOD gentrifiers use unsustainable private modes or do they use sustainable modes like the economically weaker local residents? This remains unclear. Surprisingly, these issues have attracted little attention from transport planners and equity advocates, especially in the developing world's context. To address this literature gap, the study aims to answer the following questions:

1. How does travel behaviour of gentrifiers differ from that of non-gentrifiers in station areas?
2. What is the influence of socioeconomic factors underlying gentrification on choosing PT?
3. What is the influence of mass transit on changing travel behaviour of TOD residents?

The study explores these questions in one of the gentrifying

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working-class mid-suburban metro station area (Yeshwanthpur Industrial area) in Bangalore, India, a city of 8.5 million. In India, mass transit and TOD policies are in their early phase as in most emerging areas. There exist few studies evaluating the implication of these new policies. This study is an attempt to provide an evaluation of current transit and TOD policies vis-a-vis sustainable transportation goals to guide the policy makers in developing more equitable and sustainable transit and TOD policies in future.

2. Literature review

This section presents an overview of gentrification, followed by the significance of the study and a review of studies specifically related to the impact of gentrification on travel behaviour.

2.1. An overview of gentrification

Initially, Glass (1964) defined gentrification as a process of influx of wealthy residents (gentrifiers) into working class central city neighbourhoods, leading to direct displacement of low-income inhabitants, and socioeconomic upgradation of the neighbourhood. Early gentrification literature focused primarily on the direct displacement of the poor from working-class central city neighbourhoods (Atkinson, 2000; Freeman and Braconi, 2004).

The definition of gentrification has evolved. Today, gentrification extended to the influx of capital in an inhabited or vacant area, leading to the direct or exclusionary displacement of existing residents, and socioeconomic upgradation of the area (Davidson and Lees, 2005; He, 2010; Zuk et al., 2015). Although the influx of capital (developments) in vacant and brownfield area may not lead to direct displacement of existing residents, as was the case in the earlier definition of gentrification, it may lead to social exclusion, indirect displacement of low-income residents, change in the social composition of the neighbourhood, and indirect displacement of the working class due to price shadowing (Rérat et al., 2010a; Rérat et al., 2010b; Visser and Kotze, 2008). Scholars have termed this form of gentrification as new build gentrification (Davidson, 2007; Ellen and O'Regan, 2011; He, 2010).

The literature emerging from developed and developing countries shows that TODs are more susceptible to gentrification than the neighbourhoods located away from transit stations, as the TOD housing attracts a price premium (Kahn, 2007; Lin, 2002; McIntosh et al., 2013a; Chava, 2016). Studies cite improved transit accessibility, reduction in travel cost and time, mixed land use and built environment as the reasons for willingness to pay high land and rental values to reside in TODs. Studies also highlight that the commitment to large scale investments influences the real estate market and causes TOD gentrification.

In the case study area, gentrification manifests as new build gentrification by attracting the affluent and excluding the poor from the new developments (Chava et al., 2017). Hence, in this study residents of these new developments, whose influx into the neighbourhood is leading to gentrification, are referred to as gentrifiers and residents already living/previously settled in the area are referred to as non-gentrifiers.

2.2. Why assess the impact of gentrification on transit ridership?

Across the globe, implementation of TOD policies (density, diversity and design) is gaining momentum to achieve three sustainable transportation objectives: (1) reduction in the number of motorized trips, (2) increased share of non-motorized trips and (3) reduction of travel distances and the corresponding increase in vehicle occupancy levels of motorized trips (Cervero and Kockelman, 1997).

The TOD policies were introduced in Bangalore with the same objective. As part of these policies, the Floor Area Ratio (FAR) around metro stations/terminals increased to 4 for all permitted uses,

irrespective of the applicable FAR (generally, it varies from 1.7 to 2.4 based on land use) in the areas which fall within 500 m from the metro stations (Government of Karnataka, 2009). To improve the built environment around metro stations, the Department of Urban Land Transport, Bangalore, is developing station area plans (Embarq India, 2011). However, there are no specific policies and plans to encourage inclusion. Due to the high density TOD policy, and accessibility to fast transit and other modes of transport associated with the real estate boom, most of the metro station areas are witnessing the influx of large capital on condominiums, especially in the suburbs where large vacant and brownfield land is available. However, being located in premium places with accessibility to all parts of the city and other amenities, most of the new condominiums are expensive compared to non-TOD areas (Jillella and Newman, 2017; Sharma and Newman, 2017). They are unaffordable for most low- and middle-income groups, leading to new build gentrification (Chava et al., 2017). Due to TOD gentrification, the transit and TOD policies contribution to achieving sustainable transportation goals is not clear.

A few studies in developed countries establish the contribution of new condominiums in TODs towards increasing metro ridership (Cervero, 1993; Cervero, 1994; Lund et al., 2004; Lund, 2006; Cervero, 2007; Cervero, 2010; Mckibbin, 2011). However, no evidence shows that residents of condominiums are gentrifiers, like in Bangalore. There are three reports and one published article focus specifically on the influence of gentrification on travel behaviour in developed countries. These study results may not be applicable to India or any other developing country, owing to vast differences in built environment, land use, socioeconomic, travel and behavioural characteristics. To address this literature gap, the study evaluates the impact of station area gentrification on travel behaviour in the developing world's context.

2.3. Gentrification and travel behaviour

Danyluk and Ley (2007) examined the relationship between gentrification and work-trip mode shares in three Canadian cities. This first study considers occupation and educational attainment as proxies for gentrification, and correlates them with work-trip mode shares at the census tract (CT) level. Their results conclude that, owing to liberal and political ideologies of gentrifiers, the residents of gentrified neighbourhoods are more likely to ride a bicycle to work and less likely to use PT compared to the residents of non-gentrified neighbourhoods. Unfortunately, the study omits several other important gentrification indicators such as income and vehicle ownership which could have more influence on transit ridership (Cervero, 2007; Pucher and Renne, 2003). In addition, the study does not control for land use and built-environment parameters in a neighbourhood. This makes it difficult to determine whether gentrifiers use non-motorized transport modes (NMTs) because of their political ideology or because of NMT-friendly infrastructure and mixed land use characteristics in the gentrified neighbourhoods compared to the non-gentrified neighbourhoods.

Kushto and Schofer (2008) conducted a study in Chicago to explore the relationship between gentrification and travel behaviour using both aggregate and disaggregate data. The unpublished study considers income, percentage of renter-occupied houses and education as gentrification indicators to differentiate gentrified CTs. It concludes that in spite of the same vehicle ownership patterns and PT accessibility, PT use in gentrified neighbourhoods is higher than that in non-gentrified neighbourhoods. However, despite considering most of the recognized gentrification indicators to identify gentrified CTs, the study is methodologically weak because it does not determine any factors that influence gentrifiers to use PT.

Pollack et al. (2010) explored the symbiotic relationship between transit and gentrification in a study conducted in the United States. The study assesses the change in population growth, housing units, racial and ethnic composition, household (HH) income, housing costs, in-migration rate, PT use, and motor vehicle ownership of transit rich

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