How has Transit Oriented Development Impacted Land Gentrification in London

Zhuru Fang1,*
1South Hills Academy University Preparatory High School

Abstract. This study evaluated the impact of Transit Oriented Development (TOD) on land gentrification in London, a city that adopted TOD in its railway network early in the 1920s. It analysed the benefits and drawbacks of TOD and Land Gentrification from the perspectives of economy, society and environment. It analysed the relationship between TOD’s advancement and the level of land gentrification in 33 main districts in London and evaluated the influence of the former on the latter. In addition, it discussed the impacts of gentrification on residents’ health from the aspects of residents’ life expectancy, obesity prevalence and mental trauma (anxiety and depression). It is concluded that: 1) TOD can induce different degrees of land gentrification in surrounding areas. 2) TOD and land gentrification mainly affect the social groups with middle or low income. 3) Land gentrification will affect people's physical and mental health, but these are most influential to low- and middle-income population. 4) Land gentrification will generally prolong life expectancy for low and middle-income people, but at the same time it will also increase the average level of anxiety and depression among them. The research findings contribute some advice to London and other cities’ governments to design the proper strategies of TOD planning and sustainable development.

1 Introduction

It has been widely acknowledged by various studies that investments in Transit-Oriented Development (TOD) are crucial for city development and may be a key tool for its economic growth. In the past, the industrial revolution’s development of horse-drawn and then mechanized rail-based transportation enabled a fundamental shift from tiny, compact walkable towns to expanding star-shaped cities that followed public transportation networks [1]. Both interstitial urban development between radial transport corridors and outward urban sprawl were made possible by the mass manufacture and ownership of private vehicles beginning in the United States (US) in the 1920s and subsequently elsewhere. The implementation of urban planning subsequently stopped future spread of cities in many nations, including the US and the UK, but the degree of planning regulations ranged widely from light to strong. Cities decentralized as a result of the widespread use of automobiles as access to Central Business Districts (CBDs) became more congested and as automobiles made it possible for people to travel more widely, especially close to ring roads and suburban motorway junctions [2]. The new urban frontiers were edge cities or suburban downtowns, especially in nations with lax planning regulations [3, 4].

In past studies, different researchers have given different definitions of TOD. The term "TOD" refers to the combination of transportation and land use, typically in the form of an integrated transit station area surrounded by dense urban development and high-quality pedestrian-friendly surroundings. [5]. While Still, T. Defined it as a mixed-use neighborhood that promotes living close to public transportation and lessens reliance on personal vehicles. It’s also defined as a kind of urban development where a public transportation station is surrounded by a densely populated, mixed-use region [6].

2 Previous Study

2.1 TOD Benefits and Disadvantages

It has been demonstrated in the literatures that TOD can be adopted to bring benefits not only to the economy, but also to the society as well as the environment. From the perspective of economics, by enhancing transit accessibility and providing a more pleasant environment, TOD is able to encourage economic growth and raise the value of properties nearby. Reduced congestion can be achieved by establishing medium-to-high density development around transport hubs by bringing together public transport users with regular services.
In addition, the increase in tax revenues and property values brought about by TOD is essential in defending the high cost of constructing rail transport infrastructure, as figure 1 clearly indicated [5, 7].

From the perspective of the society, buildings close to major transportation hubs help prevent the development of poor "fringe suburbs," where low-density housing is cut off from urban and suburban economic hubs. The decentralization of governmental and commercial services brought them closer to suburban population centres as a result of TODs' increased residential densities outside the Central Business District (CBD). Therefore, this kind of development helps cities break the pattern of "hub and spoke" growth by setting up a network of "alternative CBDs" that are served by both arterial and cross-city transportation corridors. In addition, well-planned transit-oriented projects may assist remodelling the urban form and boost liability by creating communities centered on shopping, entertainment, and shared green spaces. Locals are also likely to benefit from improved mobility, neighbourhood revitalization, lower transportation costs, and other amenities that spill over from the new development (Cervero and Duncan, 2004).

At a time when government is attaching more and more importance of a city’s development to its environment, TODs are applied in an effective way in making the best of both worlds. During peak periods, public transport (bus and rail) is up to six times less emissions intensive per passenger kilometre than private vehicles, which significantly reduced greenhouse gas emission.

Concerns have, however, recently been raised regarding the phenomenon that TOD is a huge financial burden to the government, and is not guaranteed to be cost-effective. From construction to maintenance, TOD systems incur huge capital costs. This problem is especially apparent among city governments with limited budgets [8]. In some cities, these projects are disapproved, if not suspended, to prevent fiscal distress. For example, in November 2017, the central government of China released guidelines to put a check on excessive URT construction. With such stringent rules, a few URT projects have been halted during construction [9].

"Rail-transit-induced gentrification", is also likely to occur after TOD when higher-status neighbourhoods replace lower-status ones as a result of the introduction of rail transit service and related investment in station areas. [10]. Gentrification caused by rail transit includes displacement of low-income families by middle- and high-income households, creating a TOD affordability conundrum, which to a phenomenon that low-income households that would have been benefited from additional accessibility provided by upgraded transit are forced to move by rising rents and housing costs. Furthermore, because minority, low-income households tend to own fewer cars and use transit more often, the displacement effect of TOD may undermine its promise of increasing transit ridership (Pollack et al., 2010). More disadvantaged communities may fail to benefit from those benefits brought by TODs if the new development does not bring appropriate housing and job opportunities, or if there is gentrification that displaces low-income and/or minority residents [11, 12]. Specifically, there is a concern that new transit investment and development may increase housing costs, forcing low-income communities, often of colour, to move to more affordable but less accessible locations and preventing these communities from sharing the benefits of this type of development. Therefore, planning for TODs has raised awareness of the potential social equity effects of land-use-based greenhouse gas reduction strategies.

However, whether gentrification can be considered as a bliss or a curse to communities and the society as a whole requires more valid evidence to demonstrate.

2.2 Definition of Gentrification

Recent studies have used the term of “gentrification” to describe upgrading in neighbourhoods that have already experienced earlier rounds of gentrification and in neighbourhoods that are in suburban and rural areas. (Davidson and Lees, 2005; Landis, 2016). It also refers to the transformation of a working-class area via an influx of capital and middle- and high-income newcomers [13].

However, defined it as a broad upgrading process whereby a neighbourhood’s socio-economic composition changes to a greater degree than that of nearby areas over a relatively short time period, as wealthy and highly skilled workers proportionally increase by outbidding poorer residents for housing [14]. This study would like to cite the last definition of Tod for the convenience.

Overall, gentrification can bring benefits such as appreciating property value, increasing local tax revenue and attracting new businesses; though drawbacks inescapably exist such as enlarge social gap, elevating communities’ conflicts and increasing living costs.

2.3 Previous Study on TOD and Gentrification

Transportation investment is inherently spatial and inevitably yields costs and benefits that vary across different neighbourhoods [15, 16]. When a new rail transit line is built, changes are expected to occur in nearby neighbourhoods as residents respond to the redistribution of transportation accessibility within the region. The impacts of rail transit on travel and land development are
Researchers and policy advocates have argued that TOD interventions could result in gentrification and the eventual displacement of low-income groups [17]. Newly-built developments or housing rehabilitation can trigger declines in housing affordability, upward social filtering, and displacements. Location theory can predict such outcomes, and neo-classical approaches and the new economic geography have converged to highlight the critical roles of commuting costs and the locational advantages conveyed by transport nodes. The provision of rail transit, especially in suburban areas, they argued, aims at recapturing middle-class, car-owning travellers as means of fulfilling broad social and environmental goals [18]. It is stated that alternative neighbourhoods that feature transit service and new urbanist design are undersupplied in U.S. metropolitan areas due to regulatory barriers [19]. Transit-oriented neighbourhoods are thus expected to attract the middle-class households who prefer to drive less and live in a compact, mixed-use neighbourhood.

However, there is evidence that transit-served neighbourhoods are more attractive to lower-income households who own fewer vehicles. Low-income households living close to rail transit stations can take the cost-saving benefit of transit by spending less on owning and using private cars [20]. The results of the National Household Travel Survey and many regional travel surveys consistently show that households with lower incomes and fewer vehicles are much more likely to use public transit than wealthier households [18, 21]. Public transportation plays an important role in explaining why the poor live in American central cities: compared with automobiles that cost a lot to purchase and use, public transit offers a time-intensive alternative that is more appealing to those with low incomes [22]. Therefore, the development of TODs may have the effects of attracting and retaining low-income households in nearby neighbourhoods, lowering its consequence in land gentrification.

Empirical studies which directly examine whether TODs result in gentrification and home unaffordability are comparatively limited. Kahn uses a 14-city census tract–level panel data set to document the effects of rail transit expansions on communities nearby new stations. He finds that two of 14 cities (Boston and Washington D.C.) stood out in terms of gentrification effects of rail transit. He also finds that communities receiving increased access to new walk-and-ride stations experienced greater gentrification than communities that were close to new park and-ride stations. Pollack and colleagues examine changes of income and housing cost in rail-transit-served neighbourhoods in 12 metropolitan areas between 1990 and 2000, finding that both income and housing cost grew faster in rail-transit-served neighbourhoods than they did in typical neighbourhoods in the region [12]. A study in three large Canadian cities (Toronto, Vancouver, and Montreal) shows that proximity to rail transit had a significant gentrification effect in Toronto and Montreal, but not in Vancouver [23]. Fan and Guthrie [24] quantified neighbourhood changes in four rail and bus-rapid-transit corridors in the Twin Cities metro area. Their analyses found that younger workers increased faster in the four transit corridors than in the transit-served area as a whole, but the changes of the employment structure measured based on monthly wages were mixed. Fan and Guthrie [25] also explored residents’ and businesses’ perceptions of neighbourhood social changes in the four transit corridors through questionnaire surveys. Their survey results show that both urban and suburban corridor residents expected positive neighbourhood changes from new transit service, and urbanites tended to report slightly more positive perceptions.

### 3 How Will Gentrification Influence Residents’ Health

Whether the process of gentrification can be beneficial to residents’ health has been a long-lasting controversial issue where scholars have collected valid evidence on both sides.

Gentrification may be beneficial to health in essential ways. First and foremost, neighbourhood improvements like repairing the playground or walkway lower the risk of accidents [26], leading to better physical health. Additionally, the development of new grocery shops boosts inhabitants' access to nutritious food, which may result in an improvement in diet [27].

In gentrifying districts, changes in crime may have conflicting impacts on self-reported health. Average murder rates are decreased by gentrification, while robberies are up in Black communities [28]. Increased drug use and lower infant birthweight have been linked to crime and violence [29, 30]. Therefore, decreases in murder may have a favourable effect on both decrease in drug use and increase infant birthweight. However, the rise in robberies in gentrifying Black areas and serious assault in upscale districts next to secure, low-income neighbourhoods may have a deleterious influence on the latter’s residents’ health.

It is also argued that gentrification’s effects on place-based social networks may have an negative influence on both mental and physical health (Fullilove 2016). Those who have place-based social networks have better psychological and physical health than those who are more isolated, owing to the material assistance, emotional support, information, and services that these networks provide. It is argued that living in a gentrifying area is related with fewer community ties on average. Displacement may have a severe influence on both mental and physical health in the long run if it splinters neighbourhood social networks [31].

Stress among long-term residents may also have a detrimental impact on self-reported health as a result of gentrification. Displacement, or the threat of it, is a significant stressor for long-term inhabitants of districts that are undergoing gentrification. The extent to which gentrification drives out long-time inhabitants is a topic of
intense discussion. While some researchers [26, 32, 33] detect very little displacement, others find more significant amounts [34, 35]. According to Saracino’s analysis of the gentrification literature, findings regarding displacement in gentrifying neighbourhoods generally follow methodological trends, with qualitative researchers discovering the physical, political, and cultural displacement of long-time residents and institutions. In contrast, quantitative researchers frequently discover little or no eviction of low-income households. However, in quantitative studies, how displacement is operationalized has a significant impact on the estimates of how much displacement occurs in gentrifying districts [36] contends that long-term residents may experience “anticipatory stress” as a result of the worry that they may be moved [37], which is more likely to occur among residents of color [26], even though it is unclear to what extent long-term residents actually experience physical displacement.

Though researchers have been putting effort in to studying TOD, gentrification residents’ health, the results are far from clear regarding the relation between them. Therefore, this research is dedicated to solve the two questions below:

How does TOD affect gentrification?
How to address the impact of TOD contributing to gentrification on residents’ health?

4 Study Area

4.1 London TOD

London can be considered as a metropolis that owns well-developed public transport system such as buses and metros. In London, around 30% of bus trips and 70% of underground trips each need at least one transfer [38]. Better system integration across modes is emphasized in the Transport for London (TfL) planning standards (Intermodal Transport Interchange for London: Best Practice Guidelines. Transport for London, 2001.). TfL’s Interchange Plan [39], in particular, assigns a priority for infrastructure enhancement to each of the 614 interchange facilities it has categorized into five types, ranging from important central London termini to minor interchanges. The strategy notes that there were no trustworthy statistics on such fundamental variables as the amount of people moving at each facility, therefore this prioritizing is based mostly on qualitative research. In London, there are over 700 bus lines that intersect, in addition to significant interchange facilities, offering chances for on-street transfers.

TfL presently has mechanisms in place for evaluating passenger demand between stops on a bus route and on parallel routes, but data on that demand between stops on a route and crossing routes or Underground stations as well as between ultimate sources and destinations is less readily available. The two surveys that currently provide stop-level passenger demand information are a rolling origin-destination survey (conducted every six years) and one that tracks boardings, alighting’s, and loads at 400 important bus stops on a two-year cycle. To assess bus routing and service adjustments, TfL’s bus network planners make use of periodic surveys, route-level electronic ticketing machine data (a farebox record at point of entrance on the bus), as well as first-hand information.

4.2 London Gentrification

London has already presented signs of gentrifications since the last counterthought it was not clear whether it was brought by the arisen of TOD there. It has been recorded that inner-city region of London, including portions of Islington, Camden, Hackney, Lambeth, and Hammersmith, have undergone gentrification. Victorian and Georgian architecture from the nineteenth century, primarily two- and three-story terraced houses with seven or eight rooms, are typical of gentrified regions. This approach has recently been used to several areas' twentieth-century Edwardian homes. It is not surprising that the search has expanded into more recent late Victorian and Edwardian, less "desirable," areas of inner London given that cheap but spacious unmodernized Georgian houses have now almost entirely disappeared from the market along with much other relatively low-priced housing in the fashionable squares of Islington and similar districts.

Some of the gentrified regions might be viewed as expansions of existing middle-class residential neighbourhoods. This is why Kentish Town and Camden Town, which are close to the established middle-class neighbourhoods of Hampstead, Highgate, and Bloomsbury, are where these shifts taking place. Obviously, not all regions follow this trend. Both the gentrification of Islington’s Angel neighbourhood and Tredegar Square in Tower Hamlets are far more isolated developments where other reasons were crucial.
From the figure 2 we can observe that from a base of 1,057,000 economically active males in 1961, Inner London lost 198,000 of them between 1961 and 1971, a decrease of 18.75%. With the exception of professionals and managers (SEGs 1, 2, 3, 4 and 13), all socioeconomic categories saw losses. Instead, these groups saw a gain of 4,790, or 3.5 percentage points (from 13% of the total in 1961 to 16.5% in 1971). This growth was not evenly distributed across the time period; between 1961 and 1966, there was a decrease of 3,040 economically active males in the professional and managerial categories, and between 1966 and 1971, there was an increase of 7,830. The socioeconomic makeup of London’s population might be considerably changed by such an increase if it persists over time, although it is by no means inevitable.

This growth was not evenly distributed across the time period; between 1961 and 1966, there was a decrease of 3,040 economically active males in the professional and managerial categories, and between 1966 and 1971, there was an increase of 7,830. Ruth Glass would have us believe that this rise, which is just 6% over the 1966 base number, is much larger than it actually is. However, if it were to persist over time, it would have a substantial impact on the socioeconomic makeup of London’s population.

4.3 Data of London Residents’ Health

Two major indicators of gentrifications are (1) real median income, (2) real median property values. These two indicators have positive relationships to the extent of gentrification. [40]. Among London countersues (more than 3 million ridership’s per day) and buses (6 million ridership’s per day) are the two most common adopted types of public transportations, accounting for 50% of the total usage of public transports. For the convenience of this study, buses and tubes are took as the two public transports which symbolize TODs, the average housing price and average household income as indicators of gentrification, for analysing the relationship between TODs and gentrification.
Figure 4 showed the analysis between number of buses stops in 34 main districts of London and gentrification, has exhibited different patterns compared to the underground figures. Rather than remaining constant, average housing prices and income have experienced a decline when number of bus stops is less than 8. This difference can be probably explained by the inference that TODs mainly target at middle-class residents while excluding those upper-classes. This is probably due to the fact that the majority of wealthy people live in villas or spacious houses where most of which are built in remote areas, far from transit stations. Wealth makes them being price-inelastic regarding to commute costs, so they are unlikely to move to denser areas even if private transportations are the only choice. Therefore, when bus stops are extremely few, the housing price is higher than that in places where bus stops are relatively dense because the places far from bus stops are densely populated with numerous inhabitants. However, this image also shows similarities to the two underground station images. After the number of bus stops reached 8, the average housing price and income per household are followed by an accelerating soar, which is similar to the patterns of underground stations in figure 4 and 5. This phenomenon, once again, demonstrates the idea that TODs will contribute to the establishment of middle-to-dense areas surrounding every transit station, therefore accelerating the increase in housing price in dense areas, enlarging the difference of price level of houses from the centre of the area to suburbs, and ending up elevating land gentrifications.

4.4 Gentrification and Residents’ Health

From figure 5, we can observe that the land gentrification by and large has the positive influence on elongating life expectancy of middle-class and working-class, while it seems to exert little impact on that of wealthy people (average income higher than 75000$). This might be attributed to the fact that land gentrification targeted at people at the lower level of social ladder, as the agglomeration effect of land gentrification have enabled them to access to improved amenities and infrastructures in the dense communities, including healthcare, education and judicial institutions. In addition, well-developed public transport systems (subways and buses) lower the road burden, allowing government to modify some of the roads into green space. This is likely to enhance local residents’ sanitation, respiratory health and standard of living. Meanwhile, those people from the upper-class might relieve less benefits for life expectancy, since they are mainly residing in suburban area where gentrification is not taking place.
Fig. 6. The relationship between gentrification and obesity prevalence

Figure 6 depicts the relationship between gentrification and obesity prevalence, which is one of the physical health indicators. Both of the charts have revealed obvious negative relationship between them, which means that land gentrification can effectively lower the number of obesity cases in that district. This is could cause by two reasons: 1) land gentrification brings more frequent human activities in the gentrified districts, which boosts the development of amenities (including healthcare institutions), which helps local residents to take treatments in a more convenient way that lowers the risks of getting diseases without being aware. 2) The TODs shift local inhabitants’ preference of commute from private vehicles to public transports to some extent. Such a green way of transportation often requires those people to walk for a longer distance from homes to transport stations, which facilitate them to burn more calories, and thus lower the obesity prevalence in those gentrified districts.

Fig. 7. The impact of land gentrification on people’s mental health

Figure 7 describe the impact of land gentrification on people’s mental trauma (anxiety and depression). These two figures all witnessed a slight decrease in number of anxiety and depression cases at the very beginning, before it increases until midpoint and then decreased again as the degree of gentrification further rose. The interpretation of this tendency might be that land gentrification can only assist releasing the mental burden of people that earn a pittance, but did little help, or even exerted negative effect to middle classes. Land gentrification, accompanied by surge of housing prices in gentrifying area, is likely to trigger the sense of insecurity and fear on those realizing their income are not capable of keeping up with the rise in housing price or rents, as they are intimidated by the displacement effect brought by gentrification. However, figure 10 and 11 provides evidence to the statement that displacement effect only occurs at the edge of cities and suburbs, in where they are mostly in habituated by middle-classes (annual income in the range of 30000$ to 75000$). Therefore, their mental pressure are inclined to increase by the growth in extent of land gentrification. Meanwhile, there is not enough valid evidence to uphold the point that upper classes are also benefit-receivers of land gentrification regarding the aspect of mental health, as most of them tend to live in suburbs where it is not susceptible to displacement effect. Though both of the figures have presented a decreasing trend of mental burden on people as the housing price and income increase, this essay tends to opine that this phenomenon might be more related to their accumulated wealth and enriched lifestyles.

5 Conclusions

Decentralization and land gentrification have continued to occur at varying rates in different regions since TOD have been adopted in London in the early 1900s. In general, this study analysed the data of 33 areas in and around London, and the results that came out are able to support the following conclusions: 1) TOD will cause different degrees of land gentrification in the surrounding areas. It is mainly a way to establish high-dense communities in a divergent manner cantering on the transit station, thereby driving up the value of the surrounding land and therefore pushing up the housing price. 2) TOD and land gentrification mainly affect the social groups with middle or low income. This is due to the fact that displacement effect occurs most frequently in middle income groups living mainly at the border between cities and suburbs. Meanwhile, because of their limited economic strength and buying power, people in these groups tend to choose to travel by public transport and are therefore most likely to be attracted by TOD and migrate to these densely populated areas. On the other hand, low-income or extremely poor people, who face homelessness or poor housing in the suburbs, are not and do not have the financial capability to move to TOD communities while suburbs are not influenced by gentrification. Those living at the top of the pyramid with extraordinary economic strength are often demand-inelastic to the change in cost of transports. Therefore, some of them will choose to live in the suburbs of wealthy-residential area, while the rest of them are inclined to live in the luxurious residences at the centre of the city. People living in wealthy suburban
areas indicates a trend of using private cars for its convenience and flexibility, which means that TOD is not likely to affect their ways of transport to a large extent. Wealthy people living in the city centre may succeed in reaping the benefits of TOD's development and therefore choose to alternate between public transport and private cars, but they are not likely to be threatened by the displacement effect of rising house prices caused by gentrification because they will often choose to purchase surrounding houses rather than rent them. 3) land gentrification will affect people's physical and mental health, but these are most influential to low- and middle-income population. The only exception is in the study on obesity prevalence where land gentrification alleviates obesity among people of all classes. 4) land gentrification will generally prolong life expectancy for low and middle-income people, but at the same time it will also increase the average level of anxiety and depression among them. It is due to the fact that gentrified communities will be equipped with more complete amenities and in that way, people will be able to reach out to better standards of living, so their life expectancy is on the rise. Nonetheless, this process will also provoke their sense of fear and anxiety that they may be displaced to the suburbs by the rising housing price in the future, which might put burden on their psychological pressure. However, more evidence is needed to determine whether land gentrification has an overall positive impact on the health of the inhabitants.

Such a conclusion gives London, and other local governments, some advice on how to develop transport and urban layout. For example, the government should decide whether to develop in an area based on the proportion of people with low income. In the face of land gentrification which is bound to occur with TOD in the future, the government should present plans to deal with the pressure of people confronting the risk of being displaced.

References