

Estimation of a land-use change model in a BRT corridor

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Abstract

Even though Transmilenio a high-capacity Bus Rapid Transit (BRT) system in the city of Bogotá, has been recognized as a successful urban process, especially the conceptualization of the system and its efficient operation (travel time reductions and increased accessibility), there are issues that were not taken into account in terms of the urban development around it. Firstly, no value capture strategies were implemented in its area of influence, and therefore there were not seizing of property values and development. Moreover, the overall city's urban development normative showed a strategic disarticulation with this transit infrastructure, built-up potential and land-use zoning has a not specific configuration along important transit corridors. At an aggregated level there has been found that farther and less benefited zones grew more than the zones near Transmilenio. As a result, it can be argued that Transmilenio was developed under a not fully integrated Land-use Transport vision that lead to a not optimal approach of both parts.

Evidence towards the impact of heavy-rail transit projects in land-use patterns has been widely analyzed and findings have shown the potential of this infrastructure in shaping urban form. However little research has been performed regarding BRT effects, which has led to the premature concept that this transport system don't produce a depth effect in urban form. Former evidence in Bogota has shown mixed effects and therefore few integrated transport and land-use planning was applied in the corridors already implemented. In this context it is desirable to expand this knowledge around the effect of the Transmilenio in the urban development in order to use it in future corridors planning.

Under this background a model is proposed in this research to evaluate two important urban features that are: densification and land-use mixing. This in order to understand the variables related with the location of land-uses within Bogota's particularities. Why and in which magnitude do the different zones of the urban area develop? and how mixed is that development?. Two independent multi-variable regression models are proposed and specified with variables related with transport and urban conditions. The model is estimated on aggregated transport zones and described the urban growth, floor-area built- in a ten-year period. 2000-2010 a particular period that encompasses all the development of Transmilenio corridors.

Two main variables were adapted in order to evaluate the effect of transport infrastructure and urban normative. The first one is a gravity-type transit-based accessibility which defines the relative mobility conditions of all the zones and allows to evaluate the specific interaction effects of the BRT corridor. The second variable is based on urban regulation conditions and is related with the Floor Area Ratio (FAR) and land-use zoning of the city. Other variables were included such as green areas, urban facilities and land-value even though the two former variables were the more significant and consistent. This means that the city grew where accessibility conditions were relatively better but also where there was more available built-up potential regardless of the transport conditions. The same applies for the land-use mixing conclusion where greater accessibility level induced more mixed-use growth besides an important normative effect of the land-use zoning. These two elements reveal high importance as they are transport and urban normative controlling elements in planning process.

Another important conclusion that goes in line with former studies about BRT effect in urban development is that zones near feeder lines had a premium effect in urban growth and land-use mixing while those along trunk corridors had just a land-use mixing effect while no significant effect in urban growth.

Then the model was used to evaluate current conditions and forecast expected activities growth along a future BRT corridor. Projections were made for the entire corridor creating longitudinal profiles that shows, first, the built-up profile (built squared meters) and the second shows a mixed land-use index. The corridor can be categorized as an already high developed, consolidated zone with specific centralities of mixed use

zones. Leaving aside the results of the case study, this research has three particular outcomes related with the empirically-supported sensitiveness of the models. The first one is related with BRT infrastructure proximity effect. The second one is related also with the sensitiveness towards a commonly-used accessibility measure. And finally significant results with variables related with urban normative such as FAR and uses zoning. Therefore the model can be used as planning support systems that helps to assess a corridor-wide urban vision to understand the location and distribution of activities induced by an accessibility improvement and/or urban normative conditions. Low-developed high-potential zones, mixed use zones and accessibility premium zones are the analysis that can be performed. In these zones particular approaches of urban intervention may be planned in order to obtain a better integration of both transport of land-use features along the transit corridor.

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