



Urban Transport Infrastructure and Household Welfare: Evidence from Colombia

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The distributional effects of urban transport policies are a broadly understudied topic, particularly when it comes to developing countries. This study¹ seeks to fill in this gap in the existing literature by analyzing the effects of a newly established bus rapid transit system in Barranquilla, Colombia. The analysis focuses on evaluating the compositional and distributional effects that may follow from the displacement of households originally living in the areas in close proximity to bus rapid transit stations. Overall, the analysis performed points to poor households living in proximity to stations being replaced by households from upper socioeconomic strata.

Latin America and the Caribbean are experiencing rapid urbanization. Rapid urbanization is one of the defining characteristics of the development process of developing countries. In Latin America and the Caribbean, despite a reduction in the urban population growth rate from 4.4 percent in the 1960's to 1.4 percent (as of early 2010s), the urban population growth rate is higher than the overall population growth rate, currently documented at 1 percent. Similarly, for Colombia, after a decrease of the urban population growth rate from 5.9 percent in the 1960's to a current 1.4 percent, the rate is still higher than the population growth rate registered at 0.9 percent.

Correspondingly, urbanization requires adequate infrastructure growth. Today, 80 percent of Latin Americans and 77 percent of Colombians live in

urban areas, contrasting with 49 percent and 45 percent, respectively, in the 1960's. The rapid growth of urban population thus requires the development of adequate infrastructure that supports the efficient provision of essential services in urban areas. Of particular importance are urban transportation services, since lack thereof leads to saturated roads and low rates of mobility. In response to this, bus rapid transit (BRT) systems have shown a dramatic growth over the recent decade.

BRT systems have adequately responded to transportation needs stemming from urbanization. The BRT system is an urban mass transport. It consists of a bus network that uses dedicated lanes that allow buses rapid mobility. So far, BRT systems have been implemented in 205 cities across the world, transport 34 million passengers

¹ This note summarizes findings of a larger working paper: Pfutze, Tobias; Rodríguez-Castelán, Carlos; Valderrama-González, Daniel. 2018. Urban Transport Infrastructure and Household Welfare: Evidence from Colombia. Policy Research Working Paper; No. 8341. World Bank, Washington, DC. © World Bank.
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daily and cover a network of over 5,600 kilometers. In Latin America, this system was pioneered by Curitiba in Brazil and Quito in Ecuador. Soon after, BRT systems spread to large capital cities, including Mexico City and Bogota. Colombia adopted the BRT in 2001, introducing it in Bogota, and later expanding it to major and mid-size cities.

The Issue and Our Approach

Analysis of BRT systems is still lacking welfare effects. The benefits of BRT systems, in terms of improved transport efficiency and environmental gains, have been widely documented in the literature. Nevertheless, the literature on the economics of public transportation is still scarce, particularly regarding the impact on household welfare. Furthermore, urban transport studies are scarce for smaller cities and middle-income countries. This study seeks to fill in the knowledge gap on the welfare effects that urban transport may have on households in mid-size cities. To this end we investigate the distributional effects of the BRT system in Barranquilla, Colombia. In particular, we focus on the compositional changes that neighborhoods may have experienced as an effect of proximity to Transmetro stations.

Transmetro is the BRT system serving Barranquilla in Colombia since 2010. The Barranquilla metropolitan area is Colombia's fourth largest population center, with over 2 million people. It consists of the municipalities of Barranquilla, Galapa, Malambo, Puerto Colombia, and Soledad. Barranquilla's BRT system, Transmetro, entered service on April 2010 and currently serves the municipalities of Barranquilla and Soledad. Because of the demographic and socio-economic characteristics of the Barranquilla metropolitan area,

the Transmetro system was originally intended to benefit the poorest households through better connectivity and lower fares. Currently, there are 18 stations on the main lines and over 600 stops along the feeder lines. The number of passengers using this BRT system rose from 3,658,421 in 2010 to over 36,400,00 in 2016.

This study combined geocoded household survey data with information of the expansion of the BRT system. Because we are interested in evaluating any possible effects that the introduction of the BRT system may have had on household characteristics, we rely on data from the 2008–15 rounds of the *Gran Encuesta Integrada de Hogares*—GEIH survey, the main labor survey in Colombia conducted by the National Administrative Department of Statistics (DANE). This survey provides information on an ample set of welfare, housing, and labor characteristics that are relevant for this study. It is also the only survey that offers a large, representative sample size at the metropolitan area level for 13 cities including the Barranquilla-Soledad metropolitan area. To assess the exposure of households to the Transmetro system, including both main lines and feeder line stations, we use geo-coded information collected from official maps of this system. Households are aggregated on blocks, and then proximity to a Transmetro station is calculated as the distance from the block centroid. The study used a total of 2,088 blocks.

Select Findings

Following the implementation of Transmetro, the quality and quantity of housing improved. The main results on home characteristics have to do with the quality and quantity of housing. First, proximity to Transmetro stations had a strong effect on the

quality of the housing stock. The results show that there was an increase in the number of apartments, the number of rooms, and the number of exclusive toilets in the households in closer proximity to stations. Second, home values and rents increased also in proximity to stations. The value effect on homes was only registered for houses in proximity to feeder stations, while the effect on rents was found on both main and feeder stations.

Housing prices went up, but not as a direct effect of the BRT system. The results suggest that the increases in home-values and rents are only the result of the increase in the quality of housing, and not of the proximity to stations per se. One possible explanation is the signal that the Transmetro system public investment gives to the households about the overall commitment of local authorities to those areas of the city. Thus, public investment could have secondary effects such as better-maintained roads. These associated secondary effects could potentially drive wealthier households, without the need to use public transportation, and more private housing investments to areas within BRT stations proximity.

Compositional changes in households also followed, including an increase in smaller households. The better and more expensive housing stock that developed in response to the Transmetro system, suggests that a change occurred in the composition of households living in proximity to stations. Our results show that indeed more well-off individuals and families replaced poorer ones. First, proximity to feeder stations raised the number of smaller households in the area, consisting of one or two members, and reduced the number of large households, consisting of more than five members. Related to this, is the additional finding that proximity to feeder stations reduced the number of young individuals, between 16 and 22 years old, living in owner-households. Similarly, the number of

children decreased in households, both owning and renting, living in proximity to feeder stations.

Poor and less educated households were replaced by richer and more educated ones. The educational attainment of adults living in households close to BRT stations also changed. Our results show that, in proximity to stations, there was a decrease in the number of individuals who completed less than high school. Interestingly, this decrease was offset by an increase in the number of individuals achieving higher education. Thus, higher educated adults replaced lower educated ones in the areas close to Transmetro stations. Further effects on household economic characteristics were also found. There was an important reduction in the number of poor households in the areas nearby main line stations. With regards to proximity to feeder stations, the number of households owning a motor vehicle increased. Similarly, the average per capita income rose among households in proximity to Transmetro stations, except for household-owners close to main stations. Furthermore, there was reduction in the number of households in the bottom two income quintiles, and at the same time an increase in the number of households in the fifth quintile. This confirms that the implementation of Transmetro led to a replacement of poorer households by wealthier ones.

Conclusions

The main results point towards a negative distributional impact of the BRT system implementation among poor households, despite the original objective to benefit them through better connectivity. This study documents an important displacement of poor households, and a replacement of them by households in middle- and

upper-income strata, following the implementation of the Transmetro system in Barranquilla. In previous literature, distributional effects of BRT systems have been often overlooked. Nevertheless, our study sets a precedent for analyzing household welfare effects of public transportation and, more importantly, questioning the often-unstated assumption that households do not relocate in response to public transportation policies.

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