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Impacts of Introducing Public Transportation in Rapidly Growing Cities

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Context

Today, 55% of the world's population lives in cities, a share expected to reach 70% by 2050. To keep up with this growth and expand access to opportunities, developing countries are investing heavily in mass transit systems. Understanding how these investments impact commuters and reshape existing paratransit networks is key to ensuring future accessibility for all.

Ambitious mobility plans for Lagos

Lagos, Sub-Saharan Africa's largest city with 22 million inhabitants, is known for its persistent traffic congestion challenge, where an average commute takes about four hours a day, and most of the vehicles on the road are over 15 years old.

To address the challenges in its public transit system, the Lagos State government, through the Lagos Metropolitan Transport Authority (LAMATA), launched the Bus Reform Initiative (BRI) to establish a more efficient and comfortable public bus system — the first step towards a multimodal transport system for Lagos. Between 2019 and 2022, the initiative introduced 820 modern buses on 64 new routes, replacing smaller paratransit minibuses. The new buses offer amenities such as air conditioning and have better emissions standards.

A joint research program to understand their impacts

The research described in this brief aimed to assess the impact of the Bus Reform Initiative and collect data on mobility in Lagos. It was conducted jointly by LAMATA, researchers at the World Bank, the University of California, Berkeley, and Columbia University.

The team used multiple methods for this research. They applied quasi-experimental approaches to track paratransit activity and analyzed changes in traffic congestion and public bus usage using GPS data, bus swipe card data, a paratransit census, and surveys of drivers and commuters. They also conducted an experiment to understand commuter preferences.

Impacts of the BRI

The new system is a net benefit for commuters

The research estimates that the new system generated $1.84 million in monthly value for commuters. This estimate is based on a model of how commuters choose transportation modes considering price, time, and amenities like comfort and safety. By incorporating usage data

from the first year, the model reveals the total value commuters place on the new system across all these attributes combined.

Commuters benefit from improved comfort and safety with the new public transit system. The team's surveys find that men and women highly value the new public transit option concerning trip safety. Women in particular face safety concerns in existing minibuses, called *danfos*, with 42% reporting verbal sexual harassment.

The system even helped commuters who didn't use it: 28% of the total commuter benefits from the new infrastructure came from the competitive response it triggered in the private sector. After it opened, many *danfo* drivers shifted to other routes, increasing service and lowering fares, which benefited many riders. This highlights the broader impact of public investments that might be overlooked if analysis focuses only on the public system.

The system generated an estimated fare revenue of $1.17–$1.33 million, based on e-ticketing data from 51 BRI routes operating between November 2022 and March 2023[1].

[1] *This calculation excludes first and last mile and BRT routes, and routes with fewer than 5 operational days in a month during this period.*

The benefit-to-cost ratio for commuters is therefore estimated at 1.4–1.57. These are short-term benefits observed within a year of opening and likely underestimate the long-term impact.

The new system is cleaner

The team estimates that the new system reduced CO2 emissions by 9% on treated routes.

But managing paratransit is still important for mobility

In comparison, *danfos* drivers have lost from the new system: they faced increased competition, amounting to $1.1 million per month in losses for the sector, roughly 60% of the benefit to commuters.

However, paratransit is still key for mobility: the old fleet of *danfos* still accounts for 52% of motorized journeys in Lagos.

Project team

The principal investigators for the World Bank are Alice Duhaut and Geetika Nagpal, together with Nick Tsivanidis (University of California, Berkeley) and Daniel Björkegren (Columbia University). The Bus System Unit of LAMATA is the research partner in Lagos. Nuruddeen S. Umar and Segun Adebamiji are providing field implementation support.

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