RESEARCH BRIEF • APRIL 2024

Optimal Urban Transportation Policy: Evidence from Chicago

Based on BFI Working Paper No. 2024-22, "Optimal Urban Transportation Policy: Evidence from Chicago," by Milena Almagro, University of Chicago; Felipe Barbieri, University of Pennsylvania; Juan Camilo Castillo, University of Pennsylvania; Nathaniel Hickok, Massachusetts Institute of Technology; and Tobias Salz, Massachusetts Institute of Technology

In Chicago, welfare would be increased by charging almost nothing for public transit, increasing the frequency of trains, and lowering the frequency of buses. Road pricing reduces environmental externalities, but only benefits travelers if the revenues are used for transit subsidies and rebates.

The gridlock that increasingly characterizes American cities leads to costly travel delays and harmful carbon emissions. How should cities address these challenges? Policy interventions range from changing public transit fares or adjusting their service frequency to implementing **road pricing**. Importantly, such policies cannot be considered in isolation as their effects interact. In this paper, the authors explore the optimal combination of urban transportation policies.

The authors conduct their study in the context of Chicago, home to one of the largest public transit systems in the United States. They combine several sources to construct a rich dataset of travel flows, times, and prices for all relevant modes of transportation (train, bus, ride-sharing, taxi, and private car). They also observe travelers' incomes and locations. The authors begin by documenting the following descriptive facts concerning transportation in Chicago:

- Travelers tend to select different modes of transit depending on their location. While bus and car trips are spread evenly throughout the city, train trips are concentrated along

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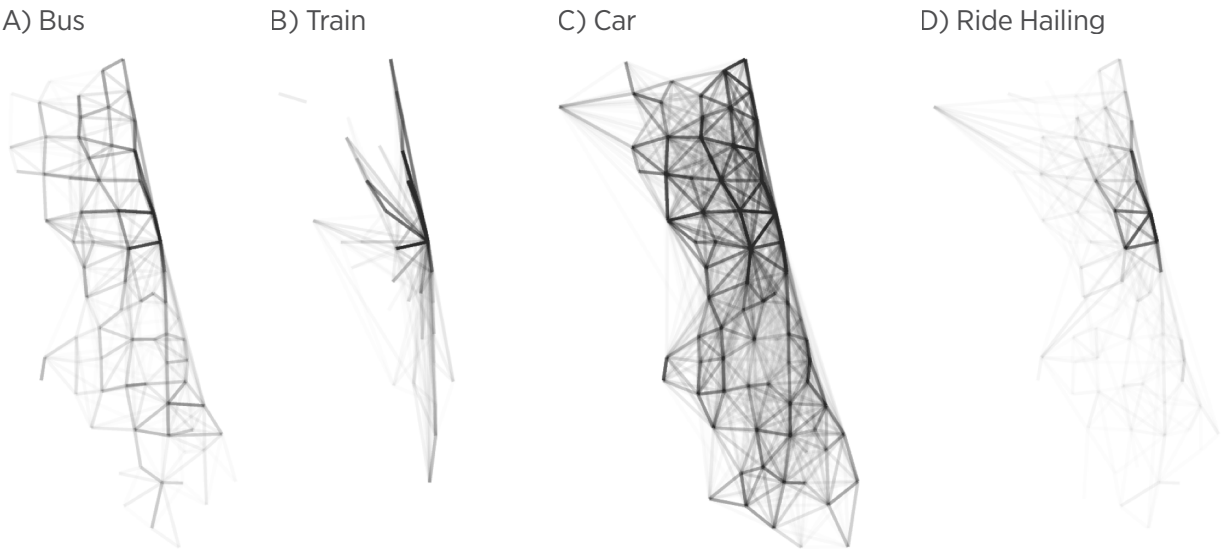
Road pricing: A transportation policy that imposes charges on drivers to manage traffic flow and reduce congestion

Figure 1 · Trips by Mode



Note: These figures show a random sample of 20,000 trips, separated by mode of transit. A line connects the origin and destination of every trip.

the corridors connected by the L lines. Ride-sharing (e.g., Uber and Lyft) mostly accounts for short trips downtown or north of downtown, along the coast of Lake Michigan, as well as for trips to and from Chicago's two major airports.

- Chicago has stark income differences that are reflected in distinct travel patterns. Low-income travelers mostly stay in the south and the west parts of the city, and the highest income travelers mostly stay downtown and to the north, along the coast of Lake Michigan. Trips of intermediate income travelers are more evenly spread throughout the city. In addition, car ownership is less common for both high- and low- income travelers compared to those with median incomes.

These patterns suggest that the impact of transportation policies will vary for different types of commuters. To account for this variation, the authors construct a model that allows for differing substitution patterns for travelers with different locations, incomes, and car ownership statuses. They first use their model to explore the cases where the government only adjusts transit prices and frequencies or only implements road pricing, before incorporating the interactions of the two types of policies. They find the following:

- A policymaker who only controls public transit should reduce the cost of both buses and trains to a price of near zero. In addition, they should reduce the frequency of buses by 28% and increase the frequency of trains by 10%. The reason for this divergence is that buses serve more price sensitive travelers and are poorly utilized. Together, these price and frequency changes lead to a weekly increase in overall **welfare** of $1.45 million ($0.54 per resident of Chicago).
- The authors next consider a policymaker who only controls road pricing. They show that the optimal road price, when it is the only transportation policy pursued, is $0.37 cents per kilometer. This policy leads to large welfare gains of $4.12 million per week, mostly due to a reduction in environmental externalities. Implementing road pricing harms travelers, however, whose **consumer surplus**

Welfare: the monetary evaluation of the economic benefits and costs affecting an individual's or society's well-being.

Consumer surplus: the difference between the amount consumers are willing to pay for a good or service and the amount they actually pay

decreases by $25.10 million per week. The largest losses are borne by middle-income consumers who are most reliant on cars. Most of these consumer welfare losses would be offset if the government were to fully rebate the revenue generated from road pricing.

- Finally, the authors consider road pricing and public transit policies in conjunction. In this case, the government's budget constraint is no longer binding because of the revenue collected from road pricing. Public transit becomes virtually free: the optimal fares are $0.07 for buses and $0.10 for trains. Compared to the status quo, train frequencies are around 20% higher and bus frequencies are around 20% lower. Overall welfare under this policy increases by $5.60 million per week. Without rebates, consumer surplus decreases by $16.20 million dollars per week ($6 per resident), but it can increase by up to $1.20 million per week if the government issues rebates.

These findings highlight the importance of jointly considering public transit policies and road pricing: road pricing can help achieve large reductions in environmental externalities, but it only benefits consumers if resulting revenues are used to cross-subsidize public transit and to rebate travelers. This research also underscores the importance of considering the distributional impacts of transportation policies. Middle-income consumers, who are most affected by road pricing, could see their interests safeguarded through targeted rebates or subsidies in public transit.

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