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Automated Vehicles and Transportation Network Companies Will Likely Impact the Efficacy of Transportation Pricing Strategies

Michael F. Hyland, PhD; Daisik Nam, PhD; Tanjeeb Ahmed; and Arash Ghaffar
Institute of Transportation Studies, University of California, Irvine
Department of Civil & Environmental Engineering, University of California, Irvine

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Transportation pricing strategies aim to manage vehicle travel demand, collect revenue, or force drivers to internalize the costs they impose on other persons (e.g., delayed travel time) and physical infrastructure. Pricing strategies include parking pricing, cordon- and area-based congestion pricing, road-usage charges (RUCs), and high-occupancy toll (HOT) lane pricing. These pricing strategies were, however, designed before the advent of ride-sourcing companies (i.e., Transportation Network Companies or TNCs) and automated vehicles (AVs). Hence, the efficacy of existing pricing strategies in a world with TNCs and a future world with AVs is unclear. Moreover, future pricing strategies must consider the behavior of TNC fleet operators in addition to private vehicle drivers.

To address this gap, we developed a conceptual framework to support systems-level analyses of pricing strategies that consider driverless and human-driven vehicles in TNC fleets or privately owned. The framework also considers the role of vehicle-to-infrastructure communication technology. We also conducted a trend analysis of congestion pricing research topics in the titles and abstracts of research presented at the Transportation Research Board (TRB) annual meeting.

Key Research Findings

AVs and TNCs negate the role of parking pricing in reducing vehicular travel in dense areas. Parking pricing serves many purposes in dense urban areas, including recouping the value of land cars occupy. Planners and policymakers who want to use parking pricing to reduce vehicle trips need to consider that travelers can now take a TNC trip to avoid parking fees. Interestingly, prior research suggests that urban areas with high parking prices generate more such trips. Moreover, with AVs that can park themselves, setting high parking prices is likely to result in AVs dropping off travelers at activity locations and then driving empty to park in cheaper areas of a city.

TNC services complicate the effectiveness of cordon-based pricing. Cordon-based pricing strategies typically charge drivers for crossing a cordon that separates unpriced and priced regions of a city. Once a vehicle crosses the cordon, many pricing mechanisms do not charge drivers for the number of miles they drive or trips they make inside the cordon. Hence, TNC vehicles could serve dozens of trips inside the cordon area and only pay the cordon fee once. Area-based congestion pricing schemes that capture the miles driven within the “priced” region are preferable for pricing TNC trips to reduce vehicular travel.

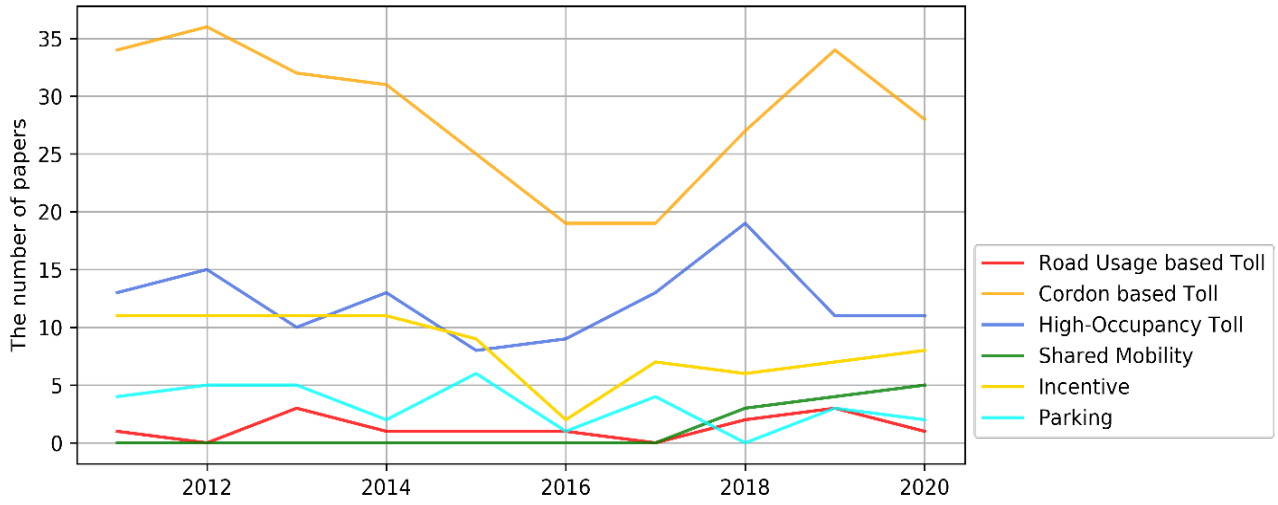

Figure 1. The number of papers created per year from 2012 to 2020 on various pricing policies

Shared mobility in the context of congestion pricing is gaining more attention from the research community. Figure 1 displays trends in papers covering six types of transportation pricing strategies. Cordon-based tolls and HOT lanes remained popular research topics between 2010 and 2020. Shared mobility papers in the context of congestion pricing, non-existent before 2018, became increasingly popular between 2018 and 2020. Incentives are also widely researched, but the focus has shifted; recent studies emphasize incentives related to shared mobility (topics like TNCs and pooled rides), while pre-2017 research centered on demand management and transit.

Policy Implications

Planners and policymakers must consider how future pricing strategies account for the implications of TNCs, AVs, and other emerging technologies, particularly since TNC vehicles and AVs do not need to park near traveler activity locations.

More Information

This policy brief is drawn from the report "Transport Pricing Policies and Emerging Mobility Innovations," available at www.ucits.org/research-project/2020-51. For more information about the findings presented in this brief, please contact Mike Hyland at hylandm@uci.edu.

[1]Ghaffar, Arash, Suman Mitra, and Michael Hyland. "Modeling determinants of ridesourcing usage: A census tract-level analysis of Chicago." Transportation Research Part C: Emerging Technologies 119 (2020): 102769.

[2]Bahk, Younghun, Michael F. Hyland, and Sunghi An. "Private autonomous vehicles and their impacts on near-activity location travel patterns: Integrated mode choice and parking assignment model." Transportation Research Record 2676.7 (2022): 276-295.

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