Experimental economics can help tackle challenges in land transport

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Land transport planning is a complex affair. By factoring in economic, social and environmental considerations, policymakers aim to maximise good outcomes like productivity and liveability, while minimising bad outcomes like congestion and pollution.

Commuter values, preferences and behaviour are also important. For the recently concluded public engagement on the Land Transport Master Plan (LTMP), Dr Janil Puthucheary, Senior Minister of State for Transport and chairman of the LTMP advisory committee, highlighted that respondents did not mind longer travelling time in exchange for convenience and comfort. Most respondents supported the idea that behavioural change can play an important role in improving Singapore's transport system.

This poses a challenge to policymaking. How much additional time or money are commuters prepared to spend for additional comfort or convenience? Can current data on commuter preferences and behaviour be used to project future commuter decisions in response to changes in the transport system?

The answers will better inform policymakers as the LTMP sets the stage for land transport in the coming decades.

TECHNOLOGY: ENABLING AND DISRUPTING TRANSPORT

Dr Janil said that the LTMP will see Singapore's Smart Nation initiative in action. Singapore has progressively introduced smart technologies such as real-time route choices and travel times across devices.

New technologies of mobility can also disrupt and complicate an already complex transport network. The Land Transport Authority (LTA) is using test beds and trials to study the benefits and costs of services such as on-demand shared buses and autonomous buses.

When necessary, Singapore has also taken a light-touch approach of regulating sharing-economy mobility solutions, such as ride-hailing and bike-sharing, to allow them to gain traction.

Such forward-looking approaches pose challenges. Accounting for future conditions in the present is difficult. In rapidly advancing fields such as autonomous vehicle technology, adoption rates and usage patterns can differ depending on factors such as technology maturity and commuter tech-savviness.

A taxi-sharing scheme introduced here 20 years ago was unsuccessful. It took the advent of smart devices in a digital society for commuters to embrace ride-sharing apps.

The light-touch approach to private ride-hailing and bike-sharing has seen its share of complications. While commuters may have benefited from the previous Grab-Uber or oBike-

Ofo wars, there have been market failures and externalities in which the LTA had to intervene. These include an oversupply of leased vehicles, indiscriminate bicycle parking and mishandled deposits.

AN EXPERIMENTAL ECONOMICS APPROACH

To plan for a future transport system, we need to know how behaviour and technology will interact in the system. To achieve this, we can use experimental economics (EE): an approach blending behavioural science, economic analysis and experimental methods to study human decision-making.

EE is a growing field that complements behavioural economics. Professor Richard Thaler's Nobel-winning research on behavioural economics was built on experimental insights.

EE provides an evidence-based method for testing actual economic preferences and behaviour. EE elicits behavioural responses from participants incentivised by monetary earnings. This gives EE an advantage as a test bed for policy options or future technologies. It differs from conventional survey approaches where people state their choices hypothetically.

The late Nobel Laureate Reinhard Selten and his group investigated commuter route choice behaviour using a computer-based laboratory experiment.

Participants repeatedly chose between two travel routes. Earnings depended on the time taken to travel on each route, which in turn depended on the number of subjects using the route. After each round, participants received information on the previous travel time of each route.

They found that earnings decreased with the frequency of switching between routes.

The insight was that a commuter who expects a route that is crowded today to be crowded tomorrow may choose to switch.

However, another commuter may expect others to do the same and choose not to switch. In this interaction, the "contrarian" benefits at the expense of others who decided to switch.

Some may remember the Incentives for Singapore's Commuters (Insinc) scheme. It used raffle-like rewards, social influence and personalised offers to nudge commuters away from peak-hour travel.

Insinc was, in fact, part of an experiment. Over two years, commuters could sign up online to link their ez-link transport payment cards to the scheme. Points earned on commutes were convertible to ez-link credit or other prizes. After the experiment, Insinc continued as LTA's Travel Smart Rewards scheme.

EE is also used commercially. University of Chicago economist John List, also the former chief economist at Uber, designed an experiment in 2017 to study how to restore consumer confidence after a delayed trip. He found that an apology with a US$5 (S$6.80) ride coupon was effective for the first delayed ride.

Smooth access for train commuters with the use of ez-link cards. The Land Transport Master Plan, which will set the stage for land transport in the coming years, will see the Smart Nation initiative in action. Singapore has already introduced smart technologies such as real-time route choices and travel times across devices. ST PHOTO: JASMINE CHOONG

Interestingly, the experiment also showed that customers tended to spend less on Uber after repeated apologies, compared to customers who received no apologies at all for repeated

EXPERIMENTATION NEEDED

EE need not be used as a stand-alone tool. Given its scalability and versatility, EE can help validate responses from surveys and focus groups such as those used during the LTMP public engagement.

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Policymakers may now be able to study how much extra travelling time or cost that commuters are willing to sacrifice in exchange for extra convenience or comfort.

Experiments should capture data representative of diverse segments of the population and imaginable technological advancements. Policymakers can use such data to calibrate cost-effective trials and pilot projects, such as determining optimal rates for distance-based electronic road pricing.

EE can also generate inputs for data science methods such as machine learning and simulations. There is also room to study radical transport policy changes such as offering ad-driven commuting trips for free.

Together with Nanyang Technological University professors Euston Quah and Yohanes Eko Riyanto, we are experimenting on autonomous transportation adoption as part of a wider National Research Foundation-funded interdisciplinary future transport programme, TUMCreate.

Our experiment elicits commuter behaviour in future transport scenarios, including fully autonomous options alongside non-autonomous vehicles, ride-sharing and walk-cycle-ride.

Transportation technology is rapidly changing, and so should the tools for evaluating and implementing them.

• Zach Lee is a Research Associate at TUMCreate and Nanyang Technological University (NTU). Jonathan Tan is Associate Professor of Economics at NTU.