

## 論文の内容の要旨

### 論文題目 **Ex-Post Comprehensive Evaluation for Urban Public Transport Pricing Policy: Case Studies of Singapore and Hong Kong**

(都市公共交通プライシング政策における事後総合評価:

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Cities are the agglomeration of humans and goods. Urban transport serves a high-dense population and economy and supports the mobility of humans and goods. Considering constraints of limited land area and increasing travel demand, compared to private transport, the promotion of public transport would be the only solution for sustainable urban transport development.

Pricing as a direct and effective intervention instrument has long been emphasized by transport economics and gains more and more attention due to the necessity of dedicated soft system management when facing hard infrastructure constraints, as well as the development of ICT that makes complicated pricing management possible. Policy makers have tried to optimize pricing policy based on pricing theory and to customize and implement pricing policies under different urban contexts for diverse purposes. However, past research and practices have pointed out pricing policy-related problems impeding the sustainability of urban public transport, such as the setting of fare to balance the tradeoff between affordability and profitability, the subsidy mechanism, as well as the finance structure for the public transport sector. These problems indicate the insufficiency of pricing theory in policy making, and highlight the necessity of learning from the existing pricing practices, namely, the ex-post evaluation.

The objective of the research is to construct an ex-post evaluation framework and to identify the pricing problems through the review of the existing pricing policy. Cases of Singapore and Hong Kong are selected for ex-post evaluation. They are top-ranked in terms of both GDP per-capita and population density, comparable in city size and geography, as well as with a good reputation in public transport. There are multiple pricing schemes implemented in Singapore and Hong Kong, which can be briefly classified into Fare Scheme, Subsidy Scheme, and Finance Scheme. Data on these pricing schemes are collected from diverse sources, including research papers, reports, legislation documents, and Statistics websites, to conduct the ex-post evaluation.

The ex-post comprehensive evaluation framework is constructed. Well-established methods and theories in policy evaluation domain, including the Multi-Criteria Evaluation method, performance indicator-based evaluation method, Theory of Change, and Realist Evaluation, are comprehensively integrated into the framework. Ex-post evaluation emphasizes on the concept of learning from the past and address the questions of “What” is implemented and

achieved, “How” and “Why” the pricing policy produced changes. The policy implementation evaluation based on Multi-Criteria Evaluation method, and policy performance evaluation based on performance indicator-based evaluation method, are carried out to address the “What” question. Results of implementation criteria scores and performance indicators are integrated and visualized by the integrated analytical framework. The causality analysis adopts a theory-based approach combined with the Theory of Change and Realist Evaluation method, to identify the causal links between policy implementation and policy performance, and to answer the question of “How” and “Why”. Findings from causality analysis are summarized in the form of CMO (context-mechanism-outcome) configurations, based on which causality maps are made, showing the interactions between key factors and the policy interventions. The comparative study is carried out and implications are derived for future pricing policy making.

The findings indicate that the priority for Singapore is the improvement of transport system capacity, while for Hong Kong, the social need for affordable fare is emphasized. Under such context, Fare Scheme, Subsidy Scheme, and Finance Scheme that implemented in the 2 cases produced different impacts.

In the case of Singapore, with the Finance Scheme, the public fund is provided to support the capacity improvement. Through the shift of finance structure, the operator's profitability is guaranteed by the service fee paid by the government, which would make the operators concentrate on the provision of service. The Fare Scheme keeps fare at an affordable level, which is justified by the fare and affordability indicator. The Fare Scheme charges fare only with reference to the distance-traveled, benefiting the seamless service of public transport. The New Capacity Factor Scheme considers the cost of capacity expansion by introducing a new factor into the fare adjustment formula. With the factor, the negative effect on fare and affordability is created, though the government tried not to impose cost burden on the low-income group. The Concession Scheme address affordability issue through the direct discount of fare at the cost of public fund. As a result, Singapore faces the problem of economics of the transport system, especially the government finance burden.

The basic principle in Hong Kong is that public transport is operated by private operators on a commercial basis. There is no direct subsidy from the government to the operators. In Fare Scheme, the profitability of operators is concerned, which resulted in continuously increasing the revenue of the operators and the raising fare level. Affordability is addressed by 2 Subsidy Schemes. Work Incentive Transport Subsidy is a mean-tested subsidy to an eligible individual or household applicants, while Public Transport Subsidy Scheme is a non-mean-tested subsidy to the whole population. Both of them have a negative impact on the public fund and a positive impact on affordability. The Finance Scheme is aiming at the improvement of network capacity and the enhancement of service standards, supported by the public fund and operator revenue. As a result, Hong Kong also faces the problem of economics of the transport system, especially government finance burden.

Singapore and Hong Kong face the same problem, government finance burden, though they have different policy intentions and have applied different policy instruments. Based on the comparison of practices in 2 cities, it is implied to apply the more efficient and/or effective instruments of one city to another in order to solve the problem. Incorporation of the Profit-Sharing mechanism and Price Cap in fare adjustment scheme in Singapore could be a solution of affordability to impose restriction on fare increasing and share a certain amount of operator revenue with the general public in Hong Kong. And Hong Kong's subsidy should

be provided in a direct way, and the non-mean tested subsidy can be revised from flat subsidy structure into differentiated subsidy structure, to save subsidy fund and make it better distributed among population groups, which is similar to the cases in Singapore. On the other hand, Hong Kong's innovative financing model is implicative to Singapore, which may help release the finance burden of public fund, which is extensively used to address the network capacity and affordability problems.

This research addresses the urban public transport pricing problems through the ex-post comprehensive evaluation of existing pricing cases. It sheds light on how to set public transport fare and adjust fare to balance the tradeoff between operator profitability and affordability, how to maintain the fare at an affordable level with subsidy mechanism, as well as the finance structure that can support a sustainable public transport system.

The academic contribution lies in the ex-post comprehensive evaluation framework. The methodology framework is the systematic integration of research methods and designed specifically for the purpose of the ex-post evaluation on urban pricing policy. The presenting forms of radar chart and causality maps are utilized in order to communicate and share knowledge with policy makers, interested public, and relevant researchers.

As the case study based ex-post evaluation, more cases would result in more powerful CMOs, which would increasingly test and refine the CMOs obtained based on cases of Singapore and Hong Kong. Pricing policy evaluation for cities with different populations, geographies, economic development levels, and with different priorities, may reveal different attributes and novel CMOs. The understanding of urban context is important for the application of findings from this research.

Future research could include comparisons with more international cases, which enable us to produce more general knowledge and implications. And it will be expected to simulate the performance of policy in order to design an appropriate policy after fully understanding the complex relations among the context, mechanism, and outcome.