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A b s t r a c t

Title	Economic Evaluation of an Electric Vehicle City: A Case Study of Toyohashi City, Japan by A CGE-Modelling Approach
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(800 words)

The underlying approach of this study is the computable general equilibrium (CGE) model. In this study, we aim to introduce an electric vehicle city (EVC) hoping to shift demand to electric vehicles (EVs) and solar power from the conventional in Toyohashi City, Japan as the study region. However, the study of EVC has been a considerably unexplored field in environmental economics despite the fact of potentially attractive and important theme though there have been little attempts for this topic in environmental economics. For example, it would significantly be worth to examine how the economic impact of both production and policy implementation for promotion and realization of an EVC is.

From this point, in our study, firstly we have applied a CGE model to investigate the economic impacts of EVs production. The result demonstrates that the output of automobile industry has shown a decrease of -9.3% though the total industrial output slightly increases 0.1%. Moreover, city GDP increases 0.9%. Both increases in the total industrial output and city GDP are considered as the positive facts, however, conversely increases in the entire commodity prices including the EVs are regarded as a negative fact of spreading EVs in Toyohashi City.

From this point, we realized that it was necessary to implement policies like introduction of subsidies to reduce prices. Beforehand, we did not consider subsidies, but subsidies may be required to overcome the initial price difference of the new industrial productions. Besides, promotion of an EVC does not only depend on EV production; it is required to acquaint with new industries like EV transport as small mileage is the main problem of EVs. Moreover, it is expected that the spread of EVs would greatly reduce the CO₂ emission; however, it only depends on internalizing electricity generated from renewable sources of energy like solar. Thus, it is also imperative to consider industries like solar power generation to introduce an EVC in Toyohashi City. Moreover, cogeneration is also important to shift the demand to renewable energies from the conventional.

Taking these backgrounds into account, we applied a CGE model similar to the previous model concerning this field to explore the economic impact of promotion and realization of an EVC. More concretely, finally this study emphasizes on a CGE modeling approach to evaluate the following issues: economic impacts of subsidies for promotion of an EVC, the possibility of price's reduction, industrial structure change towards an EVC and modal shift towards an EVC.

Our simulation results demonstrate that after applying 20% up subsidies to five industries, such as EV manufacturing, EV transport, solar power, cogeneration and other transport, the total industrial output increases 0.07%. A large increase rate is found in industries where subsidies are introduced alone with non-ferrous metal (0.54%). However, conversely decreasing tendency is seen in oil and coal product (-0.30%), mining (-0.06%), heat supply (-0.39%), and the GV transport (-0.10%). The total real GDP also grows by 0.08% in Toyohashi City. Besides, total labor demands increase 0.08%. Taking into account the current serious situation of job opportunity,

an increase in labor demand may be interpreted as a positive fact. Moreover, most importantly, all the commodity prices decrease though in industries where subsidies are presented prices shrink appreciably. For example, solar energy (-1.53%), other transport (-1.09%), EV manufacturing and EV transport (-0.42%) and (-1.00%), cogeneration (-0.32%) decreases largely.

Hence, Toyohashi City's economy shows a direction where the demand for conventional vehicles and energy are decreased, conversely, the demand for EVs and renewable energy are increased that illustrates a different lifestyle from the current one. In this study, therefore, it is clear that a society change occurs towards EVC. For all these reasons, as a conclusion of the study, it is authors' opinion that presenting 20% up subsidies can surely represent a realistic alternative society to EVC both in terms of economic development, CO₂ emission's reduction, and increase renewable energies share in Toyohashi City.

The proposed model can even be applied to the other cities in Japan and other countries in the world which are similar to this area.