

HONSHU-SHIKOKU BRIDGE EFFECTS

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ABRIDGMENT

•THE Honshu-Shikoku Bridge is planned to connect 2 main islands and is expected to have an impact throughout the country. The selection of a location, therefore, is of great importance both politically and economically. The aim of this research was to evaluate the future economic influence of the bridge on the surrounding region. An econometric simulation model was applied to evaluate social products, population, occupied populations, capital stocks, population flow, and cargo flow.

In the transportation forecast, a concept of time-weighting value in terms of money was introduced, and the time-weighting value was assumed to be subordinate to a distribution function. The transportation share of each facility between an origin and a destination was determined by comparing the total costs including the time cost.

The average total costs for all the cargo between an origin and a destination is called the economic distance. Potential variables that are formed by economic distances and economic variables were introduced. All future changes in transportation facilities were assumed to change economic distance and to affect the structure of economics. A number of simulations were made of combinations of bridge construction sites, periods, and fee policy to determine which combination will most enhance the social products, will most stimulate the development of Shikoku Island, and will result in the most efficient cost-benefit ratio.

In advance of the simulation, some assumption was made for the future transport conditions such as future travel cost, travel time, terminal cost, time, and travel speed. An express railway line from Kagoshima to Aomori was assumed to be constructed. Comparisons were made for combinations of 3 bridge locations and bridge structures as follows:

1. Route A between Kobe and Tokushima—6-lane roadway and railway bridge, roadway bridge;
2. Route D between Kojima and Sakaide—6-lane roadway and railway bridge, roadway bridge; and
3. Route E between Onomichi and Imabari—4-lane roadway bridge.

Combinations considered were as follows: only one route to be constructed, all routes to be constructed simultaneously, and one route to be constructed first and the others later until 1986.

The conclusions of the research that were disclosed for press publication were as follows:

1. In all cases, the construction of a bridge or bridges stimulate the development of Shikoku Island most.
2. Routes A and D are similar based on benefit-cost ratios. Route D allows regionally balanced developments, while route A allows maximum benefit and repayment to be completed sooner. The highway-railway bridge, compared with the highway bridge only, allows repayment to be completed sooner.
3. As for constructing the 3 bridges at once, there is no significant difference, and repayment would require a period of more than 30 years.

4. As for constructing the 3 bridges stepwise, there is no difference between routes A and B, but route D appears to be slightly preferable.

In my opinion, every route selection or construction order can be rationalized depending on the selection of bases for comparison. Selecting bases for comparison is not an engineering decision but a political decision, reflecting public opinion. However, in this situation, the public is greatly divided and there needs to be a firm government decision.

I believe that a highway-railway bridge at route D is the most preferable because the transport networks are historically developed to make the city of Takamatsu a gate from Shikoku Island to the mainland of Honshu. In a rather short period of 20 or 30 years, it is foreseeable that route D will act most efficiently. However, if a longer period, such as a hundred years, is to be considered, it is possible that route A would be most efficient because of the geometrical arrangements of the Japanese Islands.

This method allows comparisons to be made of construction plans for transport facilities and produces substantially good agreement between simulated and actual data for periods between 1955 and 1966.

Some of the limitations of the simulation model are as follows:

1. The reliability of the distribution function as to time weighting value is still questionable.

2. We were unable to form the structure equations that include the factor of social capital stocks because of lack of statistical significance. Therefore, the factors of political selection are not taken account of completely, except the change of the construction plans of the bridge or other highways. Some of the construction plans were assumed to be delayed according to the extra expense for the construction of bridges; but the treatments are still not sufficient in my opinion.

3. As to the modal selection of transportation, only one or two routes were considered, namely, those having minimum cost or minimum travel time. There may also be other routes.

4. We failed to take account of the capacity of the transport facility during the simulation. We tried, however, to build a model in which the traffic volumes affect the travel speed of highways, calculating the speed every period according to an assumed speed-volume relation. We are now reestimating the future influences by using this modified model.