

New Frontiers in Regional Science: Asian Perspectives 1

Hirotsada Kohno

Economic Effects of Public Investment

An Emphasis on Marshallian and
Monetary External Economies

 Springer

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Preface

So far, we have expressed the intention of our studies in the form of economic effects of public investment and public investment criteria—that is, the following two themes have been subjects of inquiry:

- A: Theory and measurement of the *indirect* economic effects of public investment, based on the Marshallian and monetary external economies
- B: Theory and measurement of the public investment criteria, based on the interregional input-output programming model

This time, these two are separated and will be published in separate volumes.

There has always been the theme of public investment criteria in our deep thoughts whenever the economic effects of public investment are argued.

Although the title of this volume is *Economic Effects of Public Investment*, the argument proceeds in content in the form of (A) above, that is, with the emphasis on the “indirect.”

For what reason should we adhere to the Marshallian and monetary external economies? The reason is this: the new epoch-making theory was desired in response to the paradigm-change-like background of the times in the transportation field of the new construction of ultra-gigantic public investment; public facilities (infrastructure) such as the Meishin (Nagoya–Kobe) Expressway (July 1, 1965), the To-Mei (Tokyo–Nagoya) Expressway (May 26, 1969), and the Tokaido New Trunk Line (October 1, 1964); and other projects during a period of about 20 years (1955–1975).

Corresponding to such events, in the investigative research field, two large works were of pressing need, of the preparation–learning–aftercare concerning the *Report on the Kobe–Nagoya Expressway Survey* by Ralph J. Watkins for the Ministry of Construction, Government of Japan (August 8, 1956, 188 pp.), and *Materials on The Shizuoka–Toyokawa Expressway Project* prepared for the International Bank for Reconstruction and Development, e.g., IV. *Materials on Toll Traffic and Economic Benefits*, Nihon Doro Kodan [Japan Highway Public Corporation (Tokyo, Japan, December 1964 (S. 39), A4 edition, 73 pp.]. For this difficult

problem, the old historical school-like *Treatise on Transport* did not work at all, and a new theory and method were indeed required.

On consideration of how much the pecuniary economic effects should be, for the payability/feasibility study of the Meishin Expressway, we were at that time facing the problem of what the amounts of the indirect economic effects ought to be, except for the effects of savings in running costs and reduction in transport time, which form the majority of the direct economic effects in popular thinking and are textbook-like.

For this, there are several antithetical concepts: (1) What is said to be indirect economic effects are intrinsically nothing but what is transferred from the direct effects, so it will not be able to add up to the direct effects. If this assertion is aggravated, then it turns out to be *perfect transfer theory*. (2) To the contrary, excepting the transferred indirect economic effects, there is an assertion that there are independently existing indirect economic effects apart from these. (3) Supposing the future demand function at the target period included all such various indirect effects, there also is an assertion that if only the direct effects have been estimated, there is no need to worry about the measurement problem of indirect effects.¹

However it may be with a mathematical model, it is universally admitted that the estimation in advance of such future composite demand function will be extremely difficult. This is the great crux of the subject standing in our way before the measurement of economic effects of public investment.

This problem is explained first in Chap. 9 briefly, and in exposition of the points in dispute in the latter part of this preface, our intention of how to cope with it is taken up.

More definitively, we have put the root of analysis on the windfall-like effects brought about by the initial impacts of gigantic public investments, that is, the great downfall of (long-run, short-run) marginal costs.

For a start, a summary by chapter is given. First, in Chap. 4, there are the following examples of the (pure) indirect economic effects which are not the indirect effects transferred from the direct effects: (1) ease of traffic congestion on existing roads, (2) scale-enlargement of factories-warehouses, and (3) Marshallian external economies are enumerated.

In Chap. 5, especially, the Marshallian externality is explained. The concept will be further clarified in that "technological and marketable propagation-diffusion of the technological external economies" ought to give rise to the scale-enlargement of upstream industries (raw materials purchased, product selling, advertisements, craftsmen's training, etc.) which will be input materials to the industry concerned (for instance, bread production and selling) which enjoys directly the technological innovation effects of expressways, the repercussion effects of which also are received. Here, the basic process is shaped into a "propagation-diffusion basis."

¹ Kanemoto, Y., and K. Mera. 1985. *Regional Science and Urban Economics* 15: 343-363.

In Chap. 9, based on the market equilibrium model, the confirmation of the independent existence theory has been grounded on the discrepancy of the magnitude of the generation base vs. incidence base benefits and has attained the most important target of this volume by demonstrating the existence of the independent existence doctrine of the indirect economic effects.

In Chap. 10, based on the general equilibrium model, further generalization of the externality of technological propagation-diffusion can be attained.

The above forms the mainstream of this volume and has been treated systematically in Chap. 1, Sect. 1.4 (*No. 1*); in Chap. 4, Sect. 4.3 (*No. 2*); in Chap. 5, Sect. 5.1 (*No. 3*); and in Chap. 10, Sect. 10.2 (*No. 4*).

Another large stream is the measurement method on the individual economic effects (by item). This is not a large-scale econometrics model, nor is it a large-scale interregional input-output programming model of the second volume (by which we can only derive macro gross economic effects), but, rather, what is said to be the "World Bank Method," which we will show in Tables 1.1 and 1.2 in Chap. 1, in which the following items are included: running costs saving, transport time reduction, decrease of load-damaged (goods-holder's benefits), enlargement of market area, and relaxation of upper limits (capacity restriction) of transport lot (1- or 2-t vehicle \rightarrow 20-t vehicle setup). This will have borne fruit in the scale-enlargement effects of the factory-warehouse and will also be revealed to be Marshallian economic effects.

We must make mention of one more fact that concerns the measurement of the time-saving evaluation rate of Chap. 2 and measurement of public pollution (noise) evaluation rate of Chaps. 6 and 7.

Tables 1.1 and 1.2 mentioned above show that these are measured in terms of physical units. The individual effects by item must be summed up to one scalar magnitude, that is, we must convert these effects to monetary terms and sum them up. For this purpose, we need a coefficient of conversion. Here, there is indispensable derivation work.

Chapter 3 is an easy elucidation of the perfect transfer theory of indirect effects, and Chap. 8 is the elucidation in numerical expression of the following formula:

$$\text{Benefits in incidence base} > \text{Benefits in generation base}$$

based on coordinate concepts such as generation base vs. incidence base as the time axis of measurement, remained vs. transferred, direct vs. indirect, etc. (of course, substantially, this theorem will be studied in Chaps. 9 and 10).

Finally, social costs and measurement of Chap. 6 are coordinate concepts of the social benefits which we have studied as the main research target, and they are posited and put together to form a counterpart to each other.

As explained above, a summary by chapter is given; then, from other points of view, we refer to the normative subjects at issue of three points, though with hesitation, which are as follows:

Advocacy of the Independent Existence Theory of Indirect Economic Effects

The subject of our counterargument is the proposed model by which the future market demand function 40 or 50 years from now will be able to be forecast, in which all the direct and indirect effects will be included due to the impact of a huge public investment project like the Tokyo–Nagoya Expressway class that has turned up. If the model were valid, it would be an epoch-making proposal–proposition.

This might be shown by the example that the wording to spread the magnitude or social mission of the *indirect* economic effects of the Ministry of Land, Infrastructure, Transport and Tourism (formerly the Ministry of Construction) has disappeared these 30 years; nevertheless, there remain enormous public structures such as the Honshu–Shikoku Bridge Expressways (three), the long Enasan Tunnel (August 23, 1975), the second Tokyo–Nagoya (To-Mei) Expressway (April 14, 2012), and others.

This volume is what attempts to bring forth our counterargument against the model above. Being powerless against it is like a fly trying to bite a tortoise.

This is the method and measurement of economic effects (Sect. 9.2.1, 9.2.2) based on the market equilibrium model, with which we take great pains to carry out the existence proof of the equilibrium solution, with the measurement results obtained, and subsequently the analysis in Chap. 10.

By these dealings, the indirect economic effects that exist independently and differ from the transferred indirect effects are confirmed, and our target has been attained. These effects can be added to the direct effects.

As we thought, the indirect economic effects of huge projects to which our hand can reach ought to be taken hold of, optionally and gradually by the items of indirect effects respectively. Summed up these, the comprehensive indirect effects in this sense are obtained, which we contribute to public investment criteria.

It is our opinion that this scenario will be the most effective. We had better give up, for the time being, measuring all the items of indirect economic effects, e.g., indicated as *Items 11–13* in Sect. 11.5.2, at one stroke. The traffic congestion-easing effects described in Sect. 11.5.2, choosing just one item from 13 Items is a good example for the traffic congestion-easing effects *in big city*.

Controversy Regarding Social Costs

As if the fundamental human rights of the French Revolution were being imitated, human rights of pedestrians are enhanced, fictitious human rights of which are proposed in terms of prohibitive costs, in order to protect citizens from noise pollution. (It seems that most citizens will not want such ridiculous rights. They will choose not such abstract rights, but, rather, the usual practical ones. Everyone will be aware of the additional tax burden.) It is our view that this is based on the

strong will of the proposer. Against this, the counterargument from the standpoint of practical sense is made.

If we would read accurately the assertions of both sides, they would be dispelled as a matter of course concerning what should be right. It is the way of the world that everything has gone wrong with us. (The greater part of the people such as citizens, the intelligentsia, and journalists will not read; they only praise.)

To get the people concerned to read, we had better make the results of our measurement of social costs *public* as a definitive edition in order to make them understand and support the truth. This is done in Chap. 6.

Inquiry into and Restoration of Pecuniary = Monetary External Economies

Those who participate in public investment will hope to get a grasp of the comprehensive effects including the direct and indirect economic effects, with which to investigate public investment criteria thoroughly. Therefore, the indirect effects are indispensable for us.

The impacts of the project, however, are on the users as the technological direct effects only at first. A part or most part of the impact will come from the next stage as transferred indirect effects, transferred from one firm or consumer to another, one after the other.

Apart from this, going beneath the surface like water running underground at the beginning, with the impact at the same initial time, there are also indirect effects that will manifest themselves as Marshallian external economies *at a stage along the way* and will join in the transferring of the indirect effects mentioned above.

These are prevalent in the market economy, the economic society, as the sequence of pecuniary external economies, except the technological external economies at the first stage, that is, column α (see also columns β, γ, \dots) of Fig. 1.1 of 1.1).

When the initial impact propagates and diffuses and converges at the general equilibrium solution, there exist the effects expressed by the revised *price \times quantity*, as the differences before and after the advent of impact, which are in a very small quantity at the unit level of generation of each effect and yet range across all goods and services and over whole regions.

The difficult problem, however, is left unsolved: that, if possible, we want to separate (a) what the effects due to any specific initial impact may drift to and (b) the others, at *the mouths of all streams*. If this is solved, all the problems of economic effects will be settled. The current mainstream of thought is that for a long time there has been no need to measure what once flows into the market economy.

Those like us, who take charge of public investment, however, would like to discriminate and pick up the so-called pecuniary external economies that flow in and are buried, without fail, in the market economy.

Pecuniary external economies are by no means vague, absurd, and abominable ones, but ought to exist clearly and with certainty, as mentioned above. This is rather a clear fact. This is what is referred to and dealt with in Sects. 9.2.2 and 11.4. It seems that we could get to the heart of the problem by tables and figures only. In this way, the three points above are treated mildly.

I have studied transport economics and related matters off and on for these 50 years. A deep sense of gratitude is felt for the Japan Highway Public Corporation (Economic Research Office) where I had been an investigator for about 10 years from 1961 or so, in an atmosphere like the “Research Office” of the South Manchuria Railway.

At that time, I was influenced by O. Eckstein, P.O. Steiner, S.A. Marglin, Julius Margolis, T. Scitovsky, et al. of the Water Resources Group of Harvard University; L.N. Moses (in the second volume) of Northwestern University; and J. Tinbergen, H.B. Chenery, H. Hotelling, et al. of Europe.

Here, I express my gratitude to those who guided me in a broad sense and to the Japan Highway Public Corporation, which provided me a “cradle.” So, continued to the last line.

And, I express my gratitude to Mrs. Hatsumi Uchimura, one of the secretaries to professor Dr. Yoshiro Higano (the 43rd president of RSAI) for her laborious and painstaking personal computer input services of this volume’s manuscript as side work except for her original secretary work. Likewise, I thank Mr. Tatsuya Shimatai (editorial room, Tokyo Branch Office, Sasaki Printing & Publishing Co.) from the bottom of my heart for his kindness and for his assistance with the tables, figures, and numerical formulas from their initial stage, with an editorial technical viewpoint. Lastly, I am deeply grateful to Mr. Yutaka Hirachi, publishing editor, Springer Japan KK, for his kindness; he guided an inexperienced writer like me considerably and merged, somehow, this manuscript to its present form as the first volume of the series according to the innovative basal principle from the stage of planning. And I also express my deep gratitude to Ms Misao Taguchi for her tireless assistance and for her help in arranging my manuscript. Finally I would like to thank the anonymous native-speaker referees who have checked my manuscript from beginning to end; without their kindness, my volume would not have been published. Their expert advice was invaluable, and I am full of gratitude. Thank you very much.

Dedicated to the Japan Highway Public Corporation

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August 18, 2015

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About the Author

Hirotsada Kohno was born on August 18, 1932. He graduated from the Faculty of Economics, Kagawa University, in 1955. From September 1957 to October 1960, he served as a researcher at the Expressway Research Foundation of Japan. From November 1960 to March 1965, he served as a researcher at the former Japan Highway Public Corporation, Economic Research Office. In April 1965, he began studies of economic theory and economic history in the Ph.D. program at the Graduate School of Economics, the University of Tokyo, and in March 1971, he did Program Withdrawal with Satisfaction of Credit and Enrolment Requirements. From 1971 to 1977, H. Kohno worked for the Department of Business Administration, Yokohama National University, as an associate professor (but, lecturer for 1971 only). Later, until 1996, he worked for the Institute of Socio-Economic Planning, the University of Tsukuba, as a professor (an emeritus professor conferred). In 1994 and 2007, he was a member of the 3rd division (economics) course, at the Science Council of Japan (SCJ). There he held positions including secretary, vice-chief, and chief. From 2007 to the present, he has been a councilor of the Japan Science Support Foundation, a publicly incorporated foundation. From 1983 to 1992, H. Kohno was the president of the Japan Section of the Regional Science Association International (RSAI), where he had been a member since 1962. From 1999 to 2000, he was the president of the RSAI, and from 1992 to 1997, he was the chairman of the organizing committee of the 5th World Congress of the RSAI, held May 2–6, 1996, in Tokyo. In 2006, the RSAI established “The H. Kohno Award for Outstanding Service to the RSAI” in order to encourage excellent young scholars.

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