The Economic Journal of Takasaki City University of Economics vol.45 No.1 2002 pp.15～33

The Expansions of the Essays on Tourism Multiplier Model

Yusaku HOJO

The author is a professor of Department of Economics, Faculty of Economics, Takasaki City University of Economics.

Summary

5 types of tourism multiplier are the multipliers of sales (or transactions), output, income, employment, and input-output, according to Brian H. Archer (1977). The present writer, in this small article, deal with, first of all, such cases as Alphaeus O. Ohakweh's tourism multipliers (tourism income multiplier and tourism employment multiplier) and so on (1983), secondly, some statements on Ohakweh's multipliers and the like, furthermore, Archer—Ozawa's tourism income multiplier theory (model 1 and 2), and finally, my essays on tourism (income) multiplier theory according to Archer—Ozawa's tourism income multiplier model. On that occasion, I divide importation (import) into producer goods and consumer goods as for the model 1; then separate exportation (export) into the lodging sector and the no lodging sector, and argue three types (3 cases respectively) under consideration of investment function as to the model 2. Because these points are characteristic, the multipliers go into details.

Theory of multiplier and acceleration principle form the basis of both Archer—Ozawa model 2 and my model constructed in accordance with it, in the theory development. I think that the mechanism of my tourism (income) multiplier model could be discussed through this research. I'll research tourism multipliers all the more from now on. It is desirable that various figures, methods exist.

Key words: tourism, multiplier, tourism multiplier, tourism (income) multiplier theory, tourism (income) multiplier model

1. Prologue

As for the tourism, there are various effects related to the effect on an economy such as demand expansion, income creation, employment increase, increase of tax revenue, stimulus to the industry except for the tourist allied industry, and the no economic effect of cultural promotion, the creation of the environment and that preservation, improving the image of the area and increase in an attachment etc., and so on. Because it is the tourism that shows such various effects, like common knowledge, there is a very big thing in the expectation of the local government to this.

In such cases as the society circumstances and so on of the increase in leisure time, swell of birthplace intention, improvement in the traffic advantage convenience, the development of the information-oriented, the expansion of the behavior area and so forth, the various opportunities have been maturing gradually, accordingly, the sightseeing and the recreation which contain the interchange of the cities and the farm, mountain, fishing villages will develop all the more from now on.

Therefore, the various effects which tourism has will have to be researched all the more from the various surfaces (angles) from now on. Even if how to lead economic effect (though effect exists on both sides during and after the investment, it is the latter effect to become important of course) is seen, there are various methods (techniques) of input-output analysis (I-O analysis), multiplier theory, economic (economical) base theory, cost-benefit analysis, Delphi method and others.

With this small argument, of view from the point of the development of the research in the effect on an economy which tourism exerts on the area, first of all, I want to introduce the tourist multiplier model (both multipliers of tourist income, tourist employment) and so on mentioned by the doctoral dissertation (1983) of Alphaeus O. Ohakweh, next, perform some statements on Ohakweh's multipliers and the like, furthermore, mention the tourism income multiplier theory (model 1 and 2) argued by Brian H. Archer (1977), Kenichi Ozawa (1983[1], 1987, 1988, 1992[2], 1994[3] etc.), and finally, construct my essays on tourism (income) multiplier theory according to Archer—Ozawa's tourism income multiplier model. By the way, as for tourism multiplier, is a matter of numerical value which is useful to estimate and measure the additional increase of economic scale such as the output, the income and the employment of the area concerned, through effect on the spread of the increase (initial expenditure) of this expenditure due to the increase in the total tourist expenditure of the sightseer in a certain area. Therefore, multiplier value becomes small as much as the portion from our area to other areas for the omission (the importation, the import) is big even if sightseer's expenditure increases.

In the tourist multiplier, though it can think about various things, for example, Archer (1977) argue each multiplier type from the point of view such as the multipliers of sales (or transactions), output, income, employment, and input-output.

And, even the multiplier of the same point of view must pay attention to the application of it because there are various ways of thinking in that way of leading it and the way of the calculation is different, and further the technique of the application sometimes differs too, therefore the value of the multiplier is greatly different, by the argument person.

2. The Meaning and Contents of Ohakweh's Tourist Multipliers

(1) Outline

The research[4] of Ohakweh selected as a subject area Portland metropolitan area (the area of south of the Colombia River which Clark county was removed of Clark county 〈only this county belongs to State of Washington〉, Multnomah county 〈Portland City locates in this county〉, Washington county and Clackamas county which compose Portland S.M.S.A. 〈standard metropolitan statistical area〉), and stated the economical impact of the tourism in 1980 year. Though most research until now selects a range (area) in the country and the state level, his research argues like the above-mentioned in the smaller area. It is said that big meaning exists here, too.

He catches the business which relates to the tourism as basic activity, therefore places tourism on exportation (export) industry, and does the comparison between the benefit by tourism and the cost which is necessary to provide that from the amount of money side by using monetary benefit-cost model, and finds that the former is very much beyond the latter (the net monetary benefit is large), insists that tourism plays a big part in the area.

As for main theme that he intended by this thesis, though it was to describe thing like the above-mentioned exactly by making the most of benefit-cost model, we must not forget the role (meaning) of the prediction of both multiplier effects on income and employment about the tourism developed as intermediate inputs, too, when he evaluates monetary benefit of the metropolitan area. He calculates each effect in both sides of the income, the employment due to the tourism by use of the multiplier model about each income, employment (multiplier : 1.1024)—refer to the applicable point of mentioning later—, and mentions that tourism is important in the income side and the employment side. If it is said in other words, as for the tourist (tourism) income multiplier model, effect on an income multiplier, again as for the tourist (tourism) employment multiplier model, effect on an employment multiplier can be calculated respectively, and we can understand that the

tourism plays an important part in both sides of the income, the employment by these.

(2) Tourist (Tourism) Income Multiplier Model and Tourist (Tourism) employment Multiplier Model

Ohakweh state multiplier principle and its actual application[5].

◎ Tourist (Tourism) Income Multiplier Model

His income multiplier model is expressed with the next formula, and there are nine stages on the occasion of its computation[6]. —Explanation is omitted. Incidentally, according to Ohakweh, as for the personal model, composite tourist multiplier model that was developed by Glenn D. Weaver et al. in 1978 (this can measure the direct and indirect impacts that sightseer 's expenditure exerts on the big city economy concerned) was used.

Y_m 〔1/(1−ZV)〕 = tourist income multiplier ①

Where,

Y_m = percent of tourist spending that directly increased metropolitan income,

Z = percent of metropolitan income spent in the metropolitan area,

V = percent of metropolitan goods and services produced locally and sold locally.

Some multiplier models add the unit 1 to the upper formula. —for example, B. H. Archer and Christine B. Owen (1971). The next type is that.

1+ Y_m 〔1/(1−ZV)〕 ②

◎ Tourist (Tourism) employment Multiplier Model

This model[7] considered the same pattern-type as the model concerned, except for that employment is being substituted for the value of dollar used in the income multiplier model. Therefore, the multiplier in the employment multiplier model equals to the multiplier value (1.1024) led on the occasion of the statement of the income multiplier model. —As for being so same value, it becomes so equal because the process, methods led of each former numerical value depend on the process, methods led of each latter numerical value. The employment multiplier model can show with the next formula.

Y_e 〔1/(1−ZV)〕 = tourist employment multiplier ③

Where,

Y_e = percent of tourist expenditure that directly increased metropolitan employment,

Z = percent of metropolitan income spent in the metropolitan area,

V = percent of metropolitan goods and services produced locally and sold locally.

3. Some Discussions about Ohakweh's Multipliers and so on

When multiplier theory (principle) is said, generally, we remember Richard Ferdinand Kahn's employment multiplier (1931)—John Maynard Keynes calls 'Mr. Kahn's multiplier' employment multiplier (1936) [8] —and Keynes's (investment) multiplier (1936) [9].

Keynes attached importance to the role of (public) investment to the increase in the national income (effective demand) by using the multiplier theory in *The General Theory* in 1936 publication. His (investment) multiplier has the origin in the employment multiplier of Kahn. As for the multiplier effect, generally, when total investment increases, looks at that effect, that is, means that the expansion such as the income or the employment becomes value by the multiplier times for the increase of the investment (it means autonomous investment) through effect on the spread.

The multiplier is shown by the next formula.

$$m\,(\text{multiplier}) = \partial Y / \partial I = \partial Y / \partial G = 1/(1-c_y) = 1/s_y$$

Where,

Y = income,

I = investment,

G = government expenditure,

c_y = marginal propensity to consume,

s_y = marginal propensity to save.

The former partial differential (calculus) coefficient is an investment multiplier and that of the latter means a government expenditure multiplier again. Both multipliers m become the reciprocal numbers of s_y. So, the effect on a multiplier becomes remarkable as much as the value of c_y increases more, as the value of s_y becomes smaller again, on the contrary, it does not become remarkable as much as both numerical values become reverse.

Ohakweh named $1/(1-ZV)$ local multiplier, and that value was calculated with 2.08. Usually, as for the multiplier, it means this fractional expression, though there is that difference of the country, area, as the above-mentioned Keynes's (investment) multiplier $[1/(1-c)]$ — c is marginal propensity to consume—may show that. However, Ohakweh says as the tourist income multiplier what was multiplied this value by Y_m, and calls as the tourist employment multiplier what was multiplied that value by Y_e. Therefore, both multipliers become 1.1024 (both of them are the same value from the place where they have already been mentioned) together, and much smaller than usual. —As for his research area of the previous statement, when it is seen from a vast country like the United States of America, it is a little area (it is good when not only the meaning of the square of

the area but also the scales such as population and economy, industry and other things are understood). So, leakage exists in considerably. Moreover, Ohakweh considers the numerical value multiplied each income, employment by this multiplier indirect effect, then, about the whole effect, looks from the total of both impacts of the direct, and the indirect. Because his technique multiplied by Y_m and Y_e respectively, though the value of the multiplier becomes smaller than usual, when it looks in details, the actual condition of leakage of the area can be grasped better through that. Therefore, there is an advantage that it is said that the more detailed analysis of it becomes possible. It is the technique that can be evaluated.

And, when a multiplier is taken into consideration, to cause always a trouble is the thing of whether to add the first income (or the first employment) as a fundamental initial investment (it is not induced investment but autonomous investment from the viewpoint of economics) which becomes a base, to the total sum of the derivative income (the derivative employment) after the second that to it. In a word, it is whether to make a multiplier only the latter value, or whether to add the former to this value. When the former is made 1 unit, it becomes whether to add 1 to the latter.

According to Nishioka (1963)[10], though Kahn doesn't use the word of the multiplier, makes an effort to measure the ratio of the second employment (it means the total of the derivative employment here 〈I want to be remembered geometric progression〉) to the first employment 1—what was called 'Kahn's ratio'—, Keynes calls the ratio of sum of both employments of the first, the second to the first employment 1 'Mr. Kahn's multiplier', names it employment multiplier, therefore, keeps in its mind the thing that 1 was added to 'Kahn's ratio', and thinks a personal (investment) multiplier to be a thing by such a way of thinking.

When a multiplier is taken into consideration, I always add 1(as the above-mentioned, to this idea, various opinions exist by the argument person). For, to grasp the actual condition of the (area) economy better, it is of course more desirable that the share of the initial investment that was actually seen is summed up. The composite tourist multiplier developed by above Weaver others, the (tourist) income multiplier and the (tourist) employment multiplier of Ohakweh used this are the numerical value which of course 1 was added to, further as for the formula of Archer and Owen, is the thing that for example the number of minimum perfection one was added to the above (tourist) income multiplier more.

It becomes a very important subject whether to evaluate leakage that must be removed in case of an area (regional) multiplier how, in other words whether to estimate it how (of course you must take the (marginal) propensity to save of the area concerned into consideration on that occasion at the same time, too). By grasping the actual condition of the area from different angles, variously as

much as possible, we must proceed to the effort to lead better numerical value zealously.[11]

When it is divided into the method (technique) that the part of the leakage is removed from the multiplier roughly, like common knowledge, we can think about both methods whether to take it into consideration by the composition variable of the multiplier as the (tourist) income multiplier and the (tourist) employment multiplier of Ohakweh and whether to find multiplier value through leading derivative leakage.

4. The Statement of the Outline of Archer－Ozawa's Tourism Income Multiplier Theory

Ozawa (1987 etc.) introduces Archer (1977), argues tourism income multiplier theory referring to his theory, and is giving big contribution, to mention it a little later, too. Ozawa (1987 〈announcement summary〉) mentions it as follows.

Though the research of the tourism multiplier to analyze the economical impact of the tourist expenditure is being made actively after the 1960's, as the models that are being formulated clearly of those, there are Safavi (1971), Brownrigg and Greig (1975), Archer (1977), Diamond (1976), Cleverdon and Edwards (1982), Mill and Morrison (1992).

As for the tourism multiplier models of Keynesian type that have been formulated up to the present, however, investment is handled as constant or autonomous (endogenous) variable, as that simple model 〔I call (Archer－Ozawa model 1) temporarily〕—Ozawa introduces it, and it is being discussed—may show. The model has two faults of (1) the changes of investment induced by the changes of income and tourists spending are not considered, and (2) except for input-output multiplier by Archer (1977), Diamond (1976) and so on, the linkages among the industries in the research tourist area aren't grasped clearly. So he puts the report purpose on modeling the tourism multiplier particularly the tourism multiplier of income type 〔I call (Archer－Ozawa model 2) temporarily〕—Ozawa is using the same that hi (simplification), to show it just later, though Archer uses the different acceleration coefficient in the investment function which becomes a premise, for leading the formula of the multiplier—in consideration of two points mentioned above. The formulas of the calculation are omitted in the relations of the paper width with both models. And, as for each meaning of the symbols, Y_i : the level of income in the study area (tourist spot) i, E_i : the tourist spending of i, c_i : the marginal propensity to consume of i, c_{ij} : the proportion of the marginal propensity to consume which is spent outside the study area i, t_i : the marginal propensity to indirect tax of i, t_{id} : the marginal deductions rate from the income of i, b_i : the marginal government benefit rate of i, m : the marginal propensity to importation (import) of i, I_i : the investment expenditure of i, h_i : the acceleration coefficient in Y_i and X_i, X_i : the tourist income

(revenue) or the exportations (exports) of i, m_{ik} : the marginal propensity to importation (import) of production goods (producers 'goods, producer goods) of i, and m_{ic} : the marginal propensity to importation (import) of consumption goods (consumer goods) of i.

The Multiplier Formula of (Archer−Ozawa Model 1)(12)

$$\triangle Y_i / \triangle E_i = 1 / \left[1 - (c_i - c_{ij} - t_i c_i)(1 - t_{id} - b_i) + m\right]$$

The Multiplier Formula of (Archer−Ozawa Model 2)(13)

$$\triangle Y_i / \triangle X_i = \left[1 + (1 - m_{ik}) h_i\right] / \left[1 - (1 - m_{ik}) h_i - (1 - m_{ic}) c_i\right]$$

(Premise : $\triangle I_i = h_i \triangle Y_i + h_i \triangle X_i$)

Then, Ozawa says that we can point out the next from the latter model built with the viewpoint that the change in the investment level is function of induced change of the income and the tourist expenditure. In other words, as for the high importation propensity especially the high importation propensity in the industry section, the linkages between the industry sections are comparatively weak in the stage, and the higher the importation propensity is, the smaller the value of the multiplier becomes.

According to him, because in this model, however, the viewpoint that the change in the investment level is function of induced change of the income and the tourist expenditure was only shown, the model is insufficient in the meaning not to be making specification whether that function is what kind of thing, therefore, though the matter whether what kind of investment hypothesis or investment function is presumed must be cleared, about that point, it wants to take a future subject.

The present writer's main research is the examinations, changes of the model 1, 2 to state them in the next section.

And here I want to add that it is based that much unemployment capital and unemployed people exist in the society concerned, when Keynes argues a multiplier, therefore Keynes goes to propose the theory to approach from the economy of a too small equilibrium to the situation, condition of the full-employment through the autonomous investment and the government expenditure (incidentally, a financial policy is important, too), however, when we presume investment today, we should take into consideration not only autonomous investment but also induced investment (of course in this small argument, induced investment is being taken into consideration, as it is very important), and the effects of the tourist investment on the output, the income, and the employment and so on generally aren't temporary but continuous.

5. The Expansions of the Essays on Tourism (Income) Multiplier Theory

In this section, referring to the model 1 and 2 of the former section, I will show the essays of this writer to the tourism (income) multiplier theory. Importations (imports) are divided into producer goods and consumer goods about the former. Then exportations (exports) are divided into the staying section and the non-staying section to the latter, and I state three types (3 cases each) by taking into consideration an investment function, too. The multipliers become a more detailed thing.

The Change of (Archer－Ozawa Model 1)

Here, M_i—the importations (imports) of i—used with the model 1 is divided into M_{ik} : the purchase (importations 〈imports〉) of producer goods of i and M_{ic} : the purchase (importations 〈imports〉) of consumer goods of i. Therefore, as for the formulae which relate to this, $M_{ik}=\overline{M_{ik}}+m_k Y_i$ and $M_{ic}=\overline{M_{ic}}+m_c Y_i$ are substituted for $M_i=\overline{M_i}+m Y_i$.

Multiplier formula $\triangle Y_i / \triangle E_i$

$$=1/\{1-(c_i-c_{ij}-t_i c_i)(1-t_{id}-b_i)+m_k+m_c\}$$

As for being different from the multiplier value of the model 1, it is only the place where m of the denominator changes in m_k+m_c.

The formulas of the calculation are omitted in the relations of the paper width. And, as for the meaning of the symbols, m_k : the marginal propensity to importation (import) of producer goods of i and m_c : the marginal propensity to importation (import) of consumer goods of i. And I want to be referred to the applicable points of mentioning above for others.

〔 numerical value example 〕

Let 's show the numerical value example of the multiplier formula concerned for the reference. Now, when it is put with c_i : 0.8, c_{ij} : 0.3, t_i : 0.1, t_{id} : 0.2, b_i : 0.1, m_k : 0.4 and m_c : 0.3, the multiplier value becomes 0.7112. Of course multiplier value becomes big, or sometimes becomes small by the way of taking numerical value.

The Change of (Archer — Ozawa Model 2)——that 1

X_i—the tourist income (revenue) or the exportations (exports) of i—of the model 2 is divided into X_o : the tourist income (revenue) or the exportations (exports) of tourist spot i 〔 the staying section 〕 and X_p : the tourist income (revenue) or the exportations (exports) of tourist spot i 〔 the non-staying section 〕. (Premise : $\triangle I_i=h_i \triangle Y_i+h_i \triangle X_o+h_i \triangle X_p$)

(In case of $\triangle X_o$)

Multiplier formula $\triangle Y_i/\triangle X_o$

$$= \{1+(1-m_{ik})h_i\}/\{1-(1-m_{ik})h_i-(1-m_{ic})c_i\}$$

(In case of $\triangle X_p$)

Multiplier formula $\triangle Y_i/\triangle X_p$

$$= \{1+(1-m_{ik})h_i\}/\{1-(1-m_{ik})h_i-(1-m_{ic})c_i\}$$

(In case of $\triangle X_o$, $\triangle X_p$)

Multiplier formula $\triangle Y_i/(\triangle X_o+\triangle X_p)$

$$= \{1+(1-m_{ik})h_i\}/\{1-(1-m_{ik})h_i-(1-m_{ic})c_i\}$$

Even in case of which, the found multiplier values become the same in the model 2, because only the same h_i is being used in the investment function. Therefore, as a result (as that is guessed easily from the beginning), it means that need to resolve X_i into X_o and X_p and to think about disappears. The formulas of the calculation are omitted in the relations of the paper. Furthermore, as for each meaning of the symbols used, except for h_i : the acceleration coefficient in Y_i, X_o and X_p, I want to be referred to them of mentioning above for others.

〔 numerical value example 〕

I show the numerical value example of the above multiplier formula here for the reference.

Now, when it is put with c_i : 0.8, h_i : 1.1, m_{ik} : 0.8 and m_{ic} : 0.7, the multiplier value becomes 2.2593. By the difference in these numerical values, multiplier takes various values.

The Change of (Archer — Ozawa Model 2)——that 2

Even this, as well as that 1, X_i—the tourist income (revenue) or the exportations (exports) of i—of the model 2 is divided into X_o : the tourist income (revenue) or the exportations (exports) of tourist spot i 〔 the staying section 〕 and X_p : the tourist income (revenue) or the exportations (exports) of tourist spot i 〔 the non-staying section 〕 . But, it wants to be warned that the premise of (3) equation $\triangle I_i=h_i\triangle Y_i+h_o\triangle X_o+h_o\triangle X_p$ is being done. G_i is dealt with as a constant. And, both the multiplier theory and the acceleration principle are being used in the development of the model, so that this can understand from the process of the development of it.

The each meaning of the symbols to use for the development of the formulae is C_i : consumer expenditure of i, h_i : acceleration coefficient in Y_i, h_o : acceleration coefficient in X_o and X_p, G_i : government expenditure of i, M_{ik} : purchase (importations <imports>) of producer goods of i and M_{ic} : purchase (importations <imports>) of consumer goods of i. And I want to be referred to the applicable points of mentioning above for others.

The income equation supposed here is the following thing.

$$Y_i=C_i+I_i+\overline{G_i}+X_o+X_p-M_{ik}-M_{ic} \quad (1)$$

Each change of the consumption expenditure and the investment is as follows.

$$\triangle C_i = c_i \triangle Y_i \quad (2)$$

$$\triangle I_i = h_i \triangle Y_i + h_o \triangle X_o + h_o \triangle X_p \quad (3)$$

Here, $h_i \triangle Y_i$, $h_o \triangle X_o$ and $h_o \triangle X_p$ of (3) equation show the induced changes of the income and each tourism expenditure of the staying section and the non-staying section in i respectively. If it is said in other words, as for the meaning of the equation concerned, when the logic known well as induced investment is applied and mentioned, the change in the investment level consists of what each induced change of the income and the tourism expenditures of staying section and non-staying section in i was summed up. And, when it is added, $\triangle Y_i$ is multiplied by h_i, and $\triangle X_o$, $\triangle X_p$ are multiplied by h_o.

And,

$$\triangle M_{ik} = m_{ik} \triangle I_i$$
$$= m_{ik}(h_i \triangle Y_i + h_o \triangle X_o + h_o \triangle X_p) \quad (4)$$
$$\triangle M_{ic} = m_{ic} \triangle C_i$$
$$= m_{ic}\, c_i \triangle Y_i \quad (5)$$

Therefore, the change in the tourist expenditure brings various effects on the economy to the area i like mentioning later.

(In case of $\triangle X_o$)

$$\triangle Y_i = c_i \triangle Y_i + h_i \triangle Y_i + h_o \triangle X_o + \triangle X_o$$
$$-\{m_{ik}(h_i \triangle Y_i + h_o \triangle X_o)\} - m_{ic}\, c_i \triangle Y_i \quad (6)$$

There

$$\triangle Y_i - h_i \triangle Y_i - c_i \triangle Y_i + m_{ik}\, h_i \triangle Y_i + m_{ic}\, c_i \triangle Y_i$$
$$= h_o \triangle X_o + \triangle X_o - m_{ik}\, h_o \triangle X_o \quad (7)$$

Therefore

$$\triangle Y_i (1 - h_i - c_i + m_{ik}\, h_i + m_{ic}\, c_i)$$
$$= \triangle X_o (1 + h_o - m_{ik}\, h_o) \quad (8)$$

More

$$\triangle Y_i / \triangle X_o = (1 + h_o - m_{ik}\, h_o)$$
$$/ (1 - h_i - c_i + m_{ik}\, h_i + m_{ic}\, c_i) \quad (9)$$

In other words,

$$\triangle Y_i / \triangle X_o = \{1 + (1 - m_{ik})\, h_o\}$$
$$/ \{1 - (1 - m_{ik})\, h_i - (1 - m_{ic})\, c_i\} \quad (10)$$

(In case of $\triangle X_p$)

$$\triangle Y_i = c_i \triangle Y_i + h_i \triangle Y_i + h_o \triangle X_p + \triangle X_p$$
$$-\{m_{ik}(h_i \triangle Y_i + h_o \triangle X_p)\} - m_{ic}\, c_i \triangle Y_i \quad (11)$$

There

$$\triangle Y_i - h_i \triangle Y_i - c_i \triangle Y_i + m_{ik} h_i \triangle Y_i + m_{ic} c_i \triangle Y_i$$
$$= \triangle X_p + h_o \triangle X_p - m_{ik} h_o \triangle X_p \quad (12)$$

Therefore

$$\triangle Y_i (1 - h_i - c_i + m_{ik} h_i + m_{ic} c_i)$$
$$= \triangle X_p (1 + h_o - m_{ik} h_o) \quad (13)$$

More

$$\triangle Y_i / \triangle X_p = (1 + h_o - m_{ik} h_o)$$
$$/ (1 - h_i - c_i + m_{ik} h_i + m_{ic} c_i) \quad (14)$$

In other words,

$$\triangle Y_i / \triangle X_p = \{1 + (1 - m_{ik}) h_o\}$$
$$/ \{1 - (1 - m_{ik}) h_i - (1 - m_{ic}) c_i\} \quad (15)$$

(In case of $\triangle X_o$, $\triangle X_p$)

$$\triangle Y_i = c_i \triangle Y_i + h_i \triangle Y_i + h_o \triangle X_o + h_o \triangle X_p$$
$$+ \triangle X_o + \triangle X_p - \{m_{ik}(h_i \triangle Y_i + h_o \triangle X_o$$
$$+ h_o \triangle X_p)\} - m_{ic} c_i \triangle Y_i \quad (16)$$

There

$$\triangle Y_i - h_i \triangle Y_i - c_i \triangle Y_i + m_{ik} h_i \triangle Y_i + m_{ic} c_i \triangle Y_i$$
$$= \triangle X_o + h_o \triangle X_o - m_{ik} h_o \triangle X_o + \triangle X_p$$
$$+ h_o \triangle X_p - m_{ik} h_o \triangle X_p \quad (17)$$

Therefore

$$\triangle Y_i (1 - h_i - c_i + m_{ik} h_i + m_{ic} c_i)$$
$$= \triangle X_o (1 + h_o - m_{ik} h_o) + \triangle X_p (1 + h_o - m_{ik} h_o)$$
$$= (\triangle X_o + \triangle X_p)(1 + h_o - m_{ik} h_o) \quad (18)$$

More

$$\triangle Y_i / (\triangle X_o + \triangle X_p)$$
$$= (1 + h_o - m_{ik} h_o) / (1 - h_i - c_i + m_{ik} h_i + m_{ic} c_i) \quad (19)$$

In other words,

$$\triangle Y_i / (\triangle X_o + \triangle X_p) = \{1 + (1 - m_{ik}) h_o\}$$
$$/ \{1 - (1 - m_{ik}) h_i - (1 - m_{ic}) c_i\} \quad (20)$$

Even in case of which, the found multiplier values become the same. It is only the point that h_i of the molecule is h_o that these values are different from the model 2.

〔 numerical value example 〕

Let 's show the numerical value example of the above multiplier formula for the reference.

Now, when it is put with c_i : 0.8, h_i : 1.1, h_o : 1.2, m_{ik} : 0.8 and m_{ic} : 0.7, the multiplier value becomes 2.2963 at every case. Of course multiplier value is big or small by the way of taking numerical value.

As it can understand easily from the statement until now, as for the multiplier led from the viewpoint that the change in the investment level consists of what each induced change of the income and the tourism expenditures of the staying section and the non-staying section was summed up, generally, the bigger the marginal propensity to importation (import)—more strictly, the marginal propensity to importation (import) of producer goods and the marginal propensity to importation (import) of consumer goods—grows, the smaller it becomes, on the contrary, the higher the acceleration coefficients (h_i and h_o) and the marginal propensity to consume become, the bigger it does. Again, the bigger the marginal propensity to importation (import) particularly that of producer goods increase, the weaker the inter-industry inside the area concerned becomes, and the bigger the part of leakage to the outside of the region grows, and as that result, of course the weaker the multiplier effect becomes.

To do the solution of such a problem, the thing that is necessary by all means, though it is mentioned later, is (regional) inter-industry analysis.

The Change of (Archer — Ozawa Model 2)——that 3

Even this place, as well as that 1,2, X_i—the tourist income (revenue) or the exportations (exports) of i—of the model 2 is divided into X_o : the tourist income (revenue) or the exportations (exports) of tourist spot i〔 the staying section 〕and X_p : the tourist income (revenue) or the exportations (exports) of tourist spot i〔 the non-staying section 〕. However, it wants to be warned that the premise of〔3〕equation $\triangle I_i=h_i \triangle Y_i+h_o \triangle X_o+h_p \triangle X_p$ is being done. Then, G_i is dealt with as a constant. Here, both the multiplier theory and the acceleration principle are being used in the development of the model, as this can understand from the process of the development of it.

The each meaning of the symbols to use for the development of the formulae is h_i : acceleration coefficient in Y_i, h_o : acceleration coefficient in X_o, and h_p : acceleration coefficient in X_p. And I want to be referred to the applicable points of mentioning above for others.

The income equation supposed here is the following thing.

$$Y_i=C_i+I_i+\overline{G_i}+X_o+X_p-M_{ik}-M_{ic} \quad 〔1〕$$

As for each change of the consumption expenditure and the investment, it is as the next.

$$\triangle C_i=c_i \triangle Y_i \quad 〔2〕$$

$$\triangle I_i=h_i \triangle Y_i+h_o \triangle X_o+h_p \triangle X_p \quad 〔3〕$$

Here, $h_i \triangle Y_i$, $h_o \triangle X_o$ and $h_p \triangle X_p$ of 〔3〕 equation show the induced changes of the income and each tourism expenditure of the staying section and the non-staying section in i respectively.

When it is reworded, as for the meaning of the equation concerned, when the logic known well as induced investment is applied and mentioned, the change in the investment level consists of what each induced change of the income and the tourism expenditures of staying section and non-staying section in i was summed up. And, when it is added, $\triangle Y_i$ by h_i, $\triangle X_o$ by h_o, and $\triangle X_p$ is multiplied by h_p respectively.

Furthermore,

$$\triangle M_{ik}=m_{ik}\triangle I_i$$
$$=m_{ik}(h_i\triangle Y_i+h_o\triangle X_o+h_p\triangle X_p) \quad [4]$$
$$\triangle M_{ic}=m_{ic}\triangle C_i$$
$$=m_{ic}\,c_i\triangle Y_i \quad [5]$$

Therefore, the change in the tourist expenditure brings various effects on the economy to the area i like mentioning later.

(In case of $\triangle X_o$)

$$\triangle Y_i=c_i\triangle Y_i+h_i\triangle Y_i+h_o\triangle X_o+\triangle X_o$$
$$-\{m_{ik}(h_i\triangle Y_i+h_o\triangle X_o)\}-m_{ic}\,c_i\triangle Y_i \quad [6]$$

There

$$\triangle Y_i-h_i\triangle Y_i-c_i\triangle Y_i+m_{ik}\,h_i\triangle Y_i+m_{ic}\,c_i\triangle Y_i$$
$$=h_o\triangle X_o+\triangle X_o-m_{ik}\,h_o\triangle X_o \quad [7]$$

Therefore

$$\triangle Y_i\,(1-h_i-c_i+m_{ik}\,h_i+m_{ic}\,c_i)$$
$$=\triangle X_o\,(1+h_o-m_{ik}\,h_o) \quad [8]$$

More

$$\triangle Y_i/\triangle X_o=(1+h_o-m_{ik}\,h_o)$$
$$/\,(1-h_i-c_i+m_{ik}\,h_i+m_{ic}\,c_i) \quad [9]$$

In other words,

$$\triangle Y_i/\triangle X_o=\{1+(1-m_{ik})\,h_o\}$$
$$/\,\{1-(1-m_{ik})\,h_i-(1-m_{ic})\,c_i\} \quad [10]$$

(In case of $\triangle X_p$)

$$\triangle Y_i=c_i\triangle Y_i+h_i\triangle Y_i+h_p\triangle X_p+\triangle X_p$$
$$-\{m_{ik}(h_i\triangle Y_i+h_p\triangle X_p)\}-m_{ic}\,c_i\triangle Y_i \quad [11]$$

There

$$\triangle Y_i-h_i\triangle Y_i-c_i\triangle Y_i+m_{ik}\,h_i\triangle Y_i+m_{ic}\,c_i\triangle Y_i$$
$$=\triangle X_p+h_p\triangle X_p-m_{ik}\,h_p\triangle X_p \quad [12]$$

Therefore

$$\triangle Y_i (1-h_i-c_i+m_{ik} h_i+m_{ic} c_i)$$
$$=\triangle X_p (1+h_p-m_{ik} h_p) \quad 〔13〕$$

More

$$\triangle Y_i/\triangle X_p=(1+h_p-m_{ik} h_p)$$
$$/(1-h_i-c_i+m_{ik} h_i+m_{ic} c_i) \quad 〔14〕$$

In other words,

$$\triangle Y_i/\triangle X_p=\{1+(1-m_{ik}) h_p\}$$
$$/\{1-(1-m_{ik}) h_i-(1-m_{ic}) c_i\} \quad 〔15〕$$

(In case of $\triangle X_o$, $\triangle X_p$)

$$\triangle Y_i=c_i \triangle Y_i+h_i \triangle Y_i+h_o \triangle X_o+h_p \triangle X_p$$
$$+\triangle X_o+\triangle X_p-\{m_{ik}(h_i \triangle Y_i+h_o \triangle X_o$$
$$+h_p \triangle X_p)\}-m_{ic} c_i \triangle Y_i \quad 〔16〕$$

There

$$\triangle Y_i-h_i \triangle Y_i-c_i \triangle Y_i+m_{ik} h_i \triangle Y_i+m_{ic} c_i \triangle Y_i$$
$$=\triangle X_o+ h_o \triangle X_o+\triangle X_p-m_{ik} h_o \triangle X_o$$
$$+h_p \triangle X_p-m_{ik} h_p \triangle X_p \quad 〔17〕$$

Therefore

$$\triangle Y_i (1-h_i-c_i+m_{ik} h_i+m_{ic} c_i)$$
$$=\triangle X_o (1+h_o-m_{ik} h_o)$$
$$+\triangle X_p (1+h_p-m_{ik} h_p) \quad 〔18〕$$

More

$$\triangle Y_i/(\triangle X_o+\triangle X_p)$$
$$=〔\{\triangle X_o/(\triangle X_o+\triangle X_p)\}(1+h_o-m_{ik} h_o)$$
$$+\{\triangle X_p/(\triangle X_o+\triangle X_p)\}(1+h_p-m_{ik} h_p)〕$$
$$/(1-h_i-c_i+m_{ik} h_i+m_{ic} c_i) \quad 〔19〕$$

In other words,

$$\triangle Y_i/(\triangle X_o+\triangle X_p)$$
$$=〔\{\triangle X_o/(\triangle X_o+\triangle X_p)\}\{1+(1-m_{ik}) h_o\}$$
$$+\{\triangle X_p/(\triangle X_o+\triangle X_p)\}\{1+(1-m_{ik}) h_p\}〕$$
$$/\{1-(1-m_{ik}) h_i-(1-m_{ic}) c_i\} \quad 〔20〕$$

The multipliers looked for are different even in case of which. As for the place where they differ from the multiplier value of the model 2, in the molecule, (in case of $\triangle X_o$), h_i changes into h_o, and (in case of $\triangle X_p$) h_i changes into h_p. Furthermore, (in case of $\triangle X_o$, $\triangle X_p$), a molecule is the sum of what $\{1+(1-m_{ik}) h_o\}$ by $\triangle X_o/(\triangle X_o+\triangle X_p)$, and $\{1+(1-m_{ik}) h_p\}$ is multiplied by $\triangle X_p/$

($\triangle X_o+\triangle X_p$) respectively, and both h_o and h_p are taken into consideration to think about it. In this argument, of course, fundamentally, though the ratio of $\triangle X_o$ and $\triangle X_p$ should be taken into consideration, I don't refer to it because it is the model of the formula here. And, let's show the numerical value examples of three above multiplier formulae, because I think that these are helpful.

〔numerical value examples〕

Now, in this, c_i : 0.8, h_i : 1.1, h_o : 1.2, h_p : 1.05, m_{ik} : 0.8 and m_{ic} : 0.7 are taken (of course multiplier values are big, or small by the way of taking these numerical values).

(In case of $\triangle X_o$)

Multiplier value is 2.2963.

(In case of $\triangle X_p$)

Multiplier value is 2.2407.

(In case of $\triangle X_o$, $\triangle X_p$)

Multiplier value is 2.2685.

〔$\triangle X_o/(\triangle X_o+\triangle X_p)$, $\triangle X_p/(\triangle X_o+\triangle X_p)$ are put together with 0.5〕

The multipliers which it led from the point of view that the change in the investment level was equal to the thing that summed up each induced investment of the income and the tourist expenditures of both sections of the staying and of the non-staying are like the above, as they may be understood easily from the statement until now. Generally the multiplier values concerned can be interpreted as follows. In other words, at each three cases, the bigger both marginal propensities to importation (import) of producer goods and of consumer goods grow, the smaller they become, on the contrary, (in case of $\triangle X_o$), the acceleration coefficients (h_i and h_o), the marginal propensity to consume, and (in case of $\triangle X_p$), the acceleration coefficients (h_i and h_p), the marginal propensity to consume, more (in case of $\triangle X_o$, $\triangle X_p$), the higher the acceleration coefficients (h_i, h_o and h_p), the marginal propensity to consume become, the bigger they do. And again, the bigger the marginal propensity to importation (import) particularly that of producer goods increase, the weaker the inter-industry inside the region concerned becomes, and the bigger the part of leakage to the outside of the area grows, and as that result, of course the weaker the effect of multiplier becomes.

The (regional) inter-industry analysis is necessary by all means, to do the solution of such a problem. Though the (regional) inter-industry theory is not everything, certainly it is a useful technique, method as for the problem concerned too, as it made big contribution at present in the various surfaces such as the economic conditions and the economic predictions in the levels of various areas. Because the (regional) inter-industry theory is useful theory, it will come to be used all the more from now on. So, from now, it is about to hope that the theory concerned is improved, again, from the tourism side, statistics on the tourist industry are improved, and better regional

inter-industry relations table containing these is built, and other things. Only to want to call attention here, there is a fault that the inter-industry analysis concerned stops having meaning from the purpose of it, when a region becomes small, because the inter-industry inside the region becomes weak, the part of leakage to other areas increases by all means, therefore an economic conclusion becomes weak in the inside of the area, that actual condition itself can't be grasped well any more.

6. Epilogue

Until now, because this writer thinks that it is a help of the development of the research on the effect on an economy which tourism exerts on the area, with this small article, I, first of all, want to introduce the tourist multiplier model (both multipliers of tourist income, tourist employment) and so on mentioned by the doctoral dissertation of Ohakweh, next, perform some statements on Ohakweh's multipliers and the like, furthermore, mention Archer—Ozawa's tourism income multiplier theory (model 1 and 2), and finally, construct my essays on tourism (income) multiplier theory according to Archer—Ozawa's tourism income multiplier model. Again, on that occasion, the numerical value examples of the multiplier formulae were shown just easily for the reference. Here, both the multiplier theory and the acceleration principle are being used in the statements of those changes as well as the model 2. These can understand from the process of the development of them.

As a future subject, based on the case study, the study to prove about the validity and right or wrong of the model is important. And here, the argument of the investment function isn't being done. Even if it is related to this, the strict argument of the investment function and the application of the more appropriate investment function, further various researches such as verification of the adaptability to that thing again are necessary.

We should take the role of the tourism into consideration fully because of the activation of the area or more development since tourism exerts the influence of the big plus on the economic activities of the area as becoming clear from the above statement. In today when the matter that depends on industry like former times can't be done very much any more, in other words, it cannot but depend on the third industry, it is very natural that many local governments think about area activation by tourism and convention and so on seriously, again the thing that the success produces a result, or what is being done is very wonderful, according as such things is promoted powerfully in some of local governments. These will be guidelines on the future area activation.

Notes

(1) Ozawa (1983) the 9th chapter (125-138 pages).
(2) Ozawa (1992) the 6th chapter (69-82 pages).
(3) Ozawa (1994) the 13th chapter (235-249 pages).
(4) Refer to Ohakweh (1983).
(5) Ibid. pp.15～19, 49, 50, 59～66, 71～82, etc..
(6) Ibid. pp.59～66, 71～76.
(7) Ibid. pp.66, 77～82.
(8) Keynes (1936) the beginning of the 10th chapter II (the original, p.115, Japanese translation, 130 page).
(9) Ibid. the original, pp.113～131, Japanese translation, 128-148 pages.
(10) Nishioka (1963) complementary argument 1 (239-259 pages). There are the statements about the relations between Keynes's multiplier and regional (area) multiplier others and so on.
(11) I want to be referred to regional multiplier (1959, the 9th chapter 〈215-241 pages〉), Keynesian trade multiplier and new trade multiplier considered the circulation of raw materials (1959, the 7th chapter 〈159-179 pages〉) expressed by Kenichi Miyazawa.
(12) Ozawa (1987) 1-2 pages.
(13) Ibid. 2-4 pages.

Reference materials

Archer, B. H. (1976) *Demand Forecasting in Tourism*, Bangor Occasional Papers in Economics (General Editor : Jack Revell), No.9, University of Wales Press.
———— (1976) " The Anatomy of a Multiplier, " *Regional Studies*, Vol.10, No.1.
———— (1977) *Tourism Multipliers : The State of the Art*, Bangor Occasional Papers in Economics (General Editor : Jack Revell), No.11, University of Wales Press.
———— (1991) " The Value of Multipliers and their Policy Implications, " in S. Medlik (ed.), *Managing Tourism*, Butterworth-Heinemann, London, 1991.
———— and C. Owen (1971) " Towards a Tourist Regional Multiplier, " *Regional Studies*, Vol.5, No.4.
Brownrigg, M. and M. A. Greig (1975) " Differential Multipliers for Tourism, " *Scottish Journal of Political Economy*, Vol.22, No.3, Nov..
Bull, A. (1991) *The Economics of Travel and Tourism*, Longman, Australia. *Japanese joint translation* (1998) by Tetuo Moroe, Hideki Yoshioka, Hitoshi Kikuchi, Kenichi Ozawa, Fusanobu Harada, Teruo Ikeda, and Akihito Wakui, Bunkashobouhakubunsha.
Cleverdon, R. and A. Edwards (1982) *International Tourism to 1990*, Cambridge, Massachusetts, Abt Books.
Daly, M. C. (1940) " An Approximation to a Geographical Multiplier, " *Economic Journal*, Vol.50, June-Sept..
Diamond, J. (1976) " Tourism and Development Policy : A Quantitative Appraisal, " *Bulletin of Economic Research*, Vol.28, No.1, May.
Fletcher, J. E. and B. H. Archer (1991) " The Development and Application of Multiplier Analysis, " in C. P. Cooper (ed.), *Progress in Tourism, Recreation and Hospitality Management* (Vol.3), Belhaven Press, London, 1991.
Goodall, B. and G. Ashworth (eds.) (1988) *Marketing in the Tourism Industry : The Promotion of Destination Regions*, London, Croom Helm.
Hildebrand, G. H. and A. Mace (1950) " The Employment Multiplier in an Expanding Industrial Market, " *Review of Economics and Statistics*, Vol.32, No.3.
Kahn, R. F. (1931) " The Relation of Home Investment to Unemployment, " *Economic Journal*, Vol.41, June.
Keynes, J. M. (1936) *The General Theory of Employment, Interest and Money*, Macmillan, London.

Japanese translation (1941) by Tukumo Shionoya, Toyo Keizai, 1967 (the 39th printing).
Medlik, S. (ed.) (1991) *Managing Tourism*, Butterworth-Heinemann, London.
Mill, R. C. and A. M. Morrison (1992) *The Tourism System : An Introductory Text* (2nd ed.), Englewood Cliffs, New Jersey, Prentice-Hall.
Ohakweh, Alphaeus O. (1983) *The Impact of Tourism on the Pattern of Economic Activity in Portland, Oregon*. (A doctoral dissertation)
Ozawa, Kenichi (1988) " The Extension of Tourism Multiplier Model, " *Reports for the Japan Academic Society of Tourism*, No.19, Nov..
Safavi, F. (1971) " A Cost-Benefit Model for Convention Centres, " *Annals of Regional Science*, Vol.V, No.2.
Sinclair, M. T. and M. J. Stabler (1997) *The Economics of Tourism*, London and New York : Routledge.
Thompson, G. E. (1959) " An Investigation of the Local Employment Multiplier, " *Review of Economics and Statistics*, Vol.XLI, No.1.
Wright, A. LL. (1956) " The Genesis of the Multiplier Theory, " *Oxford Economic Papers*, Vol.8, No.2, June.
[Japanese reference materials]
Ozawa, Kenichi (1983) *The Foundation of Economics to analyze Tourism*, Bunkashobouhakubunsha.
———— (1987) " On Tourism Multiplier Model, " The Japan Academic Society of Tourism, the 56th national conference (autumn convention in 1987) the announcement meeting of the research 〈November 13〉.
———— (1992) *The Economic Analysis of Tourism*, Bunkashobouhakubunsha.
———— (1994) *Tourism is analyzed in the Economics*, Bunkashobouhakubunsha.
Hojo, Yusaku (1988) " The Impact of Tourism on Economic Activity—In Portland, Oregon—, " *The Journal of Takasaki City University of Economics*, Vol.31, No.2.
———— (1996) " The Effect of Tourism on Regional Economy, " *Tourism and Regional Development* (Hisao Nishioka 〈editing and writing〉, Naigai Shuppan), pp.179-198 (It is recorded as the 9th chapter).
———— (2000) " The Sides of Regional Economics of Tourism, " *Sangyo Kenkyu*, Vol.35, No.2.
———— (2000) " The Essays on Tourism Multiplier, " The Japan Academic Society of Tourism, the 82nd national conference (autumn convention in 2000) the announcement meeting of the research 〈December 9〉.
———— (2001) " The Expansion of Tourism Income Multiplier Model, " *The Journal of Takasaki City University of Economics*, Vol.44, No.1.
———— (2001) " The Essays on Tourism Multiplier Model, " *Journal of Tourism Research*, No.39, Dec..
———— ・Hisao Nishioka (1988) " Ohakweh 's Paper on the Impact of Tourism on Economic Activity, " *Reports for the Japan Academic Society of Tourism*, No.19, Nov..
Miyazawa, Kenichi (1959) " The Regional Multiplier Analysis of the Development Investment, " *The Expansion of the National Income Multiplier Theory* (Miyohei Shinohara, Kenichi Miyazawa, and Masaichi Mizuno, Yuhikaku). It is recorded as the 9th chapter.
Nishioka, Hisao (1963) *Location and Regional Economy—Principles of Economic Policy Concerning Industrial Location and Regional Economy—*, Miyai Shoten, 1975 (enlargement the third edition 〈final edition〉 the 2nd printing).
———— (editing and writing) (1996) *Tourism and Regional Development*, Naigai Shuppan.
———— ・Yusaku Hojo (1987) " The Impact of Tourism on Economic Activity—In case of Portland, State of Oregon—, " The Japan Academic Society of Tourism, the 56th national conference (autumn convention in 1987) the announcement meeting of the research 〈November 13〉. (The report summary 〈1988〉 *Reports for the Japan Academic Society of Tourism*,No.19, Nov..)
Shioda, Masashi (1975) *The Study of Tourismlogy I*, Gakujyutu Sensho.