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Substitution between Domestic and International Tourism

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This paper sheds light on the importance of different kinds of elasticities of substitution and examines the impacts by the tourism industry on the economy. We show the importance of strong interest in foreign culture, the elasticity of substitution among tourism goods in home country, that is foreign country, the elasticity of substitution between tourism goods in home and foreign, and transportation cost.

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1.Introduction

Recently, the Japanese government emphasizes the importance of the tourism industry in the economy and makes an attempt for increasing foreign tourists. It is evident that the sales of the tourism industry is quite fragile. Just after September 11 in 2001, foreign visitors to the USA drastically declined. However, mutual understandings and increasing interest among countries will raise the importance of international tourism. To most Japanese, Kyoto is the city of typical tourism, where there are many temples. Those foreign tourists who visit Kyoto pay expensive transportation cost and may be strongly impressed by seeing the same temples as Japanese. They may have different excitement. We explicitly introduce parameters (a_i, a_j^*) which reflect mental factors by tourists. In two country framework, domestic and foreign, people in domestic country visit some tourist places in their home, we assume $a_i = 1$. When foreigners visit the same place, they feel differently and evaluate more than people in the home country $(a_j^* > 1)$. Similarly, when tourists in home country visit some tourist places in foreign country, they have much interest rather than inhabitants there.

In order to examine the impacts by the tourism industry on the economy, we introduce three different kinds of elasticities of substitution, (1) the elasticity of substitution among tourism goods in home country, (2) the elasticity of substitution of tourism goods in foreign country, and (3) the elasticity of substitution between the tourism industries in two countries.

While we assume two-level of CES utility functions, some of results may be appealing. First, the more the mutual understanding in different cultures and customs, the stronger the demand for tourism goods in each tourism place. In general, however, the aggregate effect by the tourism industry on the economy depends upon the elasticity of substitution between the tourism industries in two countries, transportation cost and relative income level spent for tourists in two countries, home and foreign. It is certain that growing world economy is necessary to the growth to the tourism industry.

Section 2 presents the model. Section 3 states the equilibrium conditions and derives our major results. Brief concluding remarks are given in Section 4.

2.The Model

There are two countries, called home and foreign, where they respectively have n and n^* tourism spots. In the following, we attach asterisks to foreign variables. An average consumer in home country with income I will plan both domestic and international tours. Tourism places in both home and foreign countries are assumed monopolistically competitive. Therefore, there are three kinds of substitution. Firstly, there is substitution among tourism goods in home country. Secondly, there is substitution among tourism goods in foreign countries. Thirdly, there is substitution between domestic and foreign tourism.

2.1.Consumers

Since consumers' behaviours are analysed interchangeably both in home and in foreign we only consider consumers' behaviours in home country.

Let X and Y respectively stand for composite goods of domestic tourism goods and composite goods of international tourism goods. We assume CES type utility function.

(1) $$U=\left[X^{\rho}+Y^{\rho}\right]^{1/\rho},$$

Where $0 < p < 1$.

Composite goods, X and Y, are specified as follows.

(2) $$X^{\rho_1}=\sum_i x_i^{\rho_1} \quad \text{and} \quad Y^{\rho}=\sum_j a_j y_j^{*\rho_2},$$

Where x_i and y_j respectively stand for the demand for tourism goods purchased at home and abroad by people in home country. Parameter a_j represents the degree of admiration and excitement for different culture and interesting natural resources by visiting foreign tourism place j. When foreigners visit their tourism place j, $a_j=1$. When security in foreign country is disturbed, a_j is nearly zero. We also assume $0 < \rho_1, \rho_2 < 1$.

The average consumer maximizes his utility (equation (1)) under the budget constraint.

(3) $$I=\sum_i p_i x_i+\sum_j q_j y_j^*,$$

where p_i and q_j respectively denote the price of domestic tourism goods and the price of international tourism goods paid by the consumer at home. We can solve this problem by two-step maximization method.

Firstly, we solve the following problem.

Maximize $U = U(X, Y)$

Subject to: $I = P_x X + P_y Y$,

where P_x and P_y respectively represent the price indexes of composite goods X and Y. P_x and P_y are defined as follows (see Dixit and Stiglitz (1976)).

(4)
$$P_x^{1-\sigma_1} = \sum p_i^{1-\sigma_1}, \text{ and}$$
$$p_y^{1-\sigma_2} = \sum_j a_j^{\sigma_2} q_j^{1-\sigma_2},$$

where $\sigma_1 = \frac{1}{1-\rho_1}$ and $\sigma_2 = \frac{1}{1-\rho_2}$. The above maximization problem yields the following solutions.

(5)
$$X = \frac{1}{p_x} I_x \text{ and } Y = \frac{1}{p_y} I_y,$$

where I_x and I_y respectively denote the expenditures spent for X and Y, which are defined as follows.

$$I_x = \frac{p_x^{1-\sigma}}{p_x^{1-\sigma} + p_y^{1-\sigma}} I \text{ and}$$

(6)
$$I_y = \frac{p_y^{1-\sigma}}{p_x^{1-\sigma} + p_y^{1-\sigma}} I,$$

Where $\sigma = \frac{1}{1-\rho}$. Secondly, we solve x_i and y_j as follows. Consider X as subutility function and maximize it under budget constraint: $I_x = \sum p_i x_i$, which yields the following solutions.

(7)
$$x_i = p_i^{-\sigma_1} p_x^{\sigma_1 - 1} I_x.$$

Similarly, we can treat Y as subutility function and maximize it under budget constraint: $I_y = \sum q_j y_j$. Then

(8)
$$y_j = q_j^{-\sigma_2} a_j^{\sigma_2} P_y^{\sigma_2 - 1} I_y.$$

It is seen that an increasing understanding for different foreign culture and interesting foreign natural resources will raise the demand for international tourism. We use the above analyses for the case of home country to the case of foreign country. It should be noted that the utility function of foreign consumers should be modified as follows.

$$U^* = [X^{*\rho} + Y^{*\rho}]^{1/\rho},$$

where $X^{*\rho_1} = \sum_i a_i^* x_i^{*\rho_1}$ and $Y^{*\rho_2} = \sum_j y_j^{*\rho_2}$. P_x^*, P_y^*, I_x^* and I_y^* are respectively defined as follows.

$$P_x^{*1-\sigma_1} = \sum_i a_i^{*\sigma_1} p_i^{*1-\sigma_1},$$

$$P_y^{*1-\sigma_2} = \sum_j q_j^{*1-\sigma_2}$$

$$I_x^* = \frac{P_x^{*1-\sigma}}{P_x^{*1-\sigma} + P_y^{*1-\sigma}} I^*$$

$$I_y^* = \frac{P_y^{*1-\sigma}}{P_x^{*1-\sigma} + P_y^{*1-\sigma}} I^*$$

$$x_i^* = a_i^{*\sigma_1} p_i^{*-\sigma_1} P_x^{*\sigma_1-1} I_x^*, \text{ and}$$

$$y_j^* = q_j^{*-\sigma_2} P_y^{*\sigma_2-1} I_y^* .$$

2.2.Firms

First, we consider firms in home country. It sells x_i to domestic tourists and x_i^* to international tourists. For simplicity, we assume that firm *i* has travel agency, which charges p_i^* to foreign tourists and contains transportation costs. Therefore, the profit of firm is written as follows.

$$\Pi_i = (p_i - c_i)x_i + (p_i^* - t\, c_i)x_i^* - F,$$

Where t and F respectively show the rate of transportation cost and fixed cost.

Referring to demand functions x_i and x_i^*, the first order conditions for maximizing profits are given as follows.

$$p_i(1 - \frac{1}{\sigma_1}) = c_i$$

(9)

$$p_i^*(1 - \frac{1}{\sigma_1}) = t\, c_i, \quad i = 1, \ldots, n.$$

Similarly, firm j in foreign country maximizes its profits.

$$\Pi_j^* = (q_j - tc_j)y_j + (q_j^* - c_j)y_j^* - F^* .$$

Given demand functions y_j and y_j^*, the first order condition will be given as follows.

$$q_j(1 - \frac{1}{\sigma_2}) = t\, c_j$$

(10)

$$q_j^*(1 - \frac{1}{\sigma_2}) = c_j, \quad j = 1, \ldots, n^* .$$

In the following, we assume $c_i = c_j = c$, so that $p_i = p$, $q_j = q$, $p_i^* = p^*$, $q_j^* = q^*$, $\pi_i = \pi$, and $\pi_j^* = \pi^*$.

3.Equilibrium Analysis

In this section, we consider two equilibrium conditions. The first one is the case where n and n^* are constant. Since n and n^* represent the numbers of natural resources in home and foreign respectively, they may seem unchanged even if time goes on. However, in the long run, the number of places for tourism may change since new potential tourism places are developed.

In addition, since the elasticity of substitution among tourism goods is nothing but the price elasticity of demand in each country, we investigate the following two cases:

Case 1: Equal Elasticity of Substitution ($\sigma_1 = \sigma_2$) and **Case 2:** Different Elasticity of Substitution ($\sigma_1 \langle \sigma_2$).

(1)Unchanged Numbers of Tourism Goods

In the following, we consider the symmetric case where $n = n^*$. However, our analysis can easily be applied for the case where $n \neq n^*$, which is omitted here.

(a)The Case Where $\sigma_1 = \sigma_2 = \sigma_i$.

In this case, it follows that $p = q^*$ and $p^* = t\, p = t\, q^* = q$.
From equations (4), (7) and (9), we have the following.

$$x = \frac{\sigma_i}{(\sigma_i - 1)C} \frac{I_x}{n}$$

Since
$$P_y \big/ P_x = q \big/ p = t, \quad I_x = \frac{I}{1 + t^{1-\sigma}}.$$

Therefore
$$X = f\ (\sigma_i, \sigma, t, n),$$

where
$$\frac{\partial x}{\partial \sigma_i} \langle 0, \frac{\partial x}{\partial \sigma} \rangle 0, \frac{\partial x}{\partial n} \rangle 0 \text{ and } \frac{\partial x}{\partial t} \rangle 0.$$

Similarly,
$$y = \frac{\sigma_i}{(\sigma_i - 1)} \frac{a^{\sigma i}}{t\, c} \bullet \frac{I_y}{n},$$

where
$$I_y = \frac{I}{1 + t^{1-\sigma}}.$$

then
$$y = g\ (\sigma_i, \sigma, n, t, a),$$

where
$$\frac{\partial g}{\partial \sigma_i} \Big\langle 0, \frac{\partial g}{\partial \sigma} \Big\langle 0, \frac{\partial g}{\partial n} \langle 0 \text{ and } \frac{\partial g}{\partial t} \langle 0.$$

Lemma 1.

The demand for tourism goods in each domestic spot increases if (1) elasticities of substitution among tourism goods ($\sigma_1 = \sigma_2 = \sigma_i$) are lowered down, (2) the elasticity of demand between domestic and international tourism (σ) become larger, (3) the numbers of tourism places are smaller, (4) transportation cost becomes higher, and (5) the interest in foreign culture and natural resources increases.

Lemma 1 states anticipated results. Since elasticity σ_i equals the price elasticity of demand in each country, when it becomes elastic, the demand will be lowered. The larger the number of firms in market, the less each firm can sell. When transportation cost is large, there will be a switch from international tourism to domestic one. The elasticity of substitution between domestic and international tourism (σ) magnifies this transportation cost effect.

Lemma 2.

As for the demand for international tourism in each foreign firm, we have the following.

(1) $\frac{\partial y}{\partial \sigma_i} < 0$ (2) $\frac{\partial y}{\partial \sigma} < 0$ (3) $\frac{\partial y}{\partial n} < 0$ and (4) $\frac{\partial y}{\partial t} < 0$.

x^* and y^* can be similarly treated. Next, we are interested in how much each firm in local region will contribute and its profits. Since $\frac{1}{\sigma_i}(p x + p^* x^*)$, it is sufficient to analyse the impact of sales in each firm. Note that

$$p x + p^* x^* = \frac{1}{n}(I_x + I_x^*) \text{ and}$$

$$I_x + I_x^* = \frac{I}{1 + t^{1-\sigma}} + \frac{I^*}{1 + t^{\sigma-1}}.$$

Letting $\tau = t^{1-\sigma}$,

$$I_x + I_x^* = \frac{1}{1+\tau}\{I + \tau I^*\}.$$

Then

$$\frac{\partial \{I_x + I_x^*\}}{\partial \tau} = \frac{I^* - I}{(1+\tau)^2}.$$

Note that $$\frac{\partial \tau}{\partial t} < 0 \text{ and } \frac{\partial \tau}{\partial \sigma} < 0.$$

When $I^* > I$, then

$$\frac{\partial \{I_x + I^*\}}{\partial t} < 0 \text{ and}$$

$$\frac{\partial \{I_x + I_x^*\}}{\partial \sigma} < 0.$$

Therefore,

$$p_x + p^* x^* = H(n, t, \sigma),$$

$$\text{where } \frac{\partial H}{\partial n} < 0, \frac{\partial H}{\partial t} < 0 \text{ and } \frac{\partial H}{\partial \sigma} < 0.$$

Theorem 1.

Suppose expenditures for tourism in foreign country is larger than those in home country. Then both sales and profits of each firm in home country increases when (1) the number of firms there is small, (2) transportation cost (t) becomes smaller and (3) the elasticity of substitution between two countries is smaller.

Finally, let us investigate the aggregate demand for tourism to domestic economy.

$$J = p X + p^* X^* = I_x + I_x^*.$$

Corollary.

Suppose $I^* > I$. Then the aggregate demand for tourism in home country is increased when (1) trade cost (t) is lowered, and (2) the elasticity of substitution between two countries is decreased.

(b)The Case Where $\sigma_1 < \sigma_2$.

This minor change in our analysis does not affect our major results, so that we omit this case.

(2)The Case Where the Number of Firm Changes

The number of firms varies as long as firms enjoy positive profits. Then, in the long run, $\pi = \pi^* = 0$, which says that

$$p x + p^* x^* = c \sigma_i F = \frac{1}{n}(I_x + I_x^*).$$

That is,

$$n = \frac{I_x + I_x^*}{\sigma_i F} = N(\sigma_i, \sigma, t, F),$$

Where $$\frac{\partial N}{\partial \sigma_i} < 0, \frac{\partial N}{\partial \sigma} < 0, \frac{\partial N}{\partial \sigma} < 0 \text{ and } \frac{\partial N}{\partial F} < 0.$$

Theorem 2.

In the long run, suppose that $I^* > I$. Then the equilibrium number of firms rises when (1) the elasticity of substitution among tourism goods in each country becomes smaller, (2) the elasticity of substitution between two countries is smaller, (3) trade cost is decreased, and (4) fixed cost is smaller.

4. Concluding Remarks

This paper has shown that the domestic sales by tourism from both inhabitants and foreigners are affected by three kinds of elasticities of substitutions: (1) the elasticity of substitution among tourism goods in home country (σ_1), (2) the elasticity of substitution among tourism goods in foreign countries (σ_2), and (3) the elasticity of substitution between the composite tourism goods in two countries. While we investigated the special case where $\sigma_1 = \sigma_2 = \sigma_i$, our analysis will be easily extended to the different elasticity case where $\sigma_1 \neq \sigma_2$. In either case, the higher the elasticity of substitution, the less the demand for tourism goods.

The aggregate impact by the tourism industry ($P\ X + p^* x^*$)crucially depends upon the trade cost and the elasticity of substitution between the composite goods in two countries. If the foreign income is higher than domestic income, the lower trade cost is, the more the positive impact on the local economy by tourism. The same also holds if the elasticity of substitution between the composite goods in two countries becomes smaller.

Finally, it is important to point out that while we assume $n = n^*$, it is interesting to examine the case where the number of tourism places differs in two countries. Since those numbers reflect externalities, they affect some of our results obtained above, which is trivial extension and omitted here.

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Reference

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