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How can we solve the problems caused by over-tourism?

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How can we solve the problems caused by over-tourism?

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Abstract: This paper focuses on two major negative effects of over-tourism caused by excessive tourists overwhelming the capacity of tourist spots. The first is traffic congestion, when a flood of tourists shuts locals out of the public transport system. The second is environmental pollution. Copious tourist trash negatively affects the natural environment and the productivity of the environmentally sensitive agricultural industry. Applying the neoclassical standard economic model, this paper theoretically investigates the economic effects of countermeasures such as a tourism tax and expanding transportation capacity to show the conditions under which those measures will be effective.

Keywords: Over-tourism, Tourism tax, Public transport, Tourist trash
JEL Classification: Z30, R40

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1. Introduction

Over-tourism or mass tourism is defined as excessive tourists causing cultural, economic, and environmental damage, reducing residents' welfare.

For example, Chart #1 shows the current status of over-tourism in Japan. The number of foreign visitors in 2019 was almost four times that in 2010. After the COVID-19 pandemic, the weak Japanese yen led to the number of foreign visitors quickly recovering, and by 2023, it had returned to pre-pandemic levels. Chart #2 shows that in some tourist hot spots, such as Kamakura, tourists have come to outnumber locals.

-------Charts #1 and #2 around here-------

The main factors of over-tourism can be categorized into underlying and proximate causes. Regarding the underlying causes, the success of the urban regeneration movement should be mentioned. For example, Bilbao in Basque Country, Spain, was formerly a declining industrial city full of old factories and infrastructure. However, the famous Guggenheim Museum transformed it into a city of art. Regarding the proximate causes, shorter working hours have allowed more leisure time. Global development has created a large middle class that can afford to travel. In addition, decreasing trip costs promoted by low-cost carriers, such as EasyJet and Ryanair, support people's travel desires. The relaxation of visa requirements is another proximate cause of tourism expansion. Online travel agents facilitate personal trips. Popular social networking services contribute to raising the profile of tourist hot spots. Cruise ship travel has made it possible for many travelers all at once to comfortably visit famous sightseeing spots worldwide. Finally, governmental policies in some countries, such as Japan, encourage inbound tourists[1].

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[1] According to the Japan Tourism Organization, the number of visitors reached a record high of 31.88 million in 2019, up from 8.35 million in 2012. By country and region, China contributed the most at 9.59 million, followed by South Korea, Taiwan, and Hong Kong. The Japan Tourism Agency estimated that travel consumption amounted to 4.8135 trillion yen, a 4.4-fold increase in seven years. This was due to the depreciation of the yen under the second Shinzo Abe administration, which began in 2012, and the relaxation of visa issuance requirements for Thailand, Indonesia, China, and other countries. Airport slots and duty-free shops have also been expanded. The Japanese government has positioned tourism as a pillar of its growth strategy, and in 2016, set a target of increasing the number of visitors to

The effects of over-tourism can be categorized into three groups. First are the effects on culture. Owing to globalization, local and traditional cultures, including languages and beliefs, are sometimes ignored by tourists who do not grasp their value[2]. Moreover, crime and antisocial behavior increase. Second are the effects on local economies. Services for tourists are of no merit to locals, except for service suppliers. Local people must bear the investment costs of new infrastructure. Local shops for residents may be changed into shops for tourists. Additionally, local and traditional job opportunities may switch to tourism-related jobs. Multinational tourism organizations or hotel chains have been introduced and have obtained market power. Moreover, in some hot spots like Kiyomizudera in Kyoto, access by train or subway is inconvenient, so tourists rush to low-cost local buses. Due to the huge number of tourists, residents cannot use buses, which are indispensable in their daily lives. Third are the effects on the natural environment. Overcrowding can cause congestion and pollution, increasing carbon emissions. The increased waste is almost out of control, harming the natural environment, reducing the environmentally sensitive agricultural industry's productivity, and destroying sustainability. In addition, increased water consumption may prevent residents from accessing clean drinking water.

Possible policies for resolving the over-tourism problem can be categorized into three groups. First are distribution policies. Seasonal distribution encourages tourists to visit from spring to summer or autumn to winter. Spatial distribution encourages exploring secondary tourist spots. Temporal distribution involves inducing tourists to visit hot spots in the early morning or late at night. Second are billing policies. Introducing an expensive admission fee or event participation fee can discourage tourists with lower budgets from visiting certain spots and can reduce the number of tourists. An admission tax reduces the number of tourists and can financially support local governments[3]. Third are restriction policies. To preserve the environment, behavioral restrictions may be required[4]. Entrance or traffic restrictions, such as Venice's no-car policy or Zermatt's electric vehicle policy, may be effective. Instituting an upper limit on tourists along with required preliminary bookings, as introduced by Alhambra

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Japan to 40 million in 2020 and 60 million in 2030.

[2] It is frequently reported that foreign tourists break the local rules in Gion, Kyoto, surrounding *maiko* girls and causing trouble.

[3] Around 40 years ago, in Kyoto, a special tax was imposed as an entrance fee for temples. But different from museums, temples are religious facilities, and imposing a tax contradicts national policy—that is, tax-free religious cooperation.

[4] For example, in the Ogasawara islands, Tokyo, only guided tours with a limited number of tourists can access fragile spots like Minamishima.

Palace in Granada and the Sistine Chapel in Rome, may also be useful. All of these restrictive policies are effective under certain conditions but are insufficient to resolve the current over-tourism problem.

Most recent studies on over-tourism describe the current status and future challenges[5]. However, economic analyses on over-tourism are scarce. Yubal (2022) adopted a game theory approach and examined cooperation or competition between municipal managers. Nepal and Nepal (2021) presented case studies of five countries. They studied the effects of economic policies, taxes, and tourism fees. To the best of the author's knowledge, no theoretical studies have been conducted on the economic effects of restrictive policies used to resolve over-tourism based on ordinary neoclassical economic models.

This study's aims are as follows: Considering the current serious problem of over-tourism caused by excessive tourists overwhelming the capacity of tourist spots, I focused on two major negative effects. The first is traffic congestion, when a flood of tourists shuts residents out of the public transport system. The second is environmental pollution. Copious tourist trash negatively affects the natural environment and the productivity of environmentally sensitive agricultural industries. Applying the neoclassical standard economic model, the economic effects of countermeasures such as a tourism tax and expanding transportation capacity were theoretically investigated to show the conditions under which those measures can be effective.

The remainder of this study is organized as follows. Section 2 presents the model. Section 3 is devoted to the analysis. Section 4 presents the concluding remarks.

2. The Model

This study considered small local regions in Japan such as Kamakura, Matsumoto, or Nara. To simplify the analysis, the inter-regional trade of goods was ignored. These regions have three industrial sectors. First is the agricultural sector. Following Copeland and Taylor (1999), this industry was considered to be environmentally sensitive, with productivity that

[5] Harrison and Sharpley (2017), Milano et al. (2019, 2021), and Séraphin et al. (2020) are, respectively, collections of selected papers about over-tourism. Higgins-Desbiolles et al. (2019) is an overview of recent contributions on this topic. Several studies have focused on the sustainability of tourism; for example, see Blázquez-Salom et al. (2021) and Higgins-Desbiolles (2021).

depends directly on the stock level of the natural environment.

The production function of the agricultural industry can be expressed as follows:

$$A = L_A\sqrt{E}, \tag{1}$$

where A is the output, E is the stock level of the natural environment, and L_A is the labor input to the agricultural industry. Assuming perfect competition, the competitive wage rate w should satisfy

$$w = \sqrt{E}, \tag{2}$$

where the unit price of agricultural goods is taken as numeraire.

The second sector is publicly managed cleaning services. Tourists generate pollution that negatively affects natural environments. The author believes that publicly managed cleaning services can mitigate these negative effects. The stock level of the natural environment can be expressed as follows:

$$E = \bar{E} - T + \delta L_C, \tag{3}$$

where $\bar{E}$ is the natural environmental stock before damages, L_C is the labor input to the cleaning service industry, δ is the recovery parameter by one unit of labor employed by the cleaning service, and T is the number of tourists. Every tourists must pay tourism tax t when they visit this small town. It is assumed that T is a decreasing function of t—that is, $T = T(t), T' < 0$.

The third sector comprises publicly managed transport services. Residents and tourists use this service, but some fail to get on owing to overcapacity. The possibility of using this service depends on random probability. Let Q denote the capacity of one unit of transport,

q is the price of one unit of transport, c is the marginal cost of one unit of transport, and L_B is the labor input to the public transport service. Each worker can transport Q number of customers. Considering that public sector management is unified and the finances of this town are balanced, all profits from the transport sector and tourism tax income should be distributed to employed public servants in the transport and cleaning sectors. Then, the following equation is obtained:

$$w(L_B + L_C) = Q(q - c)L_B + tT. \tag{4}$$

The wage rate of public servants is also w under the assumption of free labor mobility between sectors.

The full employment condition is

$$L_A + L_B + L_C = \bar{L}, \tag{5}$$

where $\bar{L}$ denotes the labor endowment of this small region. As previously mentioned, the total number of potential users of public transport dominates the capacity of the total transport services. Thus, the expected number of residents who can successfully use public transport can be expressed as $\frac{\bar{L}}{\bar{L} + T} QL_B$.

Concerning the economic welfare of residents, to simplify the analysis, the Cobb–Douglas utility function is introduced, as follows:

$$u = (QL_B \frac{\bar{L}}{\bar{L} + T(t)})^{\alpha} A^{(1-\alpha)} \equiv B^{\alpha} A^{(1-\alpha)}, \tag{6}$$

where u is the utility level. Maximizing the welfare subject to the budget constraint conditions,

$$qB + A = w\bar{L}, \tag{7}$$

gives the first order condition,

$$(1-\alpha)qB = \alpha A. \tag{8}$$

As there is no regional trade and tourists are assumed to stay for only a short period, all the produced agricultural goods are consumed by residents[6].

After substituting (2) into (4) and (7), by four equations, (4), (5), (7), and (8), four endogenous variables, L_A, L_B, L_C, and q are determined if $Q, t, \bar{L}$ and α are provided exogenously.

3. Analysis

The total differentiation of (4), (7), (8), and (5) yields

$$\begin{bmatrix} 0 & A_1-(q-c)Q & (L_B+L_C)A_{12}+A_1 & -QL_B \\ A_1 & qB_1 & A_2-\bar{L}A_{12} & B \\ \alpha A_1 & -(1-\alpha)qB_1 & \alpha A_2 & -(1-\alpha)B \\ 1 & 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} dL_A \\ dL_B \\ dL_C \\ dq \end{bmatrix} = \begin{bmatrix} (q-c)L_B \\ -B_2 \\ (1-\alpha)qB_2 \\ 0 \end{bmatrix} dQ + \begin{bmatrix} -(L_B+L_C)A_{13}+(T+tT') \\ -A_3+\bar{L}A_{13}-B_3 \\ -\alpha A_3+(1-\alpha)qB_3 \\ 0 \end{bmatrix} dt, \tag{9}$$

where $A \equiv A(L_A, L_C, t),\ A_1 = \partial A/\partial L_A = \sqrt{E} > 0,\ A_2 = \partial A/\partial L_C = \delta L_A/2\sqrt{E} > 0,$

$A_3 = \partial A/\partial t = -L_A T'/2\sqrt{E} > 0, \quad A_{11} = \partial^2 A/\partial L_A^2 = 0, \quad A_{12} = \partial^2 A/\partial L_A \partial L_C = \delta/2\sqrt{E} > 0,$

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[6] Otherwise, we may consider that tourists purchase and consume some agricultural goods produced in this region. Even then, as their total payment should be equal to the value of their consumed agricultural goods, the aggregate value of consumption by residents remains unchanged.

$A_{13} = \partial^2 A / \partial L_A \partial t_C = -T' / 2\sqrt{E} > 0, \quad B \equiv B(L_B, Q, t), \quad B_1 = \partial B / \partial L_B = Q\bar{L} / (\bar{L} + T) > 0,$

$B_2 = \partial B / \partial Q = L_B \bar{L} / (\bar{L} + T) > 0, \quad$ and $\quad B_3 = \partial B / \partial t = -QL_B \bar{L} T' / (\bar{L} + T)^2 > 0.$ The determinant of the LHS matrix of (9), Δ, can be expressed as

$$\begin{aligned} \Delta = {} & QL_B dq(A_2 - A_1)B_1 - QL_B \alpha \bar{L} A_1 A_{12} + B\alpha(A_2 - A_1)[A_1 - (q-c)Q] \\ & + (A_2 - A_1 - A_{12}\bar{L})B[(1-\alpha)Qc - \alpha A_1], \end{aligned} \tag{10}$$

where we apply $L_A A_{12} = A_2$, $L_B B_1 = B$, and $(L_B + L_C)A_{12} + A_1 = -(A_2 - A_1 - \bar{L}A_{12})$. The sign of (10) is negative under the following assumptions:

Assumptions

#1. $\alpha < c/q$, which implies that consumer preferences for agricultural goods are sufficiently large.

#2. $A_1 > A_2$, which implies that, in the agricultural industry, the marginal products of labor input to the agricultural sector directly dominate those of the indirect effects on the cleaning sector.

#3. $A_1 - (q-c)Q > 0$, which implies that the publicly managed transport service sector is in deficit.

In other words, Assumption #2 implies that δ is sufficiently small to satisfy $\delta < 2E/L_A$.

3.1. Increase in public transport capacity

One possible solution to over-tourism is to expand the public transportation capacity. Effects caused by an increase in Q yield

$$\Delta \frac{dL_A}{dQ} = cL_B B A_{12}[L_A - (1-\alpha)\bar{L}], \tag{11}$$

$$\Delta \frac{dL_B}{dQ} = -[A_2 - A_1 - (1-\alpha)A_{12}\bar{L}]cL_B B > 0, \tag{12}$$

$$\Delta \frac{dL_C}{dQ} = \frac{1}{2}cA_1 L_B B < 0, \tag{13}$$

$$\begin{aligned} \frac{du}{dQ} &= u\left(\frac{\alpha}{B}\frac{dB}{dQ} + \frac{1-\alpha}{A}\frac{dA}{dQ}\right) \\ &= \frac{\alpha u}{B}\left(B_1 \frac{dL_B}{dQ} + B_2\right) + \frac{(1-\alpha)u}{A}\left(A_1 \frac{dL_A}{dQ} + A_2 \frac{dL_C}{dQ}\right). \end{aligned} \tag{14}$$

With increased capacity in one unit of transport service, labor input to the public transport sector decreases, and labor input to the public cleaning sector increases. The sign of (11) depends on the following parameters: If α is larger (smaller) than $(L_B + L_C)/\bar{L}$, then (11) is positive (negative), implying that labor input to the agricultural sector decreases (increases).

It can be concluded that $A_1 \frac{dL_A}{dQ} + A_2 \frac{dL_C}{dQ} = -\frac{1}{\Delta}cL_B BA_1(1-\alpha)\bar{L} > 0$, which implies that an increase in Q will positively affect the total output of agricultural goods. Regardless of the decreasing L_B, if the direct effect of increasing Q dominates the indirect effect caused by decreasing L_B, then an increase in Q will have a positive effect on the total number of public transport users, B. Then, the sign of (14) is positive. Consequently, the following proposition can be established:

PROPOSITION #1

Under Assumptions #1–3, if an increase in public transport capacity raises the total number of public transport users, the economic welfare of the residents in the region will be enhanced.

Note that we can consider the opposite scenario when the indirect effect of decreasing L_B dominates and QL_B decreases overall. If the public sector's revenue is low and α is sufficiently large, there is the possibility that the economic welfare of this region will be reduced.

3.2. Increase in tourism tax

Another possible solution to over-tourism is imposing a larger tourism tax on tourists' inflow. The effects caused by an increase in t yield

$$\begin{aligned}\Delta[A_1\frac{dL_A}{dQ}+A_2\frac{dL_C}{dQ}] &= (A_2-A_1)[(1-\alpha)(L_B+L_C)-\alpha L_A]cB \\ &- A_1A_{12}[\alpha L_A A_{13}(B+QL_B)+(1-\alpha)qQL_B B_3-(T+tT')(1-\alpha)B],\end{aligned} \tag{15}$$

$$\begin{aligned}\frac{du}{dt} &= u(\frac{\alpha}{B}\frac{dB}{dt}+\frac{1-\alpha}{A}\frac{dA}{dt}) \\ &= \frac{\alpha u}{B}(B_1\frac{dL_B}{dt}+B_3)+\frac{(1-\alpha)u}{A}(A_1\frac{dL_A}{dt}+A_2\frac{dL_C}{dt}),\end{aligned} \tag{16}$$

where the sign of (15) is negative if $\alpha<(L_B+L_C)/\overline{L}$ and $T+tT'<0$. Also, similar to 3.1., if B_3, the direct effect of increasing B, dominates the indirect effect caused by decreasing L_B, an increase in t will cause a positive effect on the total number of public transport users, B. Then, the following proposition can be asserted:

PROPOSITION #2

Under Assumptions #1–3, if α is smaller than $(L_B+L_C)/\overline{L}$, and an increase in tourism tax reduces the total tax revenue, the economic welfare of residents in this region will be enhanced by increasing the tourism tax.

Again, it is important to note that whether increasing the tourism tax enhances regional economic welfare depends on several factors. The tourism tax would be effective only if all the above conditions are satisfied.

4. Concluding Remarks

Under the above assumptions, ordinary economic policies are valid. Increasing transport capacity and tourism taxes contributes to improving regional economic welfare. In other words, if one of these assumptions or conditions is not satisfied, the reverse conclusions may arise. If consumers' preference for agricultural goods is small and the publicly managed transport service sector is profitable, welfare may decrease due to increased transport capacity. In addition, if consumers' preference for agricultural goods is small, the publicly managed transport service sector is profitable, and the total tax revenue decreases, welfare may decrease due to the increased tourism tax rate.

This study is only the first step, and the potential future topics are vast. The effects of seasonal, spatial, and temporal distribution policies should be examined using different frameworks. Additionally, the effects of upper-limit restriction policies on tourists' inflow are worth studying.

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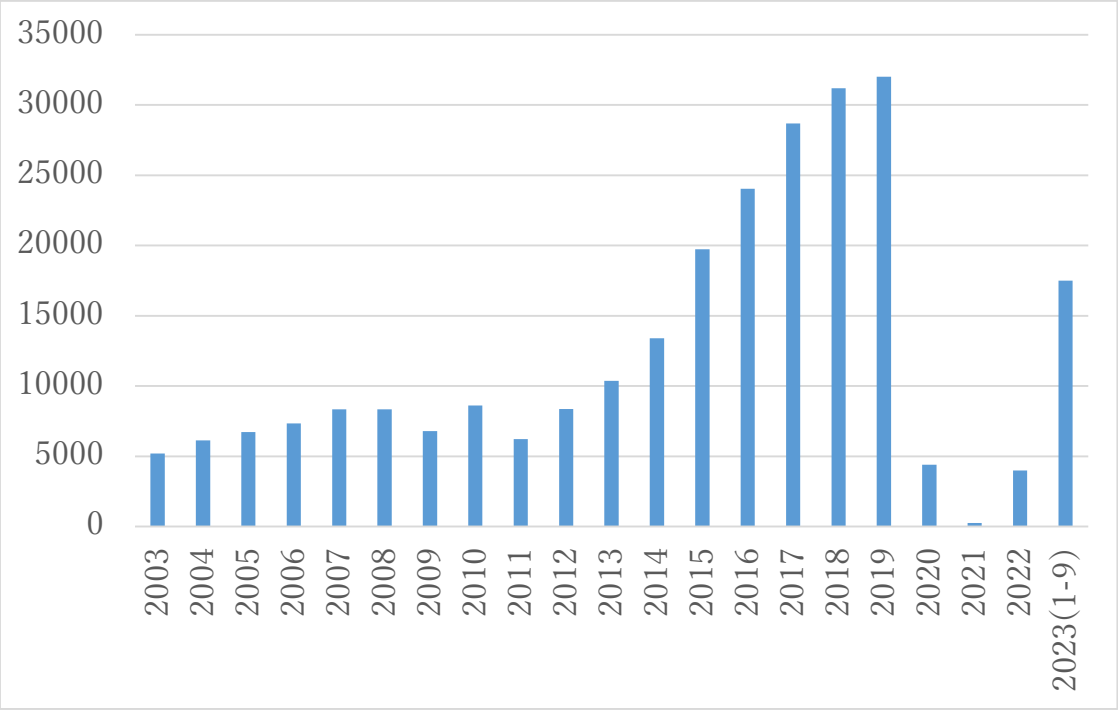
Chart #1

Number of foreign tourists in Japan



Source: Japan National Tourism Organization

Chart #2

Exchange Population Rates of Tourist Spots

City or view spot	Population (thousand) 2017	Number of tourists (thousand) 2017	Exchange population rate
Kyoto	1,470	53,620	36
Kamakura	170	20,420	120
Barcelona	1,600	18,800	12
Venice	50	30,000	115
Florence	380	10,200	27
Dubrovnik	40	1,020	26
Mallorca Island	900	14,000	15
Iceland	330	1,900	6
Orlando	1,300	71,000	50

Source: Nara and Maekawa (2019); data from the World Tourism Organization