Government, Public Policy and Social Welfare in a Tourism Economy

ZHAO, Sheng
City University of Hong Kong

Abstract

Development of the tourism industry shows an inverted U-shape pattern in that as regional growth continues, the tourism receipt to GDP ratio (TGR) first increases and then decreases. This phenomenon is explained by cross-sectional and time series data. Comparing this pattern with the N-shaped environmental Kuznets curve (EKC) shows an inverse relationship between TGR and EKC for developing and developed countries in recent decades. This paper is the first to uncover this inverse relationship and provides a theoretical explanation: development level determines pollution source in the host economy; because changes in TGR alters the industry structure, pollution emission increases or decreases depending on whether the tourism sector is polluting or non-polluting. Furthermore, by incorporating government manipulation into TGR, we carry out a welfare analysis using different scenarios in terms of pollution regulation, and offer strategies for tourism development under each condition. Optimal TGR exists under certain conditions and interestingly has an opposite response to the improvement of the environmental awareness of residents in developing and developed countries.

Keywords: TGR, EKC, Tourism, Development, Environment, Public Policy

1. Introduction

According to the World Tourism Organization (2004), tourism "comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes" (Gil-Pareja, Llorca-Vivero, and Martínez-Serrano, 2007). The global tourism industry has been experiencing consistent growth since the Second World War, and it is estimated that this growth will continue for decades to come (*Figure 1, Appendix*). For many underdeveloped areas with rich resources, tourism has been a major facilitator of local development or even a vital industry for countries and regions like Egypt, Greece, Hong Kong, Malaysia, Singapore, Thailand and many island nations, such as the Bahamas, Fiji, the Maldives, etc. The latter group is sometimes referred to as Small Island Tourism Economies (SITEs) in literature.

Despite the consensus of growing tourism in an absolute scale, however, economists seldom discuss changes in tourism's relative importance, which could be denoted by the *Tourism Receipts-GDP Ratio* (*TGR)*[1]. To the best of the author's knowledge, this paper is the first attempt at presenting a full picture of tourism evolution from a relative perspective, with cross-sectional data of regions at different administrative levels (*Figures 2–4, Appendix*). It is observed that the TGR is very low in underdeveloped and developed economies, but relatively high in regions that are at mid-range development. Time series data in Japan and Taiwan further support this finding (*Figures 5-6, Appendix*),

[1] In literature, the equivalent concept is often denoted by "the share of tourism in GDP" or similar terms. TGR is used in this study to avoid accounting issues.

indicating the dynamics of TGR behaves differently at different stages of development, forming a possible inverted-U shape. This story is the basis of this paper, focusing on the relative value of TGR rather than the absolute scale of tourism to evaluate the industry.

Tourism is closely interrelated with environment, which is the key resource of tourist attraction. In the early 1990s, economists (Grossman and Krueger, 1991; 1993) used a hypothesized Environmental Kuznets Curve (EKC) to summarize the relationship between the two, stating that environment conditions first deteriorate as a country develops and then after some point, improves along with the development of local economy. This forms an inverted-U shape similar to the Kuznets curve for income inequality. However, recent studies (Jha and Murthy, 2003; Martínez-Zarzoso and Bengochea-Morancho, 2004; Galeotti and Lanza, 2005) state that considering new pollutants, such as carbon dioxide (CO_2), the curve should be revised to an "N" shape, indicating that greenhouse gas emissions of developed countries is increasing. Research on global warming not only raises concerns on CO_2 emissions, but also demands international coordination for pollution control. Generally, rich countries have more stringent regulations for pollution control than poor countries (*Figure 7, Appendix*).

Although tourism and environment are two important issues for local development, few studies have carefully examined their relationship. Studies that combine these topics include those of Chao and Sgro (2008), Chao et al. (2008), and Beladi et al. (2009). To narrow this gap, we exploit the data of a number of Asian countries and present the dynamics of regional TGR and CO_2 emission (for pollution in Japan before 1990, we use

SO_2 and NO_x data instead) (*Figures 8-12, Appendix*), which covers tourism and environment in the context of local development. The figures obtained in this paper reveal distinct patterns across the cases. For developing countries, namely, Thailand and Malaysia, pollution level increases with increasing TGR, indicating a positive relationship between the two; for developed countries, namely, Japan and South Korea (the only two Asian member countries of the Organisation of Economic Cooperation and Development [OECD] until 2009), the relationship is generally negative (for *Figures 10* and *12*, the relationship is clearer when time period is divided into pre-Asian financial crisis [1990–1997] and post-Asian financial crisis [1998 onwards]).

This observed controversy raises the research question of the paper. The following part offers one possible explanation and policy suggestions.

2. The Model

Model I: the Poor Country Case

We first use a simple model to explain the observed positive relationship between TGR and pollution in developing countries. Consider a small open economy producing two types of goods, X and Y. X is an internationally traded good, which in the poor country case is mainly constituted by agricultural goods; and Y is a non-traded good, representing the tourist goods and services. In this model, the price of the tradable good X is taken as the numeraire. Two conventional inputs, capital K and labor L, which are domestically endowed, help produce these goods. K and L are perfectly mobile across sectors but immobile internationally in the model. A variable e, representing the environmental degradation, or pollution level is incorporated into this economic system. The pollution in this model is emitted by the tourism sector as a by-product.

Three economic agents exist in the economy: residents, tourists and government. Residents own all input factors and thus gain all the factor returns. They consume both X and Y and their utility is negatively affected by pollution emission e. Tourists are assumed to consume the tourist good Y only. Based on the stylized facts, their aggregate expenditure, or the tourism receipts from the perspective of the host economy, is determined by the regional output and TGR δ, which is an exogenous variable in the model. δ integrates several factors, including the development level of the host economy, seasonality, the geographic location, fame and reputation, facility conditions, tourist preferences, public strategy of tourism development, etc. By incorporating public strategy into δ, government is able to manipulate the TGR to a certain extent. Practically, the manipulation instruments include, but are not limited, to visa policy, quotas for admission tickets, propaganda and marketing campains, etc. Government also levies pollution tax on the polluting firms and transfers tax revenues to local residents in a lump-sum manner.

Firms

The two sectors in the poor country are the tradable good sector X, and the non-traded good sector Y. We write the production functions as

$$X = F_X(K_X, L_X)$$

$$Y = F_Y(K_Y, L_Y)$$

where $F_j(.)$, $j = X, Y$. This follows conventional neoclassical technology with the characteristics of constant returns to scale, diminishing returns to each input factor, and fulfillment of Inada conditions.

Pollution is assumed to be emitted by the non-traded good sector. Assuming a linear relationship, the total emission is

$$e = \lambda_Y Y$$

where λ_Y is the pollution rate of the non-traded good sector.

Setting the price of the tradable good X as the numeraire, the price of Y is denoted by p. Government levies pollution tax; thus, the effective producer prices of the tradable good X and non-traded good Y are 1 and $p - \tau\lambda_Y$ respectively, where τ is the pollution tax rate.

The market of the host economy is assumed to be perfectly competitive. Thus, with the above effective producer prices, zero-profit condition yields the following relationships in terms of prices:

$$1 = c^X(w, r)$$

$$p - \tau\lambda_Y = c^Y(w, r)$$

where $c^j(w, r), j = X, Y$ is the unit cost of producing each type of good.

Now let's introduce the resource constraint. L and K are assumed to be inelastically supplied and fully mobile within the host economy in our model. The endowment of labor and capital are denoted by $\bar{L}$ and $\bar{K}$ respectively. Thus, the resource constraint of the input factors gives

$$c_w^X(w, r)X + c_w^Y(w, r)Y = \bar{L}$$

$$c_r^X(w, r)X + c_r^Y(w, r)Y = \bar{K}$$

where the subscript of the cost functions denotes the partial derivate:

$$c_w^j(w, r) = \frac{\partial c^i}{\partial w}, j = X, Y$$

$$c_r^j(w, r) = \frac{\partial c^i}{\partial r}, j = X, Y$$

With the envelope theorem, we have $c_i^j(w, r), i = w, r;\ j = X, Y$, representing the unit factor requirement.

Therefore, with all the above relationships, we can write the revenue function for the economy as

$$R(p, \tau, K, L) = \max\{X + pY - \tau e:\ K_X + K_Y = \bar{K},\ L_X + L_Y = \bar{L}\}$$

which represents the GDP of the host economy in terms of the price of the tradable goods X.

Residents

The demand side of the economy has two consumers, residents and tourists. Resident utility is given as

$$U = U(C_X, C_Y, e) = \left[(C_X{}^{\alpha} C_Y{}^{1-\alpha} e^{-\rho})^{1-\sigma} - 1\right]/(1-\sigma)$$

where $0 < \alpha < 1$, $\rho > 0$, $\sigma > 0$ and $\sigma \neq 1$. In this utility function, e, or environmental degradation or pollution is a factor that brings disutility to local residents. The strength of this disutility is captured by the parameter of ρ . ρ can also be interpreted as environmental awareness of local residents. If ρ is low, residents do not care about environmental degradation too much, and the disutility is weak; if ρ is very high, residents are sensitive to the environment, and the disutility caused by pollution is very strong.

The budget constraint of residents is given by

$$C_X + pC_Y = I + S$$

In this budget constraint, I denotes the pre-subsidy resident income. Residents own all the input factors; thus they get all the factor returns, indicating $I = R$. S is the lump-sum transfer from government. A balanced government budget gives $S = \tau e$, indicating that government transfers all tax revenue collected to the local residents as a pollution subsidy. So by duality, we can write the expenditure function of the residents in the following form

$$E(p, e, u) = \min \{C_X + pC_Y : U(C_X, C_Y, e) = u\}$$

Tourists

Following a common assumption in tourism literature, we assume tourists consume the non-traded good Y only for simplicity. The following budget constraint holds for tourists, which gives the consumption level

$$pD_Y = T$$

D_Y is the consumption of Y by tourists. T is total tourist spending, which is equal to tourism receipts in empirical studies. We denote the ratio of T/R , or the TGR as δ, so we have $T = \delta R$. For poor countries, it is observed that δ is increasing in recent years. Substituting this relationship into tourist budget yields

$$D_Y = \delta R/p$$

In our model, the total tourist spending is broken down into two components: one is the TGR δ - showing the relative importance of inbound tourism, and the other is the scale of the local economy R. Therefore, unlike the conventional models with exogenous tourism in which tourist spending is determined by a shift parameter mainly describing the tourists' preferences, here we highlight the attractiveness of the host economy itself with the local economy scale R. In many developed countries nowadays, total tourism receipts increase with increasing R and decreasing δ. This means although international tourism has exceedingly become less important to a developed economy, the growth of the economy itself would attract tourists. The latter effect is stronger than the former, leading to a rise in tourism receipts. This is supported by the empirical finding of causal relationship from economic growth to tourism development (Oh, 2005; Lee and Chang 2008). If the TGR effect is sufficiently strong, a pattern of stagnating or declining tourism receipts may occur, echoing the stagnation period and possibilities of decline in the Tourist Area Life Cycle theory (Butler, 1980).

Comparative Statics

By utilizing the expenditure function and revenue function, the equilibrium of the economy is captured by

$$E_p(p,e,u) + \delta R(p,\tau)/p = R_p(p,\tau) \quad (1\text{-}1)$$

$$E(p,e,u) = R(p,\tau) + \tau e \quad (1\text{-}2)$$

$$R_\tau(p,\tau) = -e \quad (1\text{-}3)$$

Equation (1-1) is the market-clearing condition of the tourist good Y. The left-hand side (LHS) is tourist good demand, compounded by both domestic and foreign consumption; the right-hand-side (RHS) is the tourist good supply. Equation (1-2) denotes the budget constraint of local residents. LHS is resident expenditure and RHS is resident income after subsidy. Equation (1-3) gives the level of pollution caused by the non-traded good sector.

We assume that the government policy parameter τ is a given number (The effect of τ change in the host economy and domestic welfare are well elaborated by Chao et al. [2008] and Beladi et al. [2009]). Fixing the pollution tax is reasonable if we consider that changing the tax rate requires long and tedious decision-making and legislative procedures, and may encounter civil protests and political obstacles in reality. Thus, tax rate can be regarded as a constant number for a short period of time. By constrast, δ is naturally more volatile and manipulating it is exceedingly easier and faster for administrators of the tourism sector. Therefore, we have a given parameter τ , three endogenous variables u, p, e and an exogenous δ. Total differentiation of the above equations gives

$$E_{pu}du = \left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2}\right)dp - \frac{R}{p}d\delta - E_{pe}de$$

$$E_u du = D_Y dp + (\tau - E_e)de$$

$$de = -R_{\tau p}dp$$

The signs of the terms are given as follows: $E_{pu} = (\frac{\partial u}{\partial C_Y})^{-1} > 0$ because Y is a normal good, $R_{pp} = \partial Y/\partial p > 0$ for a positively sloped supply curve, $E_{pp} = \partial C_Y/\partial p < 0$ because the slope of the compensated demand curve is negative, $-\frac{\delta}{p}R_p + \frac{\delta R}{p^2} = \frac{\delta}{p}(\frac{R-pY}{p}) > 0$, $\frac{R}{p} > 0$, $E_{pe} = \rho\,(C_Y/Y) > 0$, $E_u = (\frac{\partial u}{\partial E})^{-1} > 0$ is the inverse of the marginal utility of income, $E_e = \frac{\rho E}{e} > 0$ denotes the marginal willingness to pay for pollution reduction, and $R_{\tau p} = -\,\partial e/\partial p < 0$ because higher price of the non-traded goods encourages the production of Y, and thus induces more pollution. Since there is a negative sign, $R_{\tau p}$ is negative. Although $R_{\tau p}$ and $R_{p\tau}$ are algebraically equivalent, the economic intuitions behind them are different: $R_{p\tau} = \partial Y/\partial \tau$ means higher pollution tax rate raises the cost of producing Y, and therefore the production of Y is decreasing in τ. Using these relationships, the sign of the above two equations can be shown as

$$E_{pu}du = \left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2}\right)dp - \frac{R}{p}d\delta - E_{pe}de \quad (1\text{-}4)$$

(+) (+) (-) (-)

$$E_u du = D_Y dp + (\tau - E_e)de \quad (1\text{-}5)$$

(+) (+) (?)

$$de = -R_{\tau p}dp \quad (1\text{-}6)$$

(+)

Equation (1-4) shows the conventional terms-of-trade effect of a tourism boom. In the absence of an environmental variable, an increase in tourist spending increases the relative price of the non-traded goods and promotes domestic welfare. Equation (1-5) shows two distortions in the economy: one is the presence of tourism that makes the non-traded goods tradable, which brings forth monopoly power in the tourism sector; the other distortion is from pollution, which harms the domestic welfare of the host economy if the pollution subsidy is not sufficiently high. Equation (1-6) shows that because the pollution is a by-product of the non-traded good sector, the higher the price of non-traded goods, the more severe the pollution will be.

Combining Equations (1-4), (1-5), and (1-6) we have

$$dp = -E_u \frac{R/p}{H} d\delta \quad (1\text{-}7)$$

where $H = E_u \left(E_{pp} + \frac{\delta}{p} R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe} R_{\tau p} \right) + E_{pu} [D_Y + (E_e - \tau) R_{\tau p}]$ (refer to the *Appendix* for derivation).

Following Dei (1985) and Beladi et al. (2009), the excess demand (Q) of the non-traded good Y, should be decreasing in the price adjustment, which means $\partial Q / \partial p < 0$ algebraically — a necessary and sufficient condition for stability. From Equation (1-1) stating the market-clearing condition of the tourist good, we can easily derive the expression of the excess demand Q as

$$Q = E_p(p, e, u) + D_Y(p, T) - R_p(p, \tau).$$

Fixing T and τ, we have the relationship of the excess demand Q and the non-traded good price p as $\partial Q/\partial p = E_u/H$ (refer to the *Appendix* for derivation), where $H = E_u\left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe}R_{\tau p}\right) + E_{pu}[D_Y + (E_e - \tau)R_{\tau p}]$. Thus, we require $H < 0$ for stability.

Now let's examine the relationship between TGR and pollution. Combining Equations (1-6) and (1-7), we obtain

$$-\frac{1}{R_{\tau p}}de = -E_u\frac{R/p}{H}d\delta$$

$R_{\tau p}$ is negative as analyzed earlier. Therefore, the sign of the above equation is

$$-\frac{1}{R_{\tau p}}de = -E_u\frac{R/p}{H}d\delta \tag{1-8}$$

(+) (+)

Therefore, we obtain the relationship of $\frac{de}{d\delta} > 0$ for poor countries.

Proposition 1. (The Relationship between TGR and Environment) *For poor countries where the non-traded good sector is polluting, environmental conditions deteriorate as TGR increases.*

Social Welfare and Public Strategy of Tourism

Now let's examine how TGR affects the domestic welfare. From Equation (1-7), we have

$$dp = -E_u \frac{R/p}{H} d\delta$$

(+)

indicating that $\frac{dp}{d\delta} > 0$. Thus, substituting this relationship and $\tau - E_e < 0, \frac{de}{d\delta} > 0$ into Equation (1-5), we have

$$E_u \frac{du}{d\delta} = D_Y \frac{dp}{d\delta} + (\tau - E_e) \frac{de}{d\delta} \tag{1-9}$$

(+) (+) (?) (+)

For poor countries, δ is generally increasing. However, because the sign of $\tau - E_e$ is ambiguous, we propose two scenarios for welfare analysis.

Scenario A: $\tau - E_e \geq 0$

In this scenario, τ is set to be equal to or above the marginal damage of pollution. Therefore, even higher δ induces more pollution, residents is at least as well-off for the pollution subsidy is high enough to compensate for disutility. Moreover, because of the conventional terms-of-trade effect, an increase in δ is always welfare-improving in this scenario.

However, scenario A is not common for developing countries where environmental regulation is usually poor. More often, τ is set at a very low level, or in extreme cases, τ is absent. Thus, we focus on Scenario B.

Scenario B: $\tau - E_e < 0$

In this scenario, $\tau < E_e$ holds, indicating poor pollution regulation, or mismanagement of environment in the poor country. Actually, according to the conclusion of Beladi et al. (2009), even if τ is properly managed and set at an optimal level, $\tau^o < E_e$ holds if pollution disutility is very weak. This usually holds for poor countries because residents focus more on the economic benefits of tourism at the lower stage of development and are not sensitive toward environmental degradation. Therefore, the sign of Equation (1-9) is

$$E_u \frac{du}{d\delta} = D_Y \frac{dp}{d\delta} + (\tau - E_e) \frac{de}{d\delta}$$

(+) (+) (-) (+)

Thus, the overall effect of TGR change on domestic welfare is ambiguous because an increase in TGR causes a tourist boom, which further raises the price of the non-traded goods. This effect is beneficial to residents. At the same time, however, low government subsidies and increasing pollution from the non-traded good sector harm domestic residents. The total welfare change depends on the strength of the two effects. Setting the above equation to zero, we obtain the optimal level of TGR as

$$\delta^o = \frac{p(\tau - E_e)}{R} R_{\tau p} > 0 \quad (1\text{-}10)$$

Proposition 2. (Optimal TGR) *If the pollution tax rate is lower than the marginal disutility, to cancel the distortion caused by tourism and pollution, we have an optimal TGR for the poor country case at* $\delta^o = \frac{p(\tau - E_e)}{R} R_{\tau p}$.

Moreover, we have $\frac{d\delta^o}{dE_e} > 0$ (refer to the *Appendix* for derivation). This meaningful result poses the following implication on public strategy of tourism development:

Corollary 1. *In poor countries, with all other things constant, the improvement of local environmental awareness (an increase in* ρ*) increases the optimal value of TGR.*

Model II: the Rich Country Case

The framework of Model 2 for rich countries is generally the same as that of Model 1. However, we set up this model with a distinct assumption to better approximate the situation in rich countries: the tradable good sector, instead of the non-traded goods sector, is polluting. The degree of industrialization is higher in rich countries; thus the production of the tradable good sector is mainly constituted by the secondary industry or manufacturing instead of agriculture. Thus, the tradable good sector is assumed to be polluting because of emissions from manufacturing. Tourism development is mature and technology is advanced; therefore, pollution induced by the production of tourist goods can be neglected. However, poor countries at the beginning stage of regional tourism development need to construct many facilities such as roads, hotels, entertainment places, etc., which could be major sources of pollution. Moreover, because of technology constraints, waste produced by tourists may not be abated.

Basically, the two models proposed in the paper are extreme cases in terms of polluting structure. The scenarios in the welfare analysis slightly differ from those in Model 1 because rich countries have experienced two stages of tourism development. We present the model from the equilibrium equations.

Comparative Statics

Same as Model 1, the equilibrium of the rich economy is captured by

$$E_p(p,e,u) + \delta R(p,\tau)/p = R_p(p,\tau) \tag{2-1}$$

$$E(p,e,u) = R(p,\tau) + \tau e \tag{2-2}$$

$$R_\tau(p,\tau) = -e \tag{2-3}$$

Again, we regard the pollution tax τ as a fixed number. Thus, the total differentiation of the these equations gives

$$E_{pu}du = \left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2}\right)dp - \frac{R}{p}d\delta - E_{pe}de \tag{2-4}$$

$$E_u du = D_Y dp + (\tau - E_e)de \tag{2-5}$$

$$de = -R_{\tau p}dp \tag{2-6}$$

By combining Equations (2-4), (2-5), and (2-6), we obtain

$$dp = -E_u \frac{R/p}{H} d\delta \tag{2-7}$$

where $H = E_u\left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe}R_{\tau p}\right) + E_{pu}[D_Y + (E_e - \tau)R_{\tau p}]$. With the same rationale in Model 1, the stability condition requires $H < 0$.

Combining Equations (2-6) and (2-7) we have

$$-\frac{1}{R_{\tau p}}de = -E_u \frac{R/p}{H} d\delta$$

$R_{\tau p} = -\partial e/\partial p > 0$ because higher non-traded good price attracts resources to the non-traded goods sector, contracts the production of the tradable good sector, and lessens pollution emission. This relationship is clearly observed from its counterpart $R_{p\tau} = \partial Y/\partial \tau > 0$, because a higher pollution tax suppresses the tradable good sector and thus factor resources go to the non-traded good sector. This result differs from that in Model 1 because we have different assumptions on pollution source. Therefore, the signs of the terms in the previously mentioned equation are denoted as

$$-\frac{1}{R_{\tau p}} de = -E_u \frac{R/p}{H} d\delta \tag{2-8}$$

(-) (+)

Therefore, we have the relationship $\frac{de}{d\delta} < 0$, which is contrary to the result in Model 1.

Proposition 3. (The Relationship between TGR and Environment) *For rich countries where the tradable good sector is polluting, the environment improves as TGR increases; when TGR decreases, the environment deteriorates.*

Social Welfare and Public Strategy of Tourism

Consider how TGR affects the domestic welfare. From Equation (2-7), we have

$$dp = -E_u \frac{R/p}{H} d\delta$$

(+)

which means the price of the tourist goods are increasing in TGR. Substituting the relationship in this equation and Equation (2-8) into Equation (2-5), we have

$$E_u \frac{du}{d\delta} = D_Y \frac{dp}{d\delta} + (\tau - E_e) \frac{de}{d\delta} \tag{2-9}$$

(+) (+) (?) (-)

Unlike the poor country case in which δ is generally increasing along with the development, rich countries have experienced two stages of tourism development: δ first rises then decreases after a certain point. Therefore, we have three scenarios for welfare analysis in the rich country case.

Scenario A. $\tau - E_e \leq 0$, and δ is increasing.

In this scenario, an increasing δ reduces pollution emission. Although pollution subsidy is low, the disutility is abated because of better environment conditions. In the case of $\tau - E_e \leq 0$, the latter effect is strong enough to cancel the former effect. The conventional term-of-trade effect showed by $D_Y \frac{dp}{d\delta}$ always results in welfare improvement with an increase in δ.

Scenario B. $\tau - E_e \leq 0$ and δ is decreasing.

The scenario indicates that pollution emission is increasing, whereas the compensation for pollution disutility is low. A decreasing δ results in a decreasing p, deteriorating the terms-of-trade. Combining these two effects, resident welfare decreases, indicating that in this scenario, residents are always immiserizing.

These two scenarios indicate that, for a rich country where $\tau - E_e \leq 0$ holds, public strategy for tourism development is to keep δ rising. This result has a significant practical implication. For a rich country where domestic obstacles disagree with a high τ, the government exerts considerable effort to promote the tourism in that country. Alternatively, if the government cannot increase δ but can a adopt a higher τ to reverse the relationship $\tau - E_e \leq 0$, the host economy would have Scenario C as follows:

Scenario C. $\tau - E_e > 0$

In reality, the relationship $\tau > E_e$ commonly holds, representing a strict pollution regulation. Beladi et al. (2009) suggest that when pollution disutility is strong, the condition $\tau^o > E_e$ holds. Thus, if τ is properly set at an optimal level in the rich country, $\tau > E_e$ still holds because residents always have strong environmental awareness. Therefore, the signs of Equation (2-9) are

$$E_u \frac{du}{d\delta} = D_Y \frac{dp}{d\delta} + (\tau - E_e) \frac{de}{d\delta}$$

(+) (+) (+) (-)

Under the condition $\tau - E_e > 0$, regardless of whether δ is increasing or decreasing, the overall effect on social welfare is ambiguous. Thus, by setting the above mentioned equation to zero, we obtain the optimal level of TGR for rich countries as

$$\delta^{oo} = \frac{p(\tau - E_e)}{R} R_{\tau p} > 0 \quad (2\text{-}10)$$

Proposition 4. (Optimal TGR) *If the pollution tax rate is higher than the marginal disutility, to cancel the distortion caused by tourism and pollution, we have an optimal TGR for the rich country case at* $\delta^{oo} = \frac{p(\tau - E_e)}{R} R_{\tau p}$.

Moreover, we have $\frac{d\delta^{oo}}{dE_e} < 0$, (refer to the *Appendix* for derivation), indicating that in rich countries, improving local environmental awareness lowers the optimal value of TGR. This result is contrary to the finding in Model 1.

Corollary 2. *In rich countries, with all other things constant, the improvement of local environmental awareness (an increase in* ρ*) lowers the optimal value of TGR.*

3. Conclusion

This paper discusses the relationship between inbound tourism and pollution emission. The models suggest that higher TGR raises the relative price of the non-traded goods, thus encouraging production in the non-traded good sector. Therefore, if the non-traded good sector is polluting, increasing TGR engenders higher pollution levels. However, if the tradable good sector is polluting, TGR and pollution would be in a negative relationship. These two settings approximate the situations in poor and rich countries, respectively; the results in the models offer a possible explanation on the stylized facts in the introduction section. Furthermore, with different scenarios in terms of pollution tax rate, we conducted welfare analysis and proposed public strategy for tourism development in both developing and developed country cases. In particular, the scenario of weak (strong) pollution regulation best describes the poor (rich) countries, in which we derived the optimal TGR for the host economy for tourism development strategy. This optimal TGR rises (declines) as the environmental awareness of local residents increases in the poor (rich) countries.

The contributions of this paper are as follows. We first reveal the evolving pattern of TGR with both cross-sectional and time series data, and present two distinct relationships of TGR and pollution across selected Asian countries. In the model, we break down tourist spending into two components and focus on the effect of TGR on the host economy. Another factor affecting total tourism receipts is the scale of the local economy.

This approach acknowledges the possibility of public administration and planning for the tourism industry. We also propose the idea of "optimal TGR" for public strategy under certain conditions. To the best of the author's knowledge, this is the first attempt at proposing such a strategy. With increasing environmental awareness of residents, we provide forthcoming changes in optimal TGR. Hence, in our paper, the development of inbound tourism does not depend entirely on tourists, but is closely related to the local economy, that is, its scale, development level, and public policies. The latter two affects TGR in that the host economy would be much more positive and active in industry planning and tourism administration compared with the situation reflected in conventional models. Therefore, the models proposed in this paper are more encouraging to the economies where tourism is a vital industry.

However, this paper has certain limitations that future research can address. First, because of data availability, the sample size used to reveal the stylized facts is small. The periods included in the time series data are somewhat short, making it difficult to conduct an accurate statistical test to determine the relationship between TGR and pollution. In future research, more data should be collected to adequately test the relationship between the two. Second, the assumption of pollution emission from only one sector in each model is somewhat strong, but the real world has three sectors, namely, agriculture, manufacturing, and services in both poor and rich country settings. Poor countries also typically have manufacturing plants that emit pollutants. Therefore, future research could explain the stylized facts with a three-sector model and a more relaxed assumption on pollution emission. If all sectors have equal emission rates, i.e., the contraction or expansion of a single sector has no significant effect on total pollution emission, TGR change would not lead to a corresponding rise or drop in pollution. In this case, TGR and pollution will appear to be irrelevant. This might explain the case of Singapore (*Figure 13, Appendix*). Third, the pollution tax in the model is a given parameter. Future research may relax this assumption and provide a joint optimum combination of pollution tax rate and TGR, which might yield more practical implications. Fourth, future research could consider trans-boundary effect of pollution and international coordination of pollution regulation. In the case of severe trans-boundary pollution, pollution emission in the host country can be regarded as exogenous, given by the outside world. Domestic pollution tax and TGR manipulation would be ineffective for pollution control. In such condition, only the terms-of-trade effect exists ($\frac{de}{d\delta}$ is zero); thus, increasing TGR would always be welfare-improving. Hong Kong, for example, is a sufferer of trans-boundary pollution from Mainland China, and SITEs, are victims of global warming. Last, the model provides a unidirectional relationship from tourism to environment. However, it is also possible that the environmental condition of the host economy will in turn affect tourism. To elaborate on this point, "endogenous tourism" could be used because it states that tourist spending depends on reservation utility. If there is no information asymmetry and environmental degradation decreases tourists' willingness to travel to a particular tourist destination, then there might be bidirectional causality between tourism and environment. However, addressing this issue is difficult because least one exogenous variable is needed in the comparative analysis.

In a broader sense, environment issues may not be limited to physical pollution, but could also include cultural environment degradation because culture is an import tourism resource of the host economy. Examining cultural issues is relevant in tourism economics, especially because globalization has become inevitable. This area is also a promising direction of future research.

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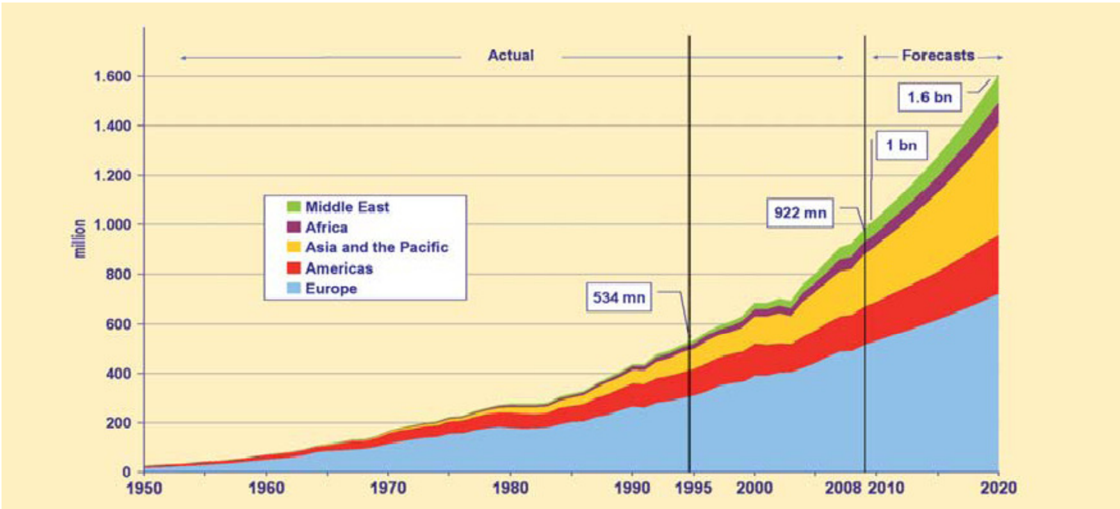
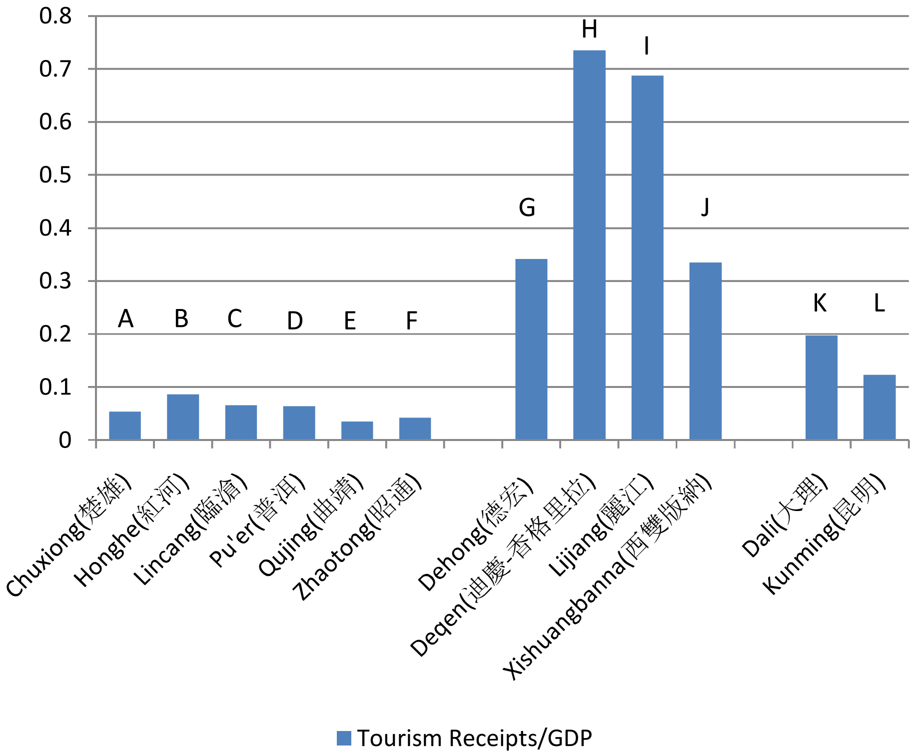
Appendix I (Figures)

Figure 1. International Tourist Arrivals, 1950-2020



Source: Copied from World Tourism Organization, *"Tourism Highlights", 2009 Edition*

Figure 2. Tourism Receipts-GDP Ratio of Different Cities and Prefectures in Yunnan, China (2008)



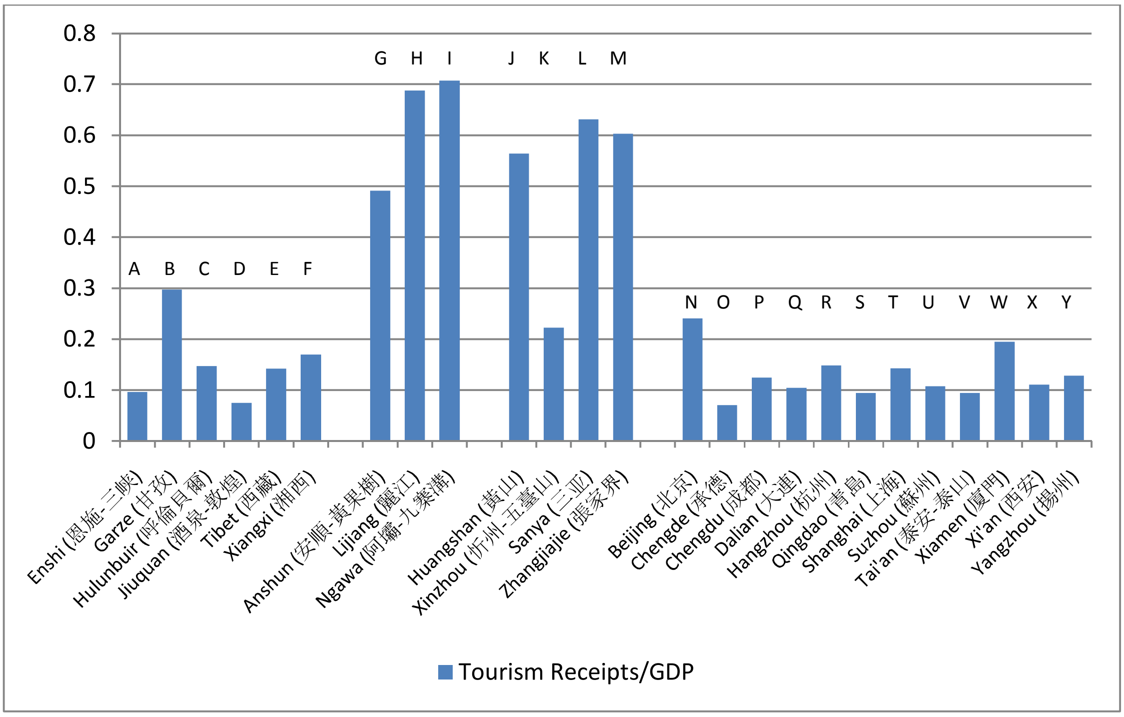
Source: *the Statistical Bulletins of National Economic and Social Development, TJCN.org*

A-F: Least Developed Cities and Prefectures;

G-J: Fast Developing Tourist Destinations;

K-L: Most Developed Cities (Current and Old Capital Cities)

Figure 3. Tourism Receipts-GDP Ratio of Different Tourist Regions China (2008)



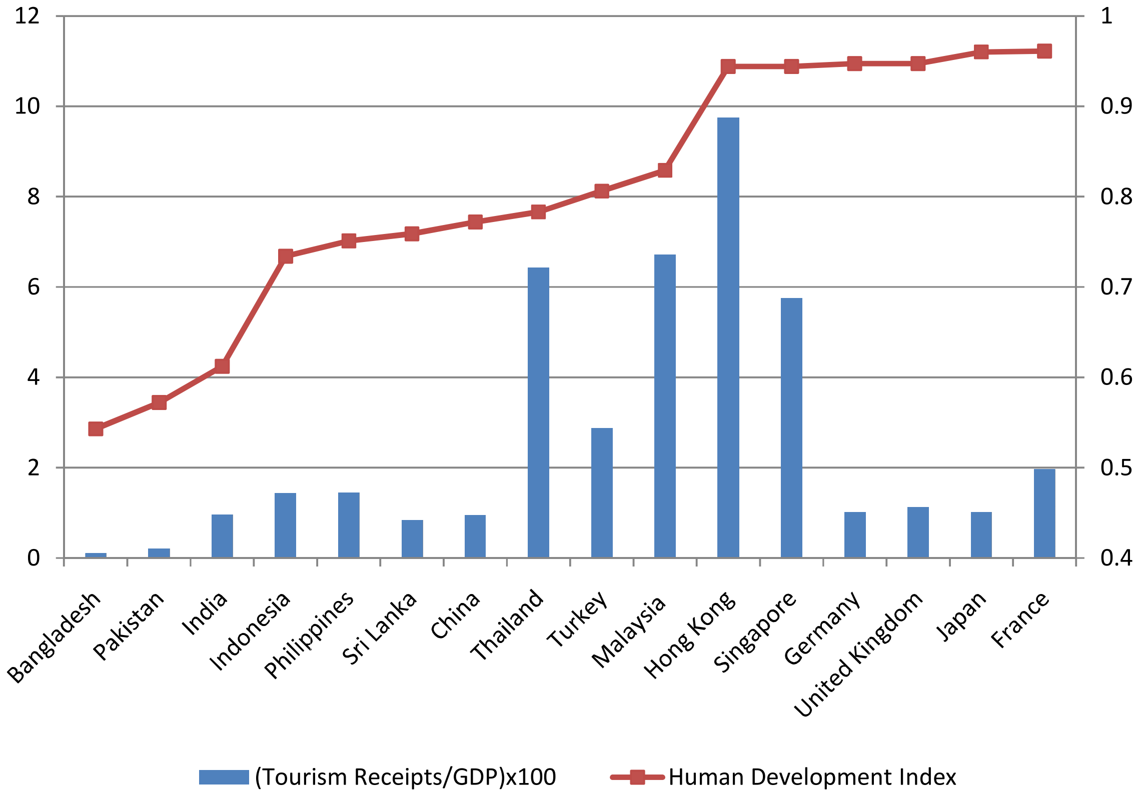
Source: *the Statistical Bulletins of National Economic and Social Development, TJCN.org*

A-I: Tourist Regions in West China (Areas included in China's Western Development Program);

J-M: Tourist Regions in Middle China and Outlaid Island;

N-Y: Urban Tourist Regions (P and X are in West China; others are in East China)

Figure 4. Tourism Receipts-GDP Ratio and Human Development Index across Countries (2008)



Source: *CEIC Global Database; Annual Report of United Nations Development Program*

Note: 1. Data of Human Development Index is of the year 2007;

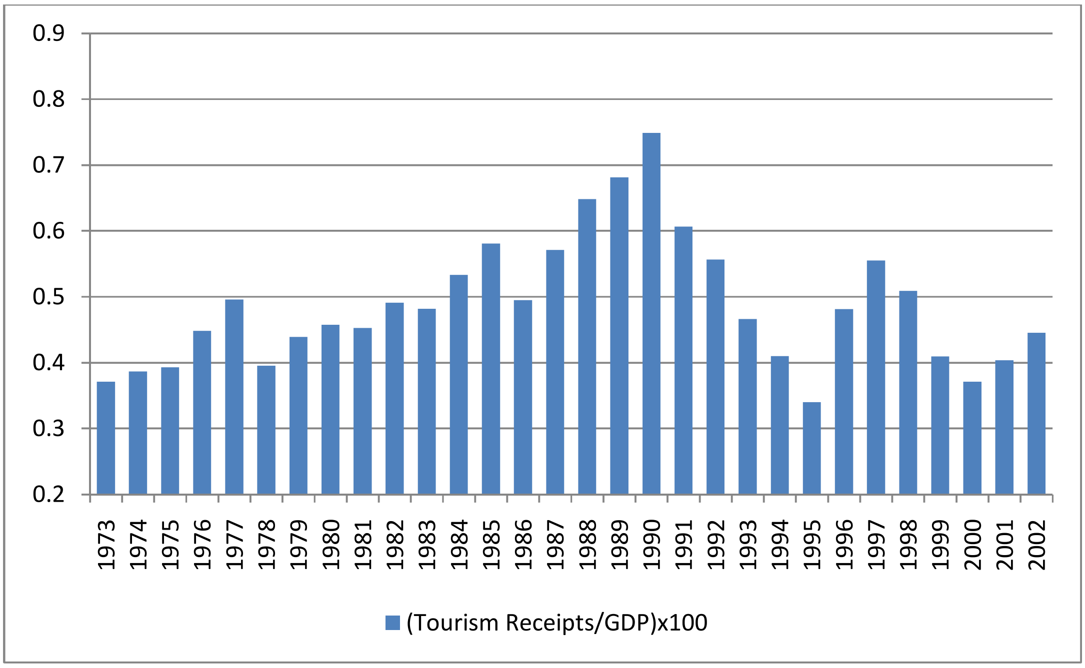
2. Year of Tourism receipts - GDP ratio data, if not 2008, are listed as follows:
Pakistan (2006), Thailand (2007), France (2005), Japan (2003).

3. Except for United Kingdom, the tourism receipts of each country includes international (non-resident) tourism only. United Kingdom's tourism receipts number includes both resident and non-resident tourism. For China, visitors from Hong Kong, Macau and Taiwan are regarded as non-residents.

Figure 5. Dynamics of Tourism receipts-GDP Ratio

Japan

(1973-2002)

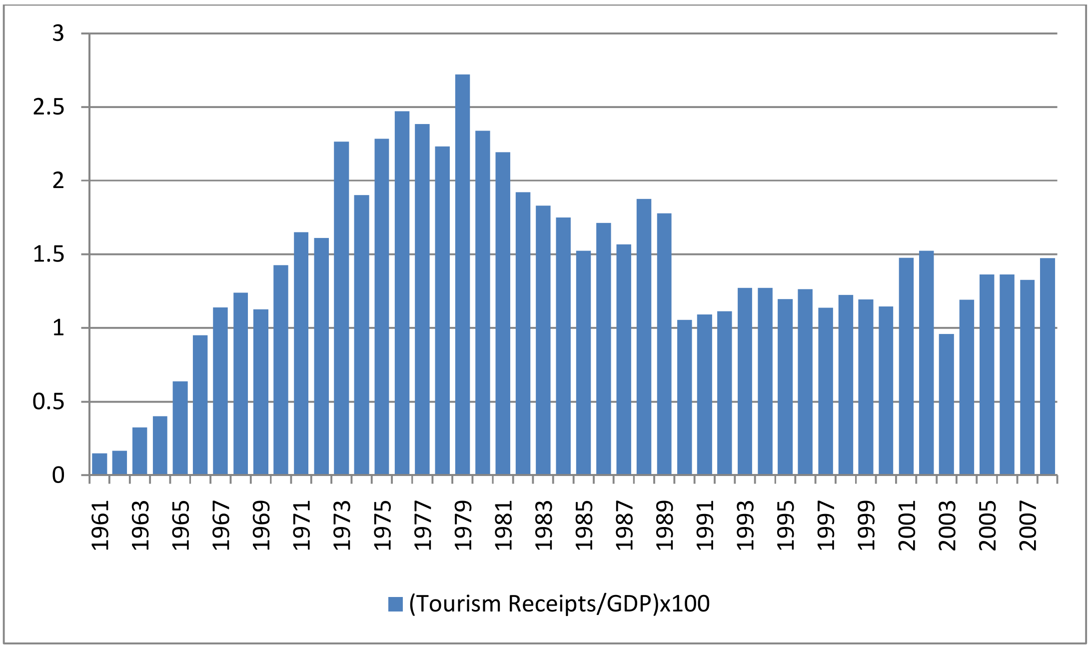


Source: *CEIC Global Database*

Figure 6. Dynamics of Tourism receipts-GDP Ratio

Taiwan

(1961-2008)

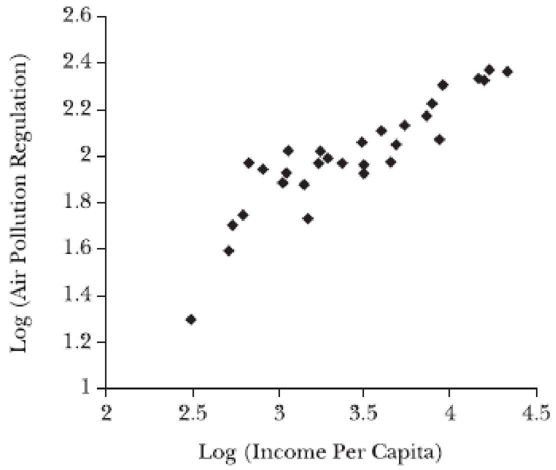


Source: *CEIC Global Database*

Figure 7. Pollution Regulation and Development Level

Figure 2

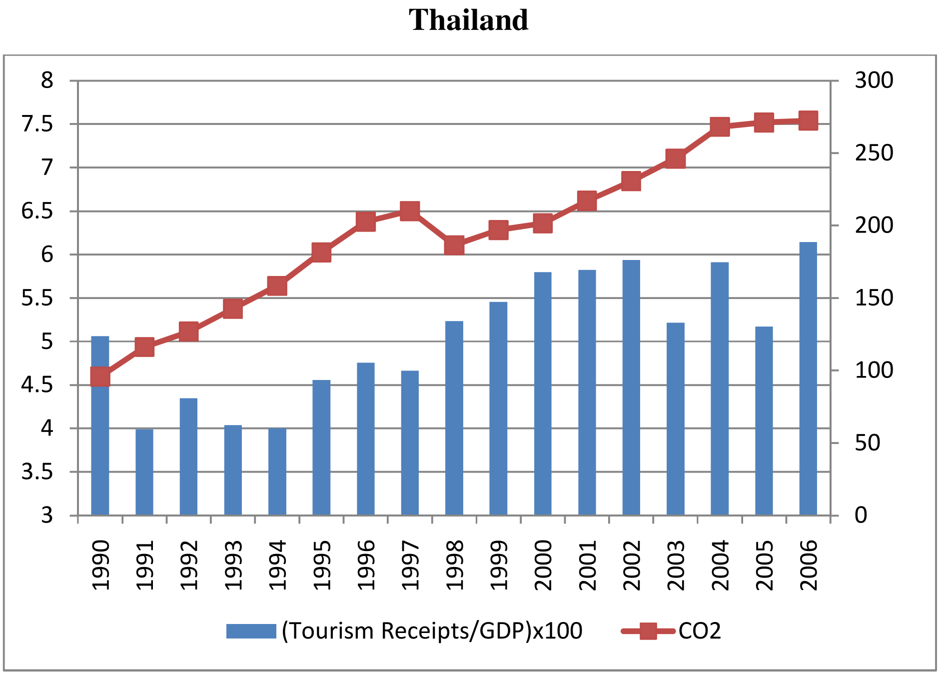
Air Pollution Regulation and Income Per Capita in 31 Countries



Source: Dasgupta, Mody, Roy and Wheeler (2001).

Source: Copied from *Dasgupta, Laplante, Wang and Wheeler (2002)*

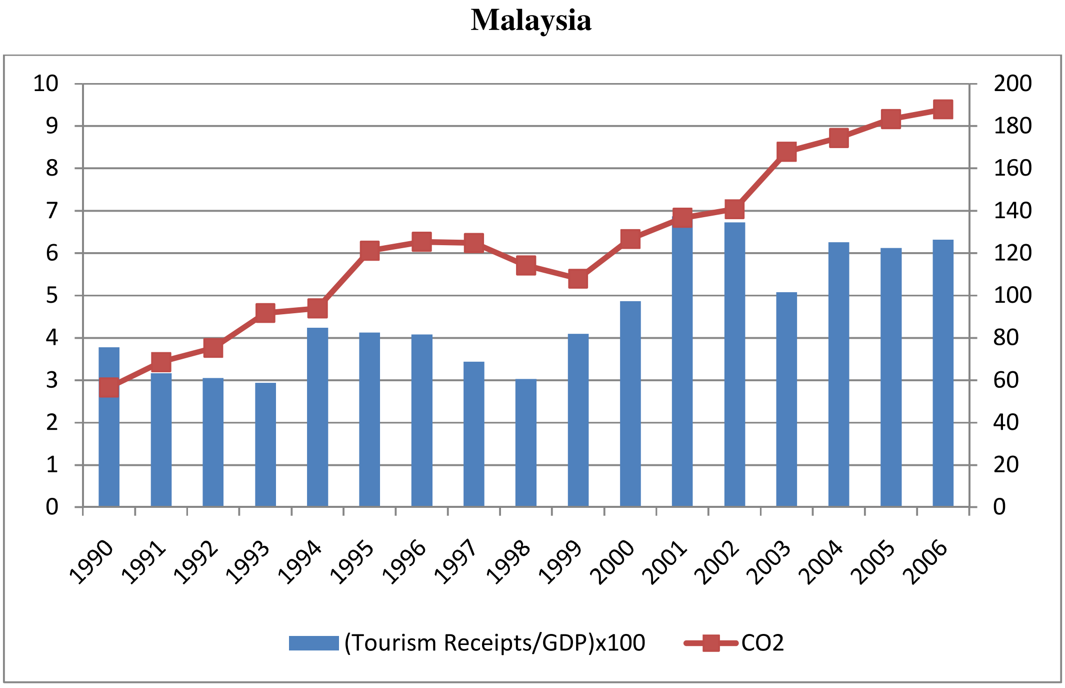
Figure 8. Dynamics of TGR and Pollution (1)



Unit of CO_2: Million Metric Tons

Source: *CEIC Global Database; Carbon Dioxide Information Analysis Center*

Figure 9. Dynamics of TGR and Pollution (2)

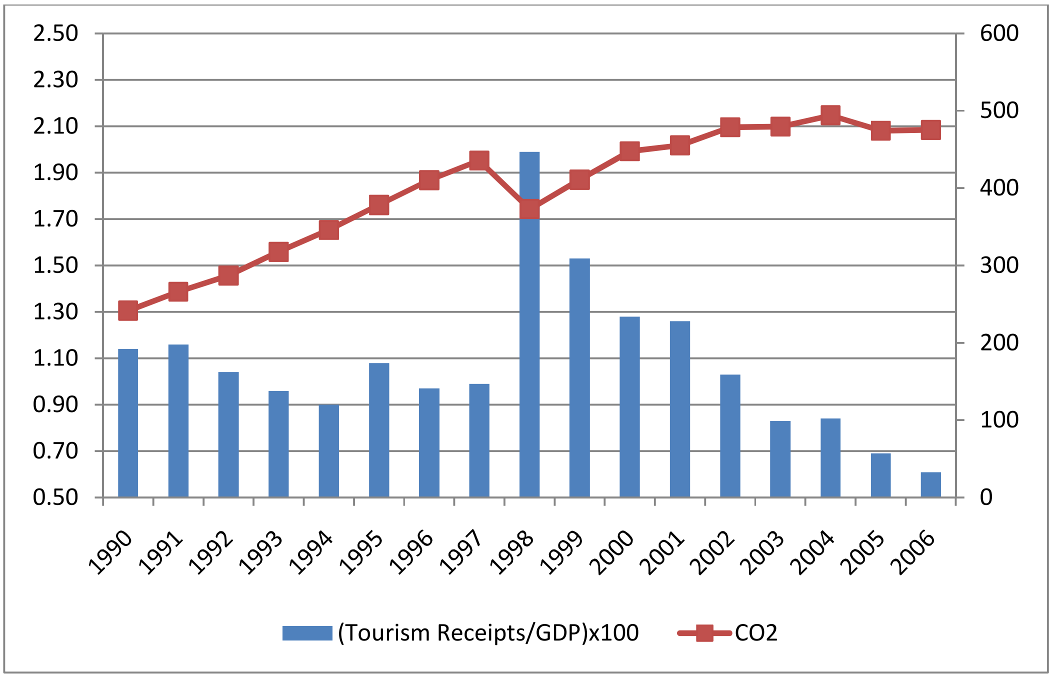


Unit of CO_2: Million Metric Tons

Source: *CEIC Global Database; Carbon Dioxide Information Analysis Center*

Figure 10. Dynamics of TGR and Pollution (3)

Korea, Republic of



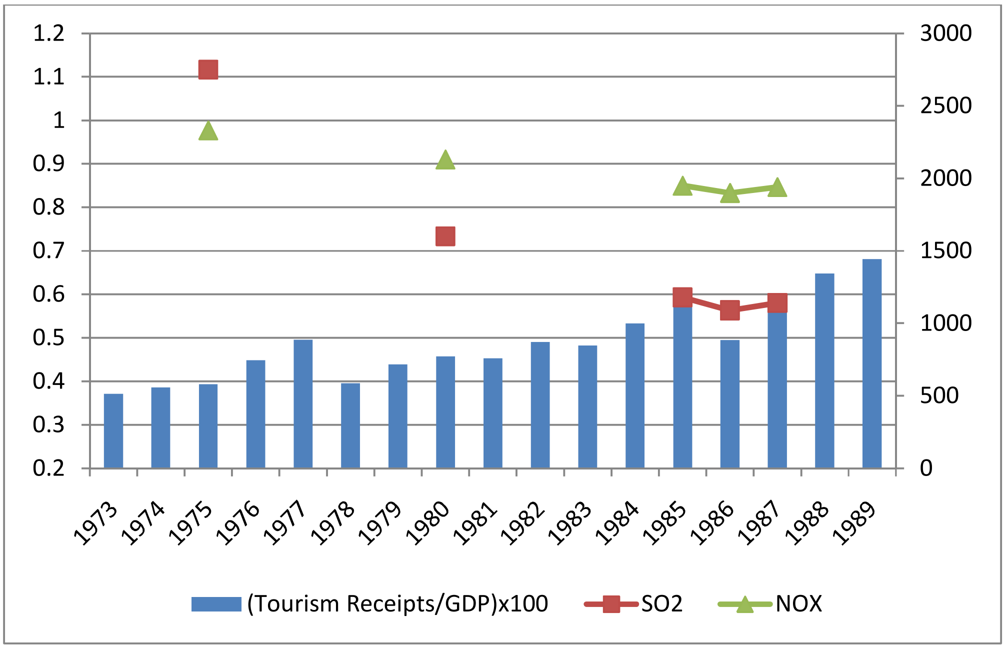
Unit of CO_2: Million Metric Tons

Source: *CEIC Global Database; Carbon Dioxide Information Analysis Center*

Figure 11. Dynamics of TGR and Pollution (4)

Japan

(1973-1989)



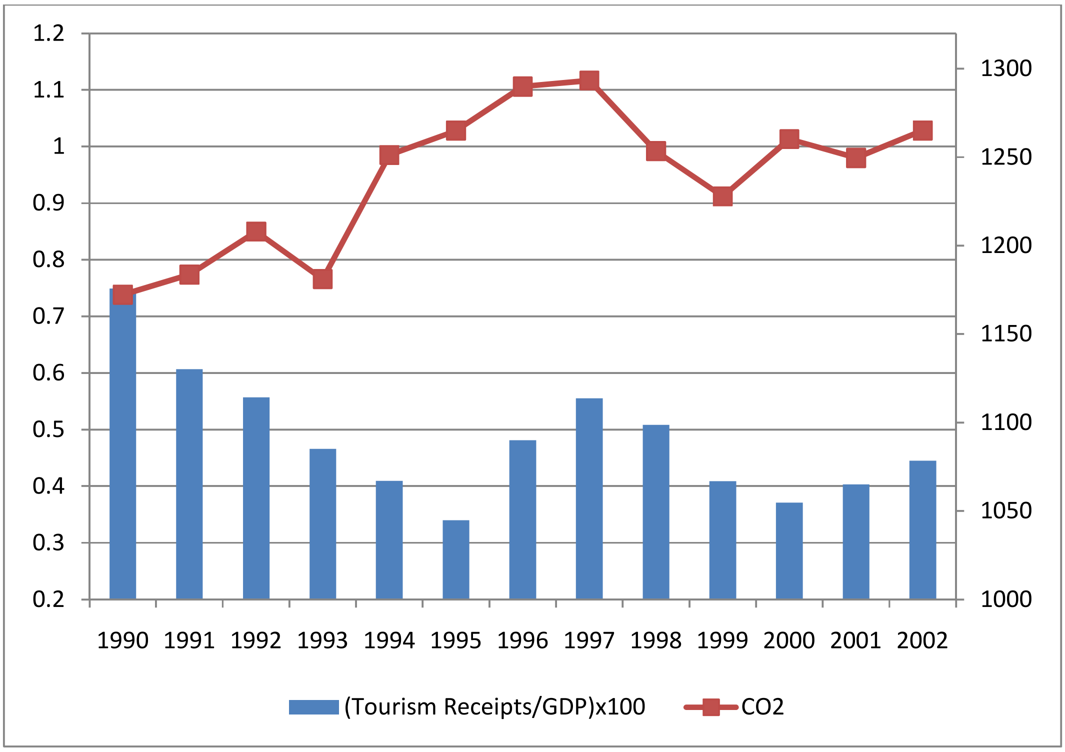
Unit of SO_2 and NO_X: Thousand Ton

Source: *CEIC Global Database; Kato and Akimoto (1992)*

Figure 12. Dynamics of TGR and Pollution (5)

Japan

(1990-2002)



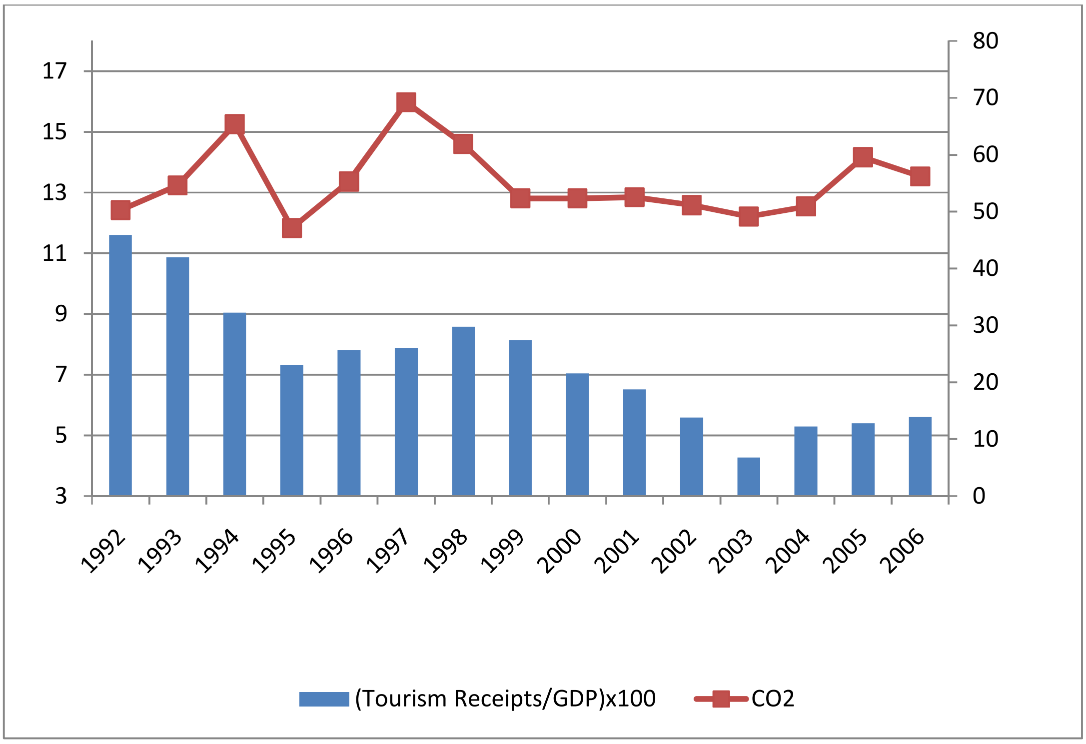
Unit of CO_2: Million Metric Tons

Source: *CEIC Global Database; Carbon Dioxide Information Analysis Center*

Figure 13. Dynamics of TGR and Pollution (6)

Singapore

(1990-2006)



Unit of CO_2: Million Metric Tons

Source: *CEIC Global Database; Carbon Dioxide Information Analysis Center*

Appendix II (Derivations)

1. Derivation of $\partial \mathbf{p}/\partial \delta$

First we have these three equations

$$E_{pu}du = \left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2}\right)dp - \frac{R}{p}d\delta - E_{pe}de$$

$$E_u du = D_Y dp + (\tau - E_e)de$$

$$de = -R_{\tau p}dp$$

Substituting $de = -R_{\tau p}dp$ into the other two equations gives

$$E_{pu}du = \left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2} + E_{pe}R_{\tau p}\right)dp - \frac{R}{p}d\delta$$

$$E_u du = [D_Y + (E_e - \tau)R_{\tau p}]dp$$

Multiply each side of the two equations by E_u and E_{pu} , respectively, and combine them:

$$E_{pu}\big[D_Y + (E_e - \tau)R_{\tau p}\big]dp = E_u\left(R_{pp} - E_{pp} - \frac{\delta}{p}R_p + \frac{\delta R}{p^2} + E_{pe}R_{\tau p}\right)dp - E_u\frac{R}{p}d\delta$$

Then we have

$$dp = -E_u\frac{R/p}{H}d\delta$$

where $H = E_u\left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe}R_{\tau p}\right) + E_{pu}[D_Y + (E_e - \tau)R_{\tau p}]$

2. Derivation of $\partial Q/\partial p$

The definition of the excess demand Q gives

$$Q = E_p(p,e,u) + D_Y(p,T) - R_p(p,\tau)$$

Fixing T and τ, total differentiation of the above equation yields

$$dQ = \left(E_{pp} + \frac{\partial D_Y}{\partial p} - R_{pp}\right)dp + E_{pu}du + E_{pe}de$$

Using the relationships of

$$E_u du = D_Y dp + (\tau - E_e)de$$

$$de = -R_{\tau p}dp$$

We obtain

$$E_{pu}du = \frac{E_{pu}}{E_u}E_u du = \frac{E_{pu}}{E_u}[D_Y + (E_e - \tau)R_{\tau p}]dp$$

Substituting this equation into $dQ = (E_{pp} + \frac{\partial D_Y}{\partial p} - R_{pp})dp + E_{pu}du + E_{pe}de$, we get

$$dQ = \left(E_{pp} + \frac{\partial D_Y}{\partial p} - R_{pp}\right)dp + \frac{E_{pu}}{E_u}\left[D_Y + (E_e - \tau)R_{\tau p}\right]dp - E_{pe}R_{\tau p}dp$$

Since $\frac{\partial D_Y}{\partial p} = \frac{\delta}{p}R_p - \frac{\delta R}{p^2}$ from the tourist budget constraint, we further have

$$dQ = \left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp}\right)dp + \frac{E_{pu}}{E_u}\left[D_Y + (E_e - \tau)R_{\tau p}\right]dp - E_{pe}R_{\tau p}dp$$

Thus the relationship of $\partial Q/\partial p$ is expressed as

$$\partial Q/\partial p = \left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe}R_{\tau p}\right) + \frac{E_{pu}}{E_u}\left[D_Y + (E_e - \tau)R_{\tau p}\right]$$

$= E_u/H$

where $H = E_u\left(E_{pp} + \frac{\delta}{p}R_p - \frac{\delta R}{p^2} - R_{pp} - E_{pe}R_{\tau p}\right) + E_{pu}[D_Y + (E_e - \tau)R_{\tau p}]$

3. Derivation of $d\delta^o/dE_e$

We first have

$$\delta^o = \frac{p(\tau - E_e)}{R}R_{\tau p} = \frac{p\tau}{R}R_{\tau p} - \frac{pE_e}{R}R_{\tau p}$$

Then $\frac{d\delta^o}{dE_e} = -\frac{pR_{\tau p}}{R}$

Since in the poor country case, $R_{\tau p} < 0$, thus, the sign of the above equation's RHS is positive, yielding $\frac{d\delta^o}{dE_e} > 0$

4. Derivation of $d\delta^{oo}/dE_e$

Similarly, we have

$$\delta^{oo} = \frac{p(\tau - E_e)}{R}R_{\tau p} = \frac{p\tau}{R}R_{\tau p} - \frac{pE_e}{R}R_{\tau p}$$

and thus, $\frac{d\delta^{oo}}{dE_e} = -\frac{pR_{\tau p}}{R}$

In the rich country case, we have $R_{\tau p} > 0$. Therefore, the sign of the above equation's RHS is negative, meaning $\frac{d\delta^{oo}}{dE_e} < 0$