Tourism Taxation: A Theoretical and Empirical Investigation

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ABSTRACT

This paper gives a theoretical an empirical analysis of the efficiency and equity effects of tourism taxation. The theoretical framework follows the Ramsey model, which is extended to include tourism in order to investigate tourism taxation. Then a single country static computable general equilibrium (CGE) model for Mauritius is used to empirically analyse the efficiency and equity effects of tourism taxation.

Tourism taxation is interesting for CGE model because of the unique traits of the tourism sector for tax purposes since tourism goods are consumed by both tourists and domestic residents. Also, tourism export has an imperfectly elastic demand even for small country because tourism goods are differentiated across countries. Tourism demand is also a 2 stage demand: micro and macro demand. A change in price of a good affects its tourism demand via both the income and substitution effects (micro) and tourist arrivals (macro).

Both analyses confirm that taxing tourism is more efficient than other sectors, and has positive equity effects.

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1. INTRODUCTION

This paper aims to analyse the economic theory behind tourism taxation, which can help to further understanding of the mechanism of tourism taxation, and to determine the factors influencing the outcomes of tourism taxation. More specifically, we analyse the efficiency and equity effects of tourism taxes, both theoretically and empirically. The theoretical framework follows the Ramsey model of optimal commodity taxation, which is extended to include tourism. Subsequently, a single country static computable general equilibrium (CGE) model for Mauritius is used to empirically investigate the efficiency and equity effects of tourism taxation.

Generating tax revenue from tourism is becoming increasingly popular in several countries given that tourism is growing as a major source of economic development, and taxing tourism is relatively less politically conflicting since tourists are not taxpayers. The increasing importance of tourism taxation requires tourism policies to be consistent with macroeconomic policies of the economy such as efficient revenue generation and income distribution. This paper attempts to identify the properties of tourism taxes using the Ramsey model and uses the CGE model to prove these features.

There are very few theoretical studies on tourism taxation including studies by Bird (1992), Forsyth and Dwyer (2002), and Clarke and Ng (1993). Both Forsyth and Dwyer (2002) and Bird (1992) papers are without a formal model, but provide very important insights about the concept of tourism taxation. Forsyth and Dwyer (2002) show how countries can use market power to extract maximum rent from tourism, while Bird (1992) describes the economic constraints to design optimal tourism taxation and reviews the fiscal instruments used by developing countries for tourism taxation. Clarke and Ng (1993) provides a formal model to depict the relationship between tourism taxation and welfare. The main formal analysis of tourism are by Copeland (1991) and Chen and Devereux (1999). However, the main focus of these papers is on the expansion of the tourism sector. Copeland finds that tourism expansion is more beneficial in the presence of domestic tourism taxes, while Chen and Devereux argue that tourism expansion is more beneficial under an import tariff and export subsidy regime. Most of the empirical economic researches on tourism taxation have been developed under partial equilibrium framework, analysing the incidence of the tax and the effects on tourism demand.[1] Exceptions are Blake (2000) and Jensen and Wanhill (2002) which investigates the effects of tourism taxes under a general equilibrium framework using Computable General Equilibrium (CGE) and input-output analysis, respectively.

The paper is organised as follows. The next section describes the extended Ramsey model which is the theoretical framework to analyse the efficiency and equity effects of tourism taxation. Section 3 reviews the structure of the Mauritian CGE model, which is used to estimate the relative efficiency and equity effects of tourism taxation. The specification of the tourism sector is also spelled out. The empirical evidence is given in section 4, while section 5 offers some concluding comments.

2. THEORETICAL MODEL

This section reviews the theoretical model used to analyse tourism taxation using the Ramsey model of optimal taxation. The efficiency effect of tourism taxation is first analysed, and the model is subsequently extended to investigate the redistributive effect. Full details of the model are given in Gooroochurn (2003a).

2.1 Efficiency Effect

The model follows the basic Ramsey model, as developed by Diamond and Mirrlees (1971a,b), which find the optimal tax rate by maximising the social utility function subject to a given level of tax revenue. It is assumed that there is a single representative domestic consumer and a single representative tourist[2] each with income level given as y^D and y^T respectively, and facing a vector of consumer prices $\boldsymbol{p} = (p_0, p_1, p_2, \ldots, p_N)$ for the $N+1$ commodities $(0, 1, 2, \ldots, N)$. Tax rates and demand for each commodity are given by the vectors $\boldsymbol{t} = (t_0, t_1, t_2, \ldots, t_N)$ and $\boldsymbol{x} = (x_0, x_1, x_2, \ldots, x_N)$, respectively. Tourism services are included among the $N+1$ commodities, and demand for each commodity (x_i) is decomposed into a domestic demand component $\left(x_i^D\right)$ and tourism demand component $\left(x_i^T\right)$ in the following fashion:

$$
\begin{aligned}
x_i &= x_i^D + x_i^T \\
x_i^T &= \psi_i \, x_i \qquad\qquad (1) \\
x_i^D &= (1-\psi_i)\, x_i
\end{aligned}
$$

[1] See Bonham et al. (1992) and Fujii et al. (1985) for examples.

where ψ_i is the proportion of tourism demand in total demand for each commodity i, and is given as

$$\psi_i = \frac{x_i^T}{x_i^T + x_i^D} \qquad (2)$$

From construction, ψ_i is therefore endogenous in the model since its value changes when price changes. A change in price will affect domestic demand and tourism demand differently since local residents and tourists have different preferences and income levels, and with x_i^D and x_i^T changing differently, ψ_i will change. ψ_i is also a function of the proportion of tourists to domestic population, denoted as Ω. With fixed domestic population, Ω is a function of tourist arrivals, which is also determined by price (and tax rate). It is therefore important to endogenise tourist arrivals in the model and this is done by expressing ψ_i as follows

$$\psi_i = f\left[p_i, \Omega(p_i)\right] \qquad (3)$$

Endogenising tourist arrivals is also capturing the effect of taxation on the international competitiveness of a destination. An increase in tourism taxes will increase price and hence make a destination less competitive in the international market.

In the formulation of ψ_i given by equation (3), we are decomposing tourism demand into two parts: micro tourism demand and macro tourism demand. The micro tourism demand is captured by price (p_i), and measures the substitution and income effects in the same fashion as the Slutsky equation. For a change in price, demand changes under the assumption that the representative tourist is already at the destination. The macro tourism demand measures tourism demand at an international level as is captured by tourist arrivals. Changes in price of goods and services will affect the number of tourists visiting the destination, which will in turn affect the demand of tourism related products. This is captured by the term $\Omega(p_i)$.

Totally differentiating equation (3) with respect to p_i, and after some manipulation, the following expression for the price elasticity of ψ_i can be obtained.

$$\varepsilon_i^{\psi} = \left(1 - \psi_i\right)\left[\left(\varepsilon_i^{x^T(\Omega)} \varepsilon_i^{\Omega(p_i)} + \varepsilon_i^T\right) - \varepsilon_i^D\right] \qquad (4)$$

[2] Note that we are referring to international tourists rather than domestic tourists. Domestic tourists are treated as local residents.

The term $\left(\varepsilon_i^{x^T(\Omega)}\varepsilon_i^{\Omega(p_i)}+\varepsilon_i^T\right)$ represents the total price elasticity of tourism demand. ε_i^T is the price elasticity of micro tourism demand and $\left(\varepsilon_i^{x^T(\Omega)}\varepsilon_i^{\Omega(p_i)}\right)$ is the price elasticity of macro tourism demand. The first element of the latter term $\left(\varepsilon_i^{\Omega(p_i)}\right)$ shows the price elasticity of tourist arrivals, that is how a change in price changes tourist arrivals. The term $\varepsilon_i^{x^T(\Omega)}$ shows the responsiveness of changes in tourism demand due to changes in tourist arrivals (which change Ω). Therefore, total tourism demand elasticity shows the extent that changes in price affect tourism demand directly and indirectly via change in tourist arrivals.

Since we are interested in domestic welfare, the social welfare function includes the indirect utility function of only local residents given as $V(p,y^D)$. The maximand of the optimal taxation problem can written as

$$\underset{p}{Max}\left[\underset{x_i^D}{Max}\ U(x_i^D)\text{ subject to } px_i^D=y^D\right] \tag{5}$$

Using equation (2), the tax revenue constraint can be expressed as

$$R(t)=\sum_{i=0}^{N}t_i\left(\frac{x_i^D}{1-\psi_i}\right)\geq\overline{R}\qquad\text{for}\quad\psi_i\neq1 \tag{6}$$

Maximising the social welfare function subject to the above revenue constraint gives the following first order condition

$$\frac{\partial V}{\partial p_i}+\tilde{\eta}\left(x_i+\sum_i t_i\frac{1}{(1-\psi_i)}\frac{\partial x_i^D}{\partial p_i}+\sum_i t_i\frac{x_i^D}{(1-\psi_i)^2}\frac{d\psi_i}{dp_i}\right)=0 \tag{7}$$

where $\tilde{\eta}$ is the Langrange multiplier. Using the Slutsky equation, equation (7) can be rearranged in elasticity terms as follows:

$$\frac{1}{(1-\psi_i)}\frac{t_i}{p_i}\varepsilon_{ii}^D+\frac{\psi_i}{(1-\psi_i)}\frac{t_i}{p_i}\varepsilon_{ii}^{\psi}=\frac{\tilde{\beta}}{\Delta} \tag{8}$$

and substituting (4) into (8), we have

$$\frac{t_i}{p_i}=\frac{\tilde{\beta}}{\Delta}\left[\frac{1}{\left[(1-\psi_i)\varepsilon_{ii}^D+\psi_i\left(\varepsilon_i^{\Omega p_i}\varepsilon_i^{x^T\Omega}+\varepsilon_i^T\right)\right]}\right] \tag{9}$$

where ε_{ii} is the own price elasticity of demand for good i and Δ is the determinant of the Slutsky matrix. $\tilde{\beta}$ is given as

$$\tilde{\beta} = \frac{\frac{1}{(1-\psi_i)}\tilde{\eta} - \tilde{\alpha}}{\tilde{\eta}} \tag{10}$$

where

$$\tilde{\alpha} = \gamma + \tilde{\eta}\sum_i t_i \frac{\partial x_i^D}{\partial y^D} + \tilde{\eta}\sum_i t_i \frac{\partial x_i^T}{\partial y^T}\left(\frac{\psi_i}{1-\psi_i}\right) \tag{11}$$

$\tilde{\alpha}$ is referred to as the social marginal utility of income, while γ is the consumer's marginal utility of income.

As illustrated in Atkinson and Stiglitz (1980: 373-375), the marginal excess burden of an indirect tax is given by $(\tilde{\eta} - \tilde{\alpha})$. Without tourists, $\tilde{\alpha}$ is given as in equation (11) but without the term $\tilde{\eta}\sum_i t_i \frac{\partial x_i^T}{\partial y^T}\left(\frac{\psi_i}{1-\psi_i}\right)$ and has hence a lower value than in the case with tourists. $\tilde{\eta}$ is the shadow cost in terms of utility of raising an additional dollar of revenue. To obtain $\tilde{\eta}$, we differentiate the Lagrangean function with respect to $\tilde{\eta}$ which gives the revenue constraint given by equation (6) itself. We then substitute it in the first order condition, equation (7), and for solve $\tilde{\eta}$ as follows:

$$\tilde{\eta} = \frac{\gamma x_i^D}{R\sum_i \frac{1}{(x_i^D + x_i^T)}\left(\frac{\partial x_i^D}{\partial p_i} + \frac{\partial x_i^T}{\partial p_i}\right) + x_i^D + x_i^T} \tag{12}$$

The value of $\tilde{\eta}$ without tourists can be derived as

$$\eta = \frac{\gamma x_i^D}{R\sum_i \frac{1}{x_i^D}\left(\frac{\partial x_i^D}{\partial p_i}\right) + x_i^D} \tag{13}$$

Although the domestic consumer surplus effect (the numerator) of the tax is the same in both cases, the revenue effect (the denominator) is higher in the presence of tourist [equation (12)] than without tourists [equation (13)]. This results to a lower value of $\tilde{\eta}$ in the former case. With a lower shadow cost $(\tilde{\eta})$ and a higher social marginal utility of income $(\tilde{\alpha})$ the excess burden of taxation in the presence of tourists is potentially smaller than without tourists. The underlying reason is that taxation in the presence of tourists increases tax revenue without any corresponding decrease in social welfare since it is assumed that tourist's welfare does not enter the social welfare function. Therefore, taxing tourism related sectors is relatively more efficient and the efficiency is higher the higher the proportion of tourism demand in aggregate demand.

The celebrated inverse elasticity Ramsey rule calls for a higher proportional tax on goods with relatively low own price elasticity of demand. In other words, for a given tax rate, commodity with a lower price elasticity of demand is more efficient. The price elasticity of demand, given by the square bracketed term of the denominator in equation (9), is a weighted average of the price elasticity values of domestic demand and total tourism demand. Without tourists, price elasticity of demand is equal to ε_{ii}^{D}. Therefore, the price elasticity of demand with tourists is less (i.e. more inelastic) than without tourists only if total tourism demand is more inelastic than domestic demand. In such a case, the optimal taxation rule posits that in order to maximise welfare, some commodities will require a higher tax rate in the presence of tourists than without tourists. Looking at it from another perspective, it also means that taxing those commodities at a higher rate has more favourable welfare effects in the presence of tourists than without.

2.2 Redistributive Effect

In several countries where tax revenue consists mostly of indirect taxes, sales tax (or VAT) is mostly used as mechanism to redistribute income. Diamond and Mirrlees (1971a,b) extend the basic Ramsey model to many consumers to investigate the redistributive effects of indirect taxation, and we apply this model to analyse the redistributive effect of tourism taxation. The model is similar to the previous one, but it is assumed that the social welfare function consists of utilities of several household groups, differentiated according to income level. It is assume that there are H domestic household groups and the social welfare function is expressed as follows

$$W = W[V^1(p,y^1),\ V^2(p,y^2),\ \ldots,\ V^H(p,y^H)] \tag{14}$$

where $V^h(p,y^h)$ and y^h are the indirect utility function and the income level of household group h, respectively. Maximising equation (14) subject to the realisation of a given level of tax revenue generates the following Lagrangean function

$$L = W\left[V^1\left(p,y^1\right),V^2\left(p,y^2\right),\ldots,V^H\left(p,y^H\right)\right] + \eta\left[\sum_{i=1}^{n} t_i\left\{\sum_{h=1}^{H} x_i^h\right\} + \sum_i t_i x_i^T - \overline{R}\right] \tag{15}$$

where x_i^h is the consumption of commodity i by household h. This yields the following $N+1$ first order conditions for optimal commodity taxes

$$-\sum_h W_h \gamma^h x_i^h + \eta\left[x_i^D + x_i^T + \sum_i t_i \sum_h \frac{\partial x_i^h}{\partial p_i} + \sum_i t_i \frac{\partial x_i^T}{\partial p_i}\right] = 0 \tag{16}$$

where $W_h = {\partial W}/{\partial V^h}$, $\gamma^h = {dV^h}/{dy^h}$ and $x_i^D = \sum_h x_i^h$.

Using the Slutsky equation, the first order condition can be expressed in the following elasticity form:

$$\frac{t_i}{p_i} = \frac{\tilde{\beta}}{\Delta}\frac{1}{\left[(1-\psi_i)\bar{\varepsilon}_{ii}^D + \psi_i \bar{\varepsilon}_{ii}^T\right]} \tag{17}$$

where $\bar{\varepsilon}_{ii}^D$ is a average of the price elasticity of domestic demand of each household group weighted by the proportion of each household's demand in total domestic demand. Following equation (4), tourism demand price elasticity $\left(\bar{\varepsilon}_{ii}^T\right)$ is given as $\varepsilon_k^{x^T(\Omega)}\varepsilon_k^{\Omega(p_k)} + \varepsilon_k^T$. $\tilde{\beta}$ is defined as in equation (10). Denoting the total price elasticity of demand as $\bar{\varepsilon}_{ii}$ $\left(= [1-\psi_i]\bar{\varepsilon}_{ii}^D + \psi_i \bar{\varepsilon}_{ii}^T\right)$, and assuming two goods (*j* and *k*) such that the cross-elasticities between the commodities are zero, i.e., $s_{jk} = 0$ $(j \neq k)$, equation (17) can be expressed as

$$\frac{\tau_j}{\tau_k} = \frac{\varepsilon_{kk}}{\varepsilon_{jj}}\left[\frac{\eta - (1-\psi_j)\bar{\alpha}_j}{\eta - (1-\psi_k)\bar{\alpha}_k}\right] \tag{18}$$

where $\tau_i = \dfrac{t_i}{p_i}$.

It can be seen that the inverse elasticity rule of Ramsey still holds (low ε_{jj} implies high τ_j), but it is modified by the inclusion of the term $\bar{\alpha}_i$ which captures the distributional effects. Consider the following formulation of $\bar{\alpha}_i$ from Feldstein (1972).

$$\bar{\alpha}_i = \operatorname{cov}\left[\left({x_i^h}/{x_i}\right), \alpha^h\right] + \frac{1}{H}\sum_h \alpha^h \tag{19}$$

$\bar{\alpha}_i$ is directly related with α^h (social marginal utility of household *h*) and with the covariance between ${x_i^h}/{x_i}$ and α^h. Feldstein argue that a low covariance means that the commodity is a luxury good. This is because budget shares $\left({x_i^h}/{x_i}\right)$ of such commodities are expected to rise with income and therefore fall with marginal utility of income since the latter is inversely related with income. Moreover, since social marginal utility of income (α^h) is inversely related to income level, richer individuals tend to have a lower α^h, and hence a lower $\overline{\alpha}_i$.

Tourism commodities are usually classified not only as leisure goods, but also as luxury goods and hence we expect a low covariance between commodity share and marginal utility of income. Moreover, tourism commodities consumed by local residents are mostly by the relatively richer household groups with a low marginal utility of income. With a low α^h and a low $\mathrm{cov}\left[\left(x_i^h / x_i\right), \alpha^h\right]$ associated with tourism products, tourism related products call for a higher tax rate for income distribution motives. By the same token, it can be argued that taxing tourism related products tend to improve income distribution. The analysis therefore argues for higher tax rate on tourism products both because of the characteristics of the products and of the consumers (domestic). Since we are concerned with equity effects among domestic residents, the redistributive effect is larger the higher the proportion of domestic demand in total demand, that is, a higher $(1-\psi_i)$ as shown in equation (18). However, a higher proportion of domestic demand will reduce the positive efficiency arguments of taxing tourism discussed earlier. This is another form of the usual trade-off between the efficiency and equity objectives.

3. THE COMPUTABLE GENERAL EQUILIBRIUM MODEL

We use a single country static CGE model for Mauritius, with the conventional neo-classical assumptions following Dervis *et al*. (1982) and Robinson *et al*. (1999). The small open economy assumption is used and tourism is the only export sector for which world price is not fixed.

3.1 Model Overview

On the supply side, the model includes 17 sectors each consisting of profit maximizing firms with production functions in the form of a Leontief function of value added and intermediate inputs. The value-added component is a constant elasticity of substitution (CES) aggregate of labor and capital, each of which is homogeneous, mobile among sectors, internationally immobile and fixed in supply. Labor is further decomposed into the unskilled, semi-skilled and skilled categories, which are aggregated in a Cobb-Douglas (CD) fashion. Intermediate inputs, which are a CES composite of domestically produced and imported inputs following the Armington assumption, are aggregated in a Leontief function. Output of each sector is split between domestic sales and exports using a constant elasticity of transformation (CET) specification.

The demand side consists of the household sector, the government, tourism demand and investment demand. There are eight household groups in the model classified according to income level, and each household group maximizes utility in a multi-stage budget process. In the first CD nest, consumers decide on how to allocate expenditure across different sectors, while in the second Armington CES nest they decide on the mix between domestically produced and imported commodities. Investment demand is formulated in a similar fashion.

The model treats government consumption as a standard demand rather than as public goods.[3] Normally, an increase in taxation causing an increase in government revenue will increase government consumption which in turn will crowd out effect private consumption, resulting to a reduction in welfare of the household sectors in addition to the one caused by higher taxes. To avoid this effect, government consumption is fixed in the model and the budget is balanced using adjustment to transfer income. The dead weight loss of taxation is measured as the difference between the reduction in consumer surplus and the increase in government tax revenue. If the increase in government revenue is transferred to the household sector (via transfer income), change in household welfare will then measure the dead weight loss of a given tax simulation. However, one limitation of using transfer income is that the distributional effect of taxation is sensitive to the proportions in which transfer income is allocated to different household groups.

With the small country assumption, the world prices of imports and exports are assumed to be fixed, but import prices will change when tariffs and the exchange rate change. With exogenously fixed foreign savings (balance of payment deficit fixed at zero), the equilibrating mechanism at work is the exchange rate. Changes in the exchange rate will alter the relative price of imports and exports, and consequently imports and exports will adjust to restore equilibrium. The model is also 'savings-driven', with total investment adjusting to be equal

[3] Government consumption is predominantly from the government services sector itself and consists mainly of public goods. However, since we do not have enough data on the valuation of public goods, we treat government consumption as a standard demand rather than as public good.

to savings. The exchange rate is used as the numéraire, and is measured such that a rise in the exchange rate represents a depreciation of the domestic currency.

3.2 Modeling Tourism

Tourism is treated as a demand phenomenon and is identified only on the demand side. It is assumed that there is an additional group of final demand, the tourists, whom consume goods and services produced by the traditional sectors, and that there is no specific sector producing only for the tourists. We follow the tourism demand specifications of Gooroochurn (2003b). In most tourism CGE models, tourism demand is derived assuming that all tourists are homogeneous and that there is a representative tourist accounting for all tourists' consumption. It is also assumed that the tourists are already at the destination when they adjust their consumption to changing price. Tourism demand is obtained by maximising the representative tourist's utility function subject to a budget constraint.

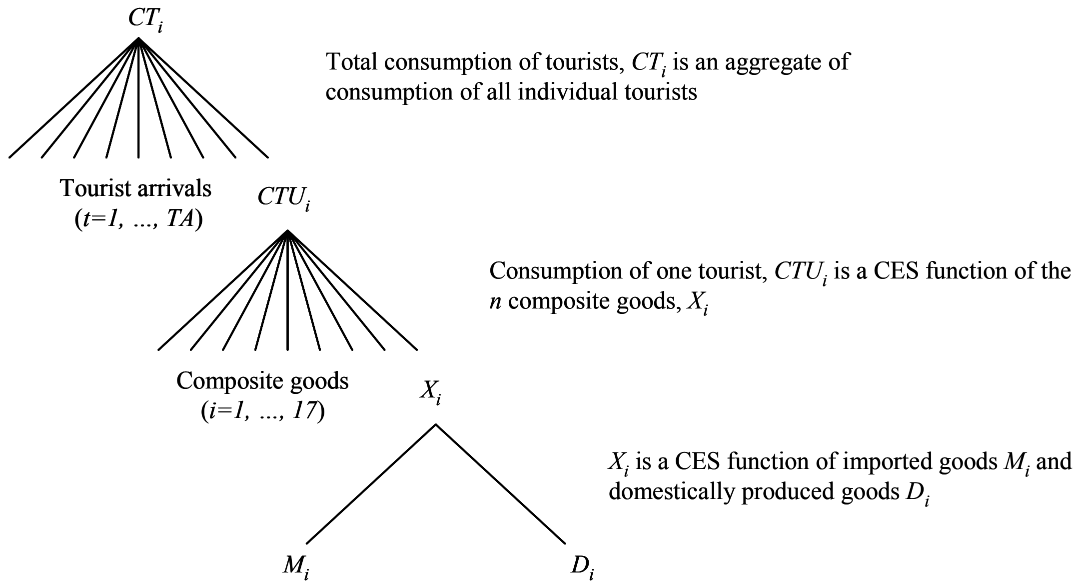
3.2.1 Endogenous Tourist Arrivals and Homogenous Tourists

In the above formulation, tourists adjust demand under the assumption that they are already at the destination. However, changes in price also affect tourist arrivals, which will in turn affect tourism demand. Several studies estimated macro tourism demand functions[4] and found that tourist arrivals are sensitive to 'price' of tourism. The price of tourism is normally proxied by the exchange rate adjusted CPI. Changes in the price of tourism products will change the CPI, tourist arrivals and subsequently tourist demand. To capture this effect, tourist arrivals are endogenised in the model via a macro tourism demand so that a change in price will change tourism demand via two avenues. One is through the normal substitution and income effects of the representative tourist that is captured by the micro tourism demand. Second is via changes in tourist arrivals induced by the change in price which is captured by the macro tourism demand. The structure given in figure 1 summarises the procedures.

In this setting, we model the consumption of a single tourist (CTU_i), rather than representative tourist, and this is shown in the second level of the nest. The first level of the nest shows that total value of tourism consumption (CT_i). Since we are assuming that all tourists are homogeneous, CT_i is simply CTU_i multiplied by the amount of tourists arrivals (TA), and is given as follows

[4] See Sinclair (1998) for a survey in tourism demand.

Figure 1: Structure of Tourism Consumption with Endogenous Tourist Arrivals



$$CT_i = TA \times CTU_i \tag{20}$$

Tourist arrivals is expressed as follows

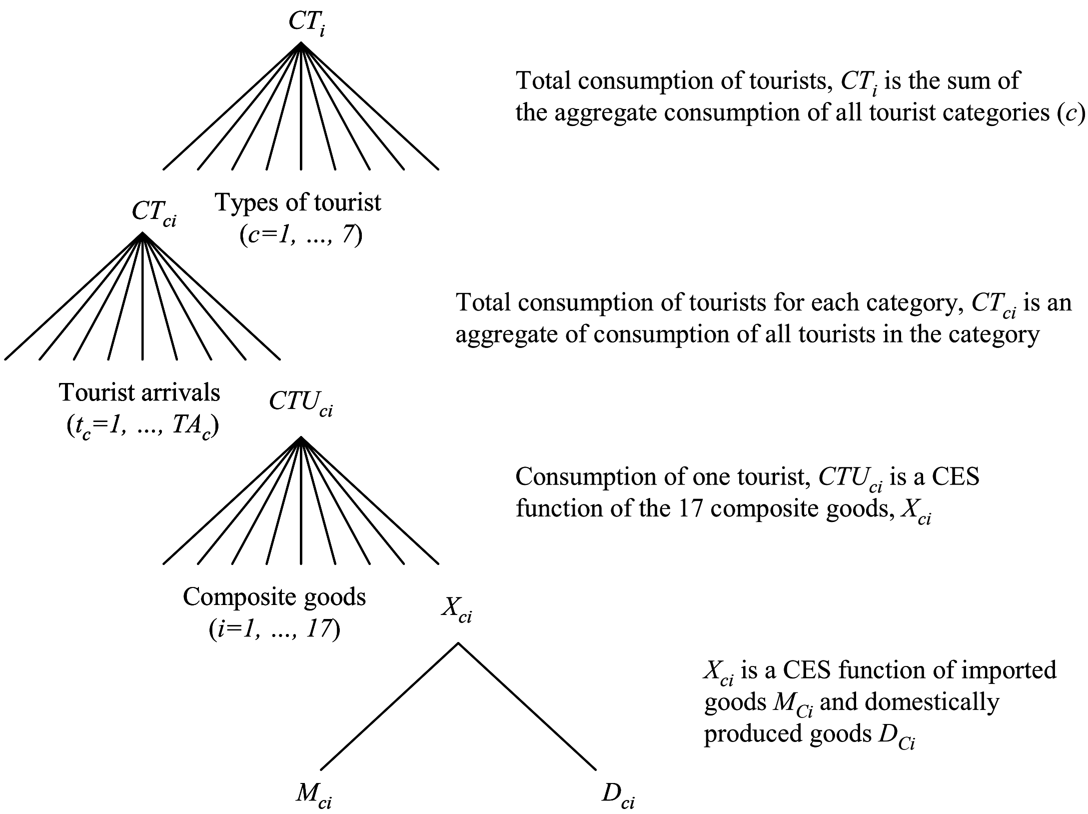
$$TA = \Theta . TA_0 . \left(\frac{PTOU}{ER} \right)^{\varepsilon_T^{price}} \tag{21}$$

where TA_0 is the benchmark level of tourism arrivals, *PTOU* is the tourism price index, *ER* is the exchange rate, ε_T^{price} the price elasticity of macro tourism demand and Θ is a shift parameter capturing exogenous change in tourist arrivals.

3.2.2 Endogenous Tourist Arrivals, Heterogenous Tourists

The assumption of homogenous tourists may not hold in practice. There are several economic differences embodied in the behaviour of tourists, especially in the expenditure pattern and sensitivity to price changes. Sinclair (1998) finds that price and income elasticities of tourism demand tend to vary considerably over tourists from different origin countries. Stratifying tourists according to country of origin, income class, purpose of visits or any combinations will capture a major part of the behavioural differences. We illustrate heterogeneous tourists using country of origin as it is commonly used to differentiate among types of tourists. The structure is given by the tree diagram in figure 2.

Figure 2: Structure of Tourism Consumption with Endogenous Tourist Arrivals and Heterogeneous Tourists



In the above formulation, we model demand for the single tourist for each tourist origin country (CTU_{ci}) individually. We then calculate the total consumption for a given country (CT_{ci}) by aggregating the consumption of all tourists from a given country which is similar to multiplying CTU_{ci} by the number of tourist arrivals from the given country (TA_c). This is illustrated by equation (23). Total consumption of tourists (CT_i) is obtained by adding up total consumption from each country. This aggregation is illustrated in the first level of the nesting in the above tree diagram and is given by the following equation

$$CT_i = \sum_c CT_{ci} \quad , \ \forall\, i \qquad (22)$$

where

$$CT_{ci} = TA_c \times CTU_{ci} \quad , \ \forall\, i \text{ and } c \qquad (23)$$

TA_c and CTU_{ci} are given as

$$TA_c = \Theta_c . TA_{0c} . \left(\frac{PINDEX}{ER} \right)^{\varepsilon_{Tc}^{price}} \quad (24)$$

respectively. $\overline{Y_c^T}$ is the income of each tourist from category *c*. It should be noted that the specification of heterogonous tourists is not used in our model due to data limitations.

4. EMPIRICAL EVIDENCE

This section uses the CGE model discussed earlier to provide empirical insights on the efficiency and equity effects of tourism taxation. We look at efficiency effects first.

4.1 Efficiency Effects

Efficiency of tourism taxes can be investigated using the concept of marginal excess burden (MEB) per additional dollar of tax revenue. MEB measures the incremental welfare cost of raising extra revenues from an existing distortionary tax and holding other taxes constant. The MEB (λ_i) is expressed per dollar of additional revenue and is given as the change in domestic welfare $\left({\partial V}/{\partial t_i} \right)$ divided by the change in government revenue $\left({\partial R}/{\partial t_i} \right)$ for a given tax change. It is formulated as

$$\lambda_i = \frac{{\partial V}/{\partial t_i}}{{\partial R}/{\partial t_i}} \quad (25)$$

where V is the household welfare, R represents government revenue and t_i, the tax rate for sector i. In our case, a higher MEB means higher welfare since it echoes either a higher welfare gain (for positive MEB) or a lower dead weight loss (for negative MEB).[5] Therefore, if $\lambda_i > \lambda_j$ taxing sector *i* to raise an additional dollar is more efficient than taxing sector *j*, and social welfare is increased by shifting revenue generation at the margin from taxing of *i* to that of *j*.

To analyse the relative efficiency of taxing the tourism sector, we apply a small increase (0.1% point) in the sales tax rate to each of the 17 sectors at a time, keeping the other tax rates constant. We then calculate and compare the associated MEB for each sector which is given in table 1. The sectors are ranked in ascending order of λ_i and hence it is more efficient to

[5] This is not to be confused by the convention that a high MEB means a high dead weight loss.

Table 1: MEB of 0.1% Increase in Sales Tax

Sectors	Initial Tax Rate (%)	Tourism Ratio	λ_i	Rank
Government Services	0.0	0.0	n.a	n.a
Sugarcane	0.0	0.0	n.a	n.a
Restaurants and Hotels	**2.616**	**95.4**	**0.9167**	**1**
Transport and Communication	**2.510**	**61.4**	**0.3819**	**2**
Foodcrops and Fruits	0.000	0	0.0831	3
Mining and Quarrying	0.000	0	0.0412	4
Other Services	**3.640**	**12.3**	**0.0248**	**5**
Wholesale and Retail Trade	**3.542**	**2.7**	**0.0116**	**6**
Livestock, Poultry and Fishing	0.000	0	-0.0145	7
EPZ Non-textiles	3.968	0	-0.0301	8
EPZ Textiles	2.962	0	-0.0406	9
Electricity, Gas and Water	2.952	0	-0.0630	10
Other Manufacturing	**2.240**	**12.1**	**-0.0658**	**11**
Other Agriculture	0.000	0	-0.0688	12
Financial Services	4.676	0	-0.0764	13
Construction	3.343	0	-0.1377	14
Sugar Milling	3.998	0	-1.1680	15

tax sectors higher up the table than those lower down it. The initial tax rates and the tourism ratio are given in the adjacent columns.

The principle of having a high MEB for goods with a low initial tax rate and a low MEB for heavily taxed commodities does not hold in all cases. While subsidised sectors like Restaurants & Hotels and Other Agriculture are at the top of the table and taxed sectors like Financial Services and Construction are at the bottom, other highly taxed sectors such as Other Manufacturing and highly subsidised sectors such as Wholesale and Retail Trade are in the middle of the table.

It can also be seen that the two main tourism sectors, viz. restaurants & Hotels and Transport & Communication have the largest MEB for this experiment. This confirms that taxing tourism-related activities is relatively more efficient than non tourism-related sectors. As explained earlier, the main reason for the higher efficiency is that the presence of tourists expands the tax base and hence raising tax revenue, and this is achieved without causing direct damage to social welfare. The other tourism-related sectors, bar Other Manufacturing, are also in the upper range of the table. Wholesale & Retail Trade and Other Services are lower in the table mostly because of having lower tourism ratio and high initial tax rates. Other Manufacturing is much lower in the table despite having a lower initial tax rate and a similar tourism ratio to Other Services. This is mainly because Other Manufacturing is a large sector, with a high percentage of its output purchased by domestic consumers and firms. Taxing Other Manufacturing hence has a high negative impact on domestic welfare. In general, the results confirm the link between tourism ratio and MEB - sectors with a higher tourism ratio tending to have a higher MEB.

4.2 Income Distribution Effects

There is a wide range of measures available to evaluate income distribution, the three most common ones being the Gini Coefficient[6], the Atkinson Index[7] and the Theil Index[8]. There is a more general category of index, the Generalised Entropy (GE) class of measures, which is believed to satisfy all the axioms[9] one would expect an income distribution index to have. As will be shown later, the Atkinson and the Theil Indices are special cases of the GE class. For our purpose, we will use the GE index, and the Gini coefficient to crosscheck the robustness of the results. The Gini coefficient is the most common and also the oldest measure, while the GE index is more flexible since the level of inequality aversion can be set exogenously.

Gini Coefficient

There are several variants of the Gini coefficient, but we use the formula introduced by the World Bank[10], which is the mean of the difference between each and every other income levels of the household groups. Algebraically, it can be formulated as follows

$$G = \frac{1}{2n^2\overline{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| y_i - y_j \right| \tag{26}$$

[6] After Gini (1912)
[7] After Atkinson (1970)
[8] After Theil (1967)
[9] See Litchfield (1999) for a brief definition of the axioms
[13] Coudouel and Hentschel (2000)

where n is the number of household groups, $\bar{y}$ is the average income of the total population, y_i and y_j are the income of household group i and j, respectively. G lies within the range 0 and 1. A value of zero will imply a perfectly equal income distribution and a value of one means that only one household group owns all income. One advantage of this formulation is that it does not require the frequency distribution of the household groups. A major disadvantage is that it changes when the distribution varies, no matter whether the change in distribution occurs at the top or at the bottom or in the middle. If a society is most concerned about the share of income enjoyed by the people at the bottom, a better indicator may be a direct measure, such as the share of income that goes to the poorest segment.

Generalised Entropy

The formulation of the GE measures is given as follows

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}\left[\frac{1}{n}\sum_{i}^{n}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right] \quad (27)$$

α captures the level of inequality aversion. The commonest values of α used are 0, 1 and 2: a value of $\alpha = 0$ gives more weight to distances between incomes in the lower tail, $\alpha = 1$ applies equal weights across the distribution, while a value of $\alpha = 2$ gives proportionately more weight to gaps in the upper tail. The other parameters are defined as above. The value of GE ranges from 0 to ∞, with zero representing an equal distribution and higher values representing higher levels of inequality. Using l'Hopital's rule, the GE measures with $\alpha = 0$ and $\alpha = 1$ are equivalent to two of Theil's inequality indices. Cowell (1995) has shown that for values of $\alpha < 1$, the GE class becomes ordinally equivalent to the Atkinson class of index.

Our simulations involve increasing the sales tax rate by 10% point for each sector at a time. We then compute the corresponding percentage change for each of the income distribution measures. The benchmark and simulated values of each measure alongside the tourism ratio are given in table 2. A negative change means an improvement in income distribution. We also rank the changes in ascending order of the real values (not the magnitude) such that sectors with a high rank shows either a bigger improvement or a smaller deterioration in income distribution following the tax changes.

The following observations can be made from the results. First, the ranks do not change considerably across the different measures. The Spearman rank correlation coefficients between the each and every measures (not reported) tend to be large, with the smallest one being 0.86. This illustrates that the results are consistent across the different income distribution measures. Second, all of the changes are negative implying that increasing the sales tax rate in turn for each sector improves income distribution using all four indicators. This is a result of the in-built income distribution mechanism of the model. An increase in taxation affects total income of households via changes in factor income due to changes in production and factor substitution, and via changes in transfer income brought about by changes in government revenue. Total factor income for a given household can fall or rise all depending on the factor intensity of the sector being taxed and on the composition of the different factors in the total income of the household. Transfer income normally rises because government revenue increases following a tax increase. An improvement in income distribution implies that the ratio of the increase in income to the decrease in income is higher for the poor than for the rich, implying in turn that the income of the poorer households increases by a higher percentage than that of the richer households. This is common in our simulation because in the model a higher proportion of transfer intrinsically goes to the poorer household in terms of pensions and other social benefits. The large change in the value of income distribution measures for the Other Manufacturing and the Transport and Communication sector arise because of the high capital to labour ratio of these sectors. Taxing these sectors reduces the price of capital and hence the income of capital owners, who are mainly the richer household groups in our model.

Thirdly and most importantly, it can be seen that the two main tourism sectors, Restaurant & Hotel and Transport & Communication are still in the top half of the table with ranks of 6th and 2nd respectively. This confirms the earlier results that taxing tourism does improve the income distribution relatively more than does taxing most other sectors. Compared to the adjusted MEB approach, there has also been a significant climb up the table by Other Manufacturing from 6th to 1st and Wholesale & Retail Trade from 7th to 4th, respectively. The difference arises because the adjusted MEB approach considers the consumption side as well. These two sectors are among the largest sectors in the economy and occupy a large proportion of total household consumption. Therefore, an increase in the sales tax rate for these sectors will have a negative repercussion on welfare of household via consumption which is not accounted for by the income distribution measures. Poorer households tend to have a larger proportion of their income spent on consumption (as opposed to savings) and hence the increase in the tax rate will affect them relatively more than richer households who

Table 2: Rank and % Change for Different Income Distribution Measures

Indicators		Gini Coeff.		GE(0)		GE(1)		GE(2)	
Benchmak Values		0.5109		0.2118		1.4571		1.0733	
	Ratio	Rank	Change	Rank	Change	Rank	Change	Rank	Change
Sugarcane	0	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Government Services	0	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Foodcrops and Fruits	0	10	-0.1028	10	-0.3378	10	-0.9303	10	-0.1065
Livestock, Poultry and Fishing	0	8	-0.1117	9	-0.3794	9	-1.0776	8	-0.1117
Other Agriculture	0	13	-0.0414	13	-0.1441	13	-0.4196	13	-0.0402
Mining and Quarrying	0	14	-0.0077	14	-0.0259	14	-0.0731	14	-0.0078
Sugar Milling	0	15	-0.0005	15	-0.0045	15	-0.0201	15	-0.0001
EPZ Textiles	0	11	-0.0901	11	-0.3125	11	-0.9052	11	-0.0877
EPZ Non-textiles	0	12	-0.0611	12	-0.2125	12	-0.6179	12	-0.0593
Other Manufacturing	**12.1**	**1**	**-2.5699**	**1**	**-8.1801**	**2**	**-10.236**	**1**	**-2.5115**
Electricity, Gas and Water	0	9	-0.1115	8	-0.3873	8	-1.1249	9	-0.1099
Construction	0	3	-1.0276	3	-3.4113	3	-9.2795	4	-1.0017
Wholesale and Retail Trade	**2.7**	**4**	**-1.0246**	**4**	**-3.3071**	**4**	**-8.7540**	**3**	**-1.0157**
Restaurants and Hotels	**95.4**	**6**	**-0.6135**	**6**	**-2.0335**	**6**	**-5.5707**	**6**	**-0.6006**
Transport and Communication	**61.4**	**2**	**-1.1775**	**2**	**-3.8739**	**1**	**-10.4131**	**2**	**-1.1523**
Financial Services	0	5	-0.8893	5	-2.8550	5	-7.5294	5	-0.8853
Other Services	**12.3**	**7**	**-0.4480**	**7**	**-1.5438**	**7**	**-4.4309**	**7**	**-0.4466**

have a larger proportion of income as savings. This effect is captured in the adjusted MEB approach but not in the income distribution approach and hence explains the lower rank for these sectors in the former approach.

5. CONCLUSIONS

This paper provides a theoretical analysis of tourism taxation by extending the Ramsey model, and uses a CGE model for Mauritius to measure the efficiency and equity effects of tourism taxation. While analysing tourism taxation we find that it is important to decompose tourism demand into two components: micro tourism demand and macro tourism demand. The micro tourism demand captures changes in demand of a representative tourist assuming he/she is already at the destination, while macro tourism demand measures the decision of tourists whether to visit the destination at all and is captured by tourist arrivals. Endogenising tourism in the model makes tourism demand less inelastic, and hence modelling with exogenous demand can generate misleading conclusions.

Both the theoretical and empirical analysis found that taxing tourism related sectors is relatively more efficient than taxing other sectors. This is mainly because the higher demand created by tourists increases tax revenue, and the associated reduction in consumer surplus of international tourists is not taken into account while measuring social welfare. In light with the "Ramsey Inverse Elasticity" rule, the theoretical model also posits that the relatively less elastic demand of tourists also make taxing tourism related sectors more efficient.

The high efficiency of tourism taxation can be useful in designing tax reform especially for developing countries faced with complex tax structure and over reliance on trade taxes. The results shown in table 1 imply that at the margin, it is more efficient to raise an additional dollar of tax revenue by taxing the Hotel & Restaurant and Transport & Communication sectors than other non tourism related sectors. This means that government should increase tax on tourism related sectors and reduces tax on non-tourism sectors to increase tax revenue and prevents welfare to fall.

Taxing tourism is also found to have positive equity effects, which arises mainly because most tourism products are classified as luxury products and the domestic consumption component of these goods are mostly from individuals in the higher income brackets. This is referred to as the use of income effect. The source of income effect is also an important determinant of income distribution, that is, which income brackets are more affected by the change in the price of factors. With tourism sectors tending to be labour intensive, tourism taxation can have negative equity effects. The CGE model captures both effects, and it is found taxing tourism related sectors does have relatively higher equity effects than other sectors.

As part of macroeconomic policies, efficiency and equity effects are not the only factors that need to be considered. Tourism taxation has other important economic impacts such as changes in GDP, investment, price level, consumption and trade balance that may not be favourable. Thus the government have to consider these effects as well. It is also important to ensure that the tourism sector does not shrink by a large extent following the increase in tax rate. Although taxing tourism can generate tax revenue and improves income distribution, in the long run it can seriously affect the international competitiveness of the destination and hamper the sustainability of the sector. The administration cost of collection, enforcement and monitoring to ensure a smooth taxation process is also essential to consider.

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