Annals of Tourism Research 61 (2016) 45–62

Contents lists available at ScienceDirect

Annals of Tourism Research

journal homepage: www.elsevier.com/locate/atoures

Impacts of Thailand's tourism tax cut: A CGE analysis

Pathomdanai Ponjan [a], Nipawan Thirawat [b,*]

[a] Thai Ministry of Finance, Thailand
[b] Mahidol University International College, Thailand

ARTICLE INFO

Article history:
Received 28 June 2015
Revised 26 July 2016
Accepted 29 July 2016

Coordinating editor: Larry Dwyer

Keywords:
CGE model
Tax
Thailand
Flood
Fiscal policy

ABSTRACT

This study examines Thailand's tourism tax cut policy aimed to alleviate negative impacts arising from the 2011 flood on the tourism industry and economy. The proposed TRAVELTHAI model, a medium-scale dynamic computable general equilibrium model, serves as a powerful analytical tool for effective policy decision making. Direct-tourism industries benefit the most from the industry specific tax policy, deemed a suitable short-run policy in response to the flood. Tax cuts on inbound tourism improves the terms of trade and marginally stimulates Thailand's GDP. It is recommended that the development of fiscal policies should be more inclusive, in order to achieve better national impacts in the long run.

Introduction

Tourism inevitably plays a substantial role in the economy (Goeldner & Ritchie, 2006). The Thai Tourism industry has for long now, continuously grown at climbing rates. In terms of inbound tourism, revenue has grown considerably with a total of 2175 million Baht in 1970 to 253,018 million Baht in 1999, ranking one of the top three major exporting sectors in Thailand for countless consecutive years (Tourism Authority of Thailand, 2012a, 2012b). The population of foreign tourists peaked at its highest in 2011 at 19.1 million visitor arrivals with a corresponding total revenue of 800.6 billion Baht; double the revenue in 2000 which had 9.51 million visitor arrivals, and 2.6 times higher in terms

* Corresponding author.
E-mail addresses: yoddoy@gmail.com (P. Ponjan), nipawan.thi@mahidol.ac.th (N. Thirawat).

http://dx.doi.org/10.1016/j.annals.2016.07.015
0160-7383/

of revenue which was approximately 299.5 billion Baht that year (Bank of Thailand, 2012). These staggering numbers were reached despite the nation being hit with the worst flooding in 70 years.

This increasing trend could prove to be an important catalyst for economic development since Tourism does not only generate income, but also creates permeated employment nation-wide, mitigates migration to large cities, revives the culture of communities, stimulates regional and local economies and improves living standards amongst the local people (Chancharat, 2011). In response to the sector's fast-growing nature and economic significance, the Ministry of Tourism and Sports (MOTS) was established in 2002. The Tourism Authority of Thailand (TAT), which was officially assigned responsibility of this industry since 1979, was incorporated under its umbrella.

Overtime, the Thai Government had launched a series of promotional campaigns such as 1987's "Visit, Thailand Year", 1998's "Amazing Thailand", the 2003–2004's "Unseen Thailand", the revisited 2009's "Visit Thailand Year" and the 200 million Baht campaign "Miracle Thailand 2012" to reboot tourism from the 2011 flood. In addition, the second National Tourism Development Agenda (2012–2016) was launched in 2011 emphasising competitiveness and responsiveness to changing circumstances including instabilities caused by natural disasters.

Flooding is a major crisis considered as a striking setback for the tourism industry. Such a sudden shock may be regarded as temporary, however the series of effects on direct-tourism and tourism-related sectors could lead to economic costs due to instabilities and losses in revenue. The flood in 2011 devastated the country and its tourism sector. It dampened GDP in the fourth quarter down to a negative of 9 percent (NESDB, 2012). The Ministry of Tourism and Sports estimated the effects as a disappearance of 0.7 million visitor arrivals which equated to be approximately 19 billion Baht in revenue foregone in the last quarter of that year. A total of 175 attractions in 21 provinces were damaged with a minimal cost of 560 million Baht. Damage and losses in the Thai tourism and cultural heritage sectors were estimated at 94,808 million Baht and 7505 million Baht respectively (World Bank, 2012).

Other studies on Thailand's tourism sector employ Box-Jenkins autoregressive integrated moving average (ARIMA) models (Chang, Sriboonchitta, & Wiboonpongse, 2009) and comparative static analysis (Wattanakuljarus, 2006); there has never been a dynamic Computable General Equilibrium (CGE) model for Tourism in Thailand. The CGE model was used in this research. The main reason was that economic analyses of policies could be carried out by considering sectoral and macroeconomic effects. This paper proposes a dynamic computable general equilibrium model for the Thai economy, with a specification of tourism named as the TRAVELTHAI model to investigate the effects of a uniform half-percentage tourism tax cut on the Thai tourism industry and economy. The 2011 flood was a major catastrophic event that greatly affected the Thai economy. For Thai tourism, the deluge worsened both demand and supply sides and served as one apparent illustration amongst damaging disasters. Tax-cut measures served beneficial in alleviating negative impacts on Thai tourism. The model could be further applied for other disaster cases or even unfortunate circumstances such as political turmoil, with some tailored modifications to suit each particular situations. The 2011 tax-cut policy in this study is a hypothetically proposed what-if scenario. Since this is the first time using dynamic CGE modelling for Thai tourism and the tax cut policy, this article intends simplification to test the application of the dynamic CGE model, specifically on general tax cuts. As stated, the types of taxes on tourism and different circumstances will also be studied further to compare results with the base scenario of this research.

The next section reviews relevant literature, where the third section explains the theoretical structure of the dynamic CGE model of the Thai economy, database and model closure. The fourth section will analyse external shocks and policy simulations, where the final section will provide concluding remarks.

Literature reviews

The primary purposes of tourism taxation are to increase government revenues, provide public goods and solve external problems. Taxing tourism does not generate significant adverse effects on domestic welfare (Gooroochurn, 2009). Taxes imposed on tourist activities can be categorised into specific and general indirect taxes (Gago, Labandeira, Picos, & Rodríguez, 2009). Examples of specific taxes are hotel room taxes and airport exit taxes (WTO, 1998). Value added tax (VAT) is a widely used indirect form of tax. In practice, the government can set different tax rates in specific industries. The advantages are that general indirect taxes have broader tax bases than specific taxes, and VAT administration is very efficient. This article focuses on VAT on tourism goods and services, and its implications.

The significance of tourism taxation is well recognised. Given the complexity of CGE modelling, tourism taxation impact analysis has rarely been studied in a CGE framework. Exceptions are Gago et al. (2009)'s work on tourism taxes in Spain. Gooroochurn and Sinclair (2005) and Gooroochurn and Milner (2005) provided empirical evidence on impacts of taxing tourism in Mauritius, whereas optimal tourism taxation was examined in Gooroochurn (2009). Jensen and Wanhill (2002)'s work concentrated on the macroeconomic impacts of value added tax cuts in Denmark using an input-output approach. The CGE analysis, nevertheless, has advantages over other models and the partial equilibrium analysis. CGE modelling has overcome constraints that input-output analysis has on the insufficient specification of the economic agents' behaviours and the role of prices as stated in Dixon and Parmenter (1996). The CGE model is intended to be an explainable basis for the relationship of all important economic variables either macroeconomic or sectoral. This includes overall production, consumption, investment, employment, price level, international trade, GDP as well as important policy measure variables related to tourism and non-tourism sectors. The tourism industry is an amalgam of industries, ranging from travel agents, tourism-related transportation to souvenirs. It is thus suitable to investigate effects of external shocks or policy changes across 'what-if' scenarios employing the multi-sectoral model. Tourism is an industry that rationally suits a CGE model (Blake & Sinclair, 2003; Dwyer, Forsyth, & Spurr, 2004).

Other studies employing CGE models mainly focus on the effects and roles of tourism such as those of Blake (2009), Blake, Arbache, Sinclair, and Teles (2008), Sugiyarto, Blake, and Sinclair (2003) and S. Meng (2014). Changes caused by external shocks and their implications such as catastrophic events (Blake & Sinclair, 2003; Giesecke et al., 2012), sporting events (Madden, 2006; Narayan, 2003), financial crises (Li, Blake, & Cooper, 2010) and export boom (Forsyth, Dwyer, & Spurr, 2014) are research areas which have been steadily increasing in popularity. Many researchers develop tourism specific CGE models to evaluate policies (Chen & Yang, 2010). Forsyth (2006), and X. Meng (2014) are good examples of applications of CGE modelling to tourism related fiscal policies. Dwyer, Forsyth, and Spurr (2012) and Dwyer, Forsyth, Spurr, and Hoque (2013) examined the effects of the carbon tax on the tourism sector and its implications.

Only a few studies on tourism taxation are conducted in the context of developing countries (Bird, 1992). This is especially true in the case of Thailand. The quantitative studies on Thai tourism emphasise the estimation of inbound and outbound tourism demands. For example, Chang et al. (2009) evaluated changes in tourism trends by considering stationary and non-stationary tourist arrival series. They tested the unit roots and seasonal unit roots prior to the stage of estimation, model selection and forecasting respectively. Various ARIMA models and seasonal ARIMA models were estimated and they indicated the tourist arrivals series displaying seasonal patterns. Khamkaew and Leerattanakorn (2010) assessed the Thai outbound tourism demand for five major destinations over the period spanning 1998–2007, within long run and short run Almost Ideal Demand (AID) frameworks based on monthly data. For the long run AID model, the U.S. was most the sensitive destination to price changes, whilst the rest remained at the same price sensitivity. In terms of the acceptability of consumer behaviour restrictions, the dynamic model outperforms the long run model. The sensitivity of tourism demand to relative price change varied considerably between destinations in both long-run and short-run consideration, whereas the expenditure elasticities represented that travelling to all destinations could be considered as normal goods in the short run.

There is no research on Thai tourism that employs a dynamic CGE model as well as tax implementation. Wattanakuljarus (2006) could be seen as the only comparative static study for Thailand, examining how inbound tourism affects the Thai economy. Wattanakuljarus (2006)'s work employs a CGE analysis using Social Accounting Matrices (SAM) 2001 provided by the Thailand Development Research Institute (TDRI) as the database with the finalised version of Base SAM of 208 accounts, of which were 80 activities, 80 commodities, 18 types of occupations, land, two forms of capital, three margin services, four classes of households and five regional tourism sectors. The study also includes land, forest and water resources in SAM. The CGE framework is based on Löfgren, Harris, and Robinson (2002). Tourism is assumed as a bundle of goods and services with Leontief technology. Wattanakuljarus and Coxhead (2008) investigated the relationship between inbound tourism and income distribution. The results of their static applied general equilibrium (AGE) model indicated that tourism growth does not lead to better equality outcomes. Unlike the dynamic CGE models, the weakness of this approach is that comparative static frameworks are not capable of analysing the adjustment process of key economic variables at different points in time.

This paper sheds light on whether the tourism tax cut is an effective means to address negative consequences of natural disasters, namely the 2011 floods. The aim of this study is to convey contributions to this issue. There has been no existing literature to examine the tax cut effect in the multi-sectoral mode, which is appropriate for tourism as an amalgam industry for Thailand. There are a few studies on the taxation on Thai tourism using the CGE approach, lesser on tax cuts, and no particular studies attempting to address such mixed effects with the disasters. It would also be beneficial to deliver the benefits of tax cuts, if any, as incentive means to alleviate the banish effects of alike disasters in the future, with more varied incentive types and circumstances, apart from the main focus of the general tax cut in this article first using dynamic CGE modelling. Amongst a few, Giesecke et al. (2012)'s ORANI-LA model and Verikios, McCaw, McVernon, and Harris (2012)'s Monash health model are proved to be good references for this study regarding economic losses. The regional economic effects of a Dirty Bomb attack was estimated in ORANI-LA basing the attack on an event of magnitude of Radiological Dispersal Devices (Giesecke et al., 2012). Their results showed that the short-run or event-year impacts of the Dirty Bomb scenario on business interruption were catastrophic. Relative to that, resource loss and behavioural effects provided little short-run regional economic damage.

Verikios et al. (2012) used the MONASH-Health model to examine the H1N1 epidemic effects. The model included domestic, inbound, and outbound tourism sectors. The quarterly model was suitable for the short and sharp impact analysis of the outbreak. The model had sticky real wages and an excess capacity assumptions to reflect the inertia in the labour market and to avoid the misleading upsurge in export with the sharp setback by the pandemic. There were 35 non-health sectors and 18 treatment activities. Two scenarios, the 2009 outbreak and severe outbreaks, of four economic shocks were constructed from the Susceptible-Exposed-Infected-Removed (SEIR) model.

Apart from the two studies on the dynamic CGE model, Ihalanayake (2012) provided empirical evidence on economic effects of tourism tax changes in Australia using a comparative static CGE model (ORANI-G). The nature of the effects from the changes of tourism taxes varied, and the pattern of these effects reflected the assumptions on different circumstances. Studies on three main simulations focusing on recovery of external costs, funding tourism-related public goods and maximisation of government revenue were presented. Although it provided scenarios with a tax refund scheme and a broad base commodity tax that replaces existing tourism taxes, which indicates overall benefits to the tourism sector as the cost to tourists is effectively reduced and increases demand for tourism products, the macroeconomic effects of these policy changes varied, and the findings were subject to various assumptions used in the simulations. In particular scenarios, the macroeconomic effect for tourism tax reductions are expansionary in the short-run, illustrated by increased employment and export volumes, whilst it is indicated with a contraction in the long run, with loss in welfare. Tourism tax abolition on the contrary, revealed the contraction irrespective of the short run or the long run schemes.

Model, data and closure

A CGE model for Thai tourism

TRAVELTHAI is a dynamic CGE model for Thai tourism based on MyAGE, a Monash-style Applied General Equilibrium model for Malaysia (CoPs, 2010a, 2010b, 2010c) and McHUGE (later on CHINAGEM by Mai, Dixon, & Rimmer, 2010). These are successors of MONASH, the dynamic CGE model for Australia (Dixon & Rimmer, 2002), which has also been developed from the comparative static version of ORANI model (Dixon, Parmenter, Sutton, & Vincent, 1982). More specifically, TRAVELTHAI holds the neo-classical assumptions and incorporates the dynamic features of MyAGE and MONASH. TRAVELTHAI not only helps assess the Thai economy but also explicitly captures the 'amalgam' characteristic of Thai tourism. TRAVELTHAI, however, incorporates all three types of tourism including inbound, domestic, and outbound into one dynamic model. It also provides the balance of travel to show the effects that tourism may generate as a part of the balance of payments. These are major contributions of TRAVELTHAI to the fields of tourism modelling.

The theoretical structure describes behavioural relationships of all economic agents, namely, industries, investors, households, the international trade, and the government. The real economy with only markets for goods and services, is treated with the neutrality of money. That is, only the relative prices matter for the market mechanism and, often, either consumer price indexes or exchange rates are chosen as the numeraire. It is assumed that the markets are perfectly-competitive with zero pure profit. All agents are optimisers through cost minimisation and utility maximisation subject to their constraints. Government consumption is often set to be proportional with private consumption whereas government investments are assumed to be relative to the total investment. Export demand has a negative relationship with the export price.

For this study, the model is calibrated with the Thai Tourism Satellite Accounts for the year 2000, with 40 industries and 40 commodities (in broad category as 12 direct-tourism industries, 20 tourism-connected industries, and 8 non-tourism industries), 40 investors, three primary factors of production (e.g. capital, land and labour), one representative household, one central government, and an international trade with net foreign liabilities. The inbound tourism demand bundle follows the fashion of export demand alike whilst the domestic tourism demand bundle is set to be a component of household consumption. Using the Tourism Satellite Account data that provides inbound tourism explicitly, this enables the arrangement to analyse tourism in a dynamic sense. The household's utility function used is a two-stage nested Linear Expenditure System (LES)—Constant Elasticity of Substitution (CES) function. The industry-specific decision making on output composition is then assumed to maximise revenue subject to the Constant Elasticity of Transformation (CET) production function. The choices of inputs are bound by a three-level nested production technology. Each industry makes a decision to choose effective composite intermediate inputs and a composite primary input to minimise the total costs subject to the Leontief production function. The primary factor bundles and the intermediate input bundles are used in fixed proportions to output at the first level whereas in the second level, intermediate input bundles are set with the CES function of the two sources: import-composite commodities and domestic commodities. It is also a CES combination of labour, capital and land for the primary factor bundles. The demand for inputs to create the new units of physical capital as given are derived from the cost minimisation of capital creation subject to a nested production function. The top-level Leontief function determines such demands. At the second level, imported and domestic inputs to capital formation, represent a certain degree of imperfect substitution with CES functions.

Table 1 summarises the stylised version of the 19 groups of equations and Table 2 summarises the endogenous and exogenous variables used in the model.

This group of inbound tourists' demand equations is the contribution for the study. With the information of TSA, it is possible to explicitly determine the relationship of the Tourism industry. In Eq. (12) of stylised version, the equation is clarified in the similar way to the export demand of Eq. (9), only with its own way representing the demand of its type (7) and the treatment of tourism as a bundle (so, only X7TOT and P7). This is because the study regards it as one type of export, only the inbound tourists as consumers come to visit the country to consume the tourism commodities as a bundle. Eq. (13) tells the price composite linking to P_1. Eq. (11) informs the bundle moves with its composition.

The full version follows the same way as collective export demand and treats tourism services in bundle as well. This is because the sizes of the tourism sectors are all small with less market power and it is possible to let this group of commodities/activities has the same export demand curve. The demand for tourism bundle is negatively related to the price of it, which is a divisia index of the prices of all tourism exports, including the shifters on prices and quantity as bundle. Any change in the quantity shifter (horizontal movements) results from changes in foreign preferences at any given price level or changes in foreign tourists' demand concerning income effects.

Domestic tourists' demand equations (Eqs. (14)–(16)) follow the style of the functional form of Eq. (8) of the consumer demand in the stylised version, but the key difference is the treatment of bundle.

Table 1
Stylised version of TRAVELTHAI equations.

Groups of equations	Eqs.	Dimension
1. Outputs and inputs		
$X0(i,1,j) = X1TOT(j) * \mu 0i1j(P1)$	1	CxI
$X0COM(i) = \Sigma j\ X0(i,1,j)$	2	C
$X1(i,s,j) = X1TOT(j) * \mu\ 1isj\ (P1(i), P2(i), A1i, ATWIST)$	3	CxSxI
$L(j) = X1TOT(j) * \mu\ Lj(W, Q(j), APFj)$	4	I
$K(j) = X1TOT(j) * \mu\ Kj(W, Q(j), APFj)$	5	I
2. Inputs to capital creation and asset prices		
$X2(i,s,j) = X2TOT(j) * \mu_{2isj}(P1(i), P2(i), A2j, ATWIST)$	6	CxSxI
$PI(j) = \mu PIj(P1, P2, A2j)$	7	I
3. Household demands for commodities		
$X3(i,s) = \mu 3_{is}(C, P31, P32, A_3(i), ATWIST)$	8	CxS
4. Exports		
$X4(i) = \mu 4i\ (PE(i)) + A4(i)$	9	C
5. Government demands		
$X5(i,s) = A5(i,s) * A(5)$	10	CxS
6. Inbound tourists' demands		
$X7(i) = X7TOT + A_{7i}$	11	C
$X7TOT = \mu 7\ (P7, A7)$	12	1
$P7 = \mu P7i(P1(i), A_{7i})$	13	1
7. Domestic tourists' demands (national tourists)		
$X8(i,s) = X8TOT(s) + A8(i,s)$	14	CxS
$X8TOT(s) = X8\_S - \mu 8(P8(s), A8)$	15	S
$P8(s) = \mu P8s(P1, P2, A_{8s})$	16	S
8. Demands for margin services		
$X3MAR(k,s,i) = A3MAR(k,s,i) * X3(k,s)$	17	CxSxC
9. Supply equals demand for commodities		
$X0COM(i) = \Sigma jX1(i,1,j) + \Sigma jX2(i,1,j) + X3(i,1) + X4(i) + X5(i,1) + X7(i) + X8(i,1) + \Sigma k\Sigma sX3MAR(k,s,i)$	18	C
$X0IMP(i) = \Sigma jX1(i,2,j) + \Sigma jX2(i,2,j) + X3(i,2) + X5(i,2) + X8(i,2)$	19	C
10. Zero profits in production, import, export & distribution		
$\Sigma iP1(i)X0(i,1,j) = \Sigma i\Sigma sPs(i)X1(i,s,j) + W * L(j) + Q(j) * K(j)$	20	I
$P2(i) = [PM(i)/\Phi] * TM(i)$	21	C
$P1(i) = [PE(i)/\Phi]/T4(i)$	22	C
$P3s(k) = Ps(k) * T3(k,s) + \Sigma iP_1(i) * A3MAR(k,s,i)$	23	CxS
11. Indirect taxes		
$T4(i) = A0T(i) * A4T(i)$	24	C
12. Macro variables		
$CPI = \mu\ CPI(P31, P32)$	25	1
$WR = W/CPI$	26	1
$LTOT = \Sigma jL(j)$	27	1
$KTOT = \Sigma jK(j)$	28	1
$GDP = C + \Sigma jPI(j) * X2TOT(j) + \Sigma s\Sigma iPs(i) * X5(i,s) + \Sigma i[PE(i)/\Phi] * X4(i) + [P7/\Phi] * X7TOT + \Sigma sP8(s) * X8TOT(s) - \Sigma i[PM(i)/\Phi] * X0IMP(i)$	29	1
13. Capital stocks, investment, rates of return		
$K+(j) = (1 - D(j)) * K(j) + X2TOT(j)$	30	I
$IKRATIO(j) = X2TOT(j)/K(j)$	31	I
$K+(j)/K(j) - 1 = \mu KG(EROR(j)) + AKG(j) + AKGT$	32	I
$EROR(j) = \mu ERORj(Q(j), PI(j)) + AEROR(j)$	33	I
14. Balance of payments and GNP		
$NFLF+ = NFLF + CAD * \Phi$	34	1
$CAD = \Sigma i(PM(i)/\Phi) * X0IMP(i) - \Sigma i(PE(i)/\Phi) * X4(i) - (P7/\Phi) * X7TOT + R0IF * (NFLF/\Phi)$	35	1
$GNP = GDP - R0IF * (NFLF/\Phi)$	36	1
15. Function for private and public consumption		
$C + \Sigma s\Sigma iPs(i) * X5(i,s) + \Sigma s\Sigma iPs(i) * X8(i,s) = AC * GNP$	37	1

Table 1 (*continued*)

Groups of equations	Eqs.	Dimension
16. The government accounts		
PSD = ΣsΣiPs(i)X5(i,s) – ΣsΣk[T3(k,s) – 1]Ps(k)X3(k,s) – Σi(TM(i) – 1)[PM(i)/Φ]X0IMP(i) – Σi(T4 (i) – 1) * P1(i) * X4(i) – Σi(T7(i) – 1) * P1(i) * X7(i) – ΣsΣi[T8(i,s) – 1]Ps(i)X8(i,s) + TRANSFERS	38	1
17. Sticky-wage specification for policy simulations		
$\left[\frac{WR}{WR_f} - 1\right] = \left[\frac{WR_{lag}}{WR_{flag}} - 1\right] + \alpha\left[\frac{LTOT}{LTOT_f} - 1\right] + A_{WR}$	39	1
18. Technical and preference change		
A3(i) = A3G(i) * A3F(i)	40	C
A3G(i) = ACG(q), ∀ i ∈ G(q)	41	C
19. Equations for facilitating historical and forecast simulations		
CG(q) = Σj∈G(q) ΣsX3(j,s)	42	Q
Total number of equations: (CxSxC) + 2(CxSxI) + (CxI) + 4(CxS) + 8I + 10C + Q + 2S + 13		

This bundle is chosen upon optimising the constraints between the domestic price and imported price of P8(s), thus, whether to be domestic tourists or outbound tourists (National tourists are the residents in the country either travel within or abroad outbound).

The full version has treated the same way but with the explicit link to consumption. This is because the expenditure for travel as leisure follows as a part of consumption and it is common to look at it as a luxury commodity rather than subsistence one. The opportunity cost involved in working is the forgone hours of leisure. Travel is one type of leisure and leisure is amongst varieties of commodities consumed.

Data

Unlike most CGE models which use input-output tables as their main databases, coefficients in the TRAVELTHAI (based on the THORANI comparative static CGE version) model are derived from the 2000 Tourism Satellite Accounts (TSA) of Thailand published by the Tourism Authority of Thailand (TAT). This TSA has made a specification on tourism industries other than the general input-output formulation. The TSA of Thailand is based upon the conceptual framework of the Tourism Satellite Account provided by the World Tourism Organization (UNWTO) and the standardised input-output analysis according to the United Nations System of National Accounts, SNA 1993. The TSA2000 provides the data for tourists (visitors with more than one night stay), but does not include same-day visitors within the country. There are two main industry classifications for TSA; the tourism industry and non-tourism industry. Within the tourism industry, there are also two sub-categories, the tourism characteristic industry and the tourism connected industry. Fig. 1 illustrates the developed tourism specific TRAVELTHAI database.

The basic structure of the THORANI coefficient data file adapted from Horridge (2003) is represented in Fig. 1 with column headings showing the various demands of economic agents. There are 8 types of demanders: (1) domestic producers for i industries (2) investors for i industries (3) household for H groups, here assumes one household (4) exports (5) government demands (6) inventory demands (7) inbound tourist demands, and (8) domestic tourist demands. It could be easily seen that the major difference of the THORANI from the ORANI-G is the specific incorporation of inbound tourist demands and domestic tourist demands listed in (7) and (8). The structure of the purchase for source specific commodities made by each demander above is shown in the entries for each column. V1BAS represents the purchase of domestic producers upon commodities either domestically produced or imported from overseas to use as inputs for its output production. V2BAS is the inputs purchased for capital creation, V3BAS denotes the household consumption, V4BAS is the export, V5BAS represents the commodities the government purchases from locals and imports and V6BAS is the inputs remaining in inventory. Commodities purchased by inbound tourists and domestic tourists are shown

Table 2
Notation of variables in the stylised model.

Variables	Notations	In Eq.	Dimension
I. Endogenous variables			
A3G(i)	Household preferences corresponding to ACG(q)	40	C
AWR	Slack in wage-determination equation	39	1
A3(i)	Household preferences with respect to good i	40	C
A4(i)	Slack in export-demand function for i	9	C
A8(i,s)	Slack in domestic tourism demand function for (i,s)	14	CxS
CAD	Current account deficit	35	1
CG(q)	Consumption in qth group of commodities	42	Q
CPI	Consumer price index	25	1
GDP	Gross domestic products	29	1
GNP	Gross national products	36	1
EROR(j)	Expected rate of return in industry j	33	I
IKRATIO(j)	Ratio of investment to capital in industry j	31	I
K + (j)	End-of-year stock of capital in industry j	32	I
KTOT	Total start-of-year capital stock	28	1
L(j)	Employment in industry j	4	I
LTOT	Total employment	27	1
NFLF+	End-of-year net foreign liabilities in foreign currency	34	1
PI(j)	Asset price of capital in industry j	7	I
PSD	Public sector deficit	38	1
P1	Basic prices of domestic commodities	22	C
P2	Basic prices of imported commodities	21	C
P31, P32	Vectors of household purchasers' prices (2 sources)	8	CxS
P7	Price of inbound tourism bundle	13	1
P8(s)	Price of domestic (national) tourism bundle	16	S
Q(j)	Rental rate on capital in industry j	4,5	I
T4(i)	Power of tax on exports of commodity i	24	C
W	Wage rate	26	1
X0(i,1,j)	Output of commodity (i,1) by industry j	1	CxI
X0COM(i)	Total output of commodity (i,1)	2	C
X0IMP(i)	Total imports of commodity i	19	C
X1(i,s,j)	Input of (i,s) to production in industry j	3	CxSxI
X1TOT(j)	Activity level in industry j	1	I
X2(i,s,j)	Input of (i,s) to j's capital creation	6	CxSxI
X2TOT(j)	Investment in industry j	6	I
X3(i,s)	Household consumption of commodity (i,s)	8	CxS
X3MAR(k,s, i)	Margin use of domestic good i in facilitating the flow of (k,s) from producers & ports of entry to households	13	CxSxC
X4(i)	Exports of commodity i	9	C
X5(i,s)	Government demands of commodity i	10	CxS
X7(i)	Inbound tourists' demand for commodity i	11	C
X7TOT	Inbound tourists' demand bundle	11	1
X8(i,s)	Domestic tourists' demands for commodity (i,s)	14	CxS
X8_S	Domestic (National) tourists' demand bundle	15	1
X8TOT(s)	Domestic (National) tourists' demand for bundle (s)	15	S
Total number of endogenous variables: (CxSxC) + 2(CxSxI) + (CxI) + 4(CxS) + 8I + 10C + Q + 2S + 13			
II. Exogenous variables			
AC	Aggregate propensity to consume	37	1
K(j)	Start-of-year capital stock in industry j	30	I
NFLF	Start-of-year net foreign liabilities in foreign currency	34	1
WRlag	Real wage rate in previous year	39	1
WRflag	Forecast for real wage rate in previous year	39	1
WRf	Forecast for real wage rate	39	1
LTOTf	Forecast for total employment	39	1
TM(i)	Power of tariff on imports of commodity i	21	C
T3(k,s)	Power of tax on household consumption of good (k,s)	23	CxS
T7(i)	Power of tax on inbound tourism of commodity i	38	C

Table 2 (*continued*)

Variables	Notations	In Eq.	Dimension
T8(i)	Power of tax on domestic tourism of commodity i	38	C
TRANSFERS	Transfers from the public sector to households,e.g., unemployment benefits and interest on the public debt	38	1
PM(i)	Foreign currency c.i.f. price of imports of commodity i	21	C
ROIF	Rates of interest or dividends applying to NFLs	35	1
Φ	Exchange rate	21	1
C	Total household expenditure	37	1
WR	Real wage rate	26	1
PE(i)	Foreign-currency price of exports of commodity i	22	C
All the A's	Potential slack and variables used to represent shifts in technology and preferences (except AWR, A4(i), A3G(i) and A3(i) for all i)		(CxSxI) + Q + 4C + 5I + S + 4
Total number of exogenous variables: (CxSxI) + (CxS) + Q + 9C + 6I + S + 15			
III: Other notations			
C	Number of commodities (40 commodities in the study)		
I	Number for industries (40 industries in this study)		
S	Number of sources (domestic and imported)		
Q	Number of commodity groups for which data on Household consumption are available		
D(j)	Depreciation rate in industry j, treated as a parameter		
G(q)	Set of industries in the group q		
All the μ's	Functions		
α	Positive parameter		

in V7BAS and V8BAS. Margins and commodity taxes are shown in the next two rows. Margins (M) are the mark-ups required for transferring the commodities from the sources to the end-users. V1MAR to V8MAR represent the margins marked up upon the basic value of the commodities purchased by each demander whereas V1TAX to V8TAX show the commodity taxes each demander pays at purchase. Domestic producers also need to hire and purchase three primary factors comprising labour, capital, and land for their output production. Other costs represent the incurred costs of holding inventories and miscellaneous production costs. V1LAB shows the payment for labour. Rents for capital and land are V1CAP and V1LND respectively. V1OCT represents other costs. The dynamic mechanism for CGE modelling normally deals with five more features to convert the simple comparative static version into the dynamic version of TRAVELTHAI: (1) investment and capital accumulation (2) treatment of foreign liabilities (3) wage adjustment (4) government accounts and (5) accounts with the rest of the world. This study incorporates these main features by tradition as fully described in MONASH (Dixon & Rimmer, 2002), with the main difference for the foreign assets and liabilities, instead, the study follows MyAGE model (Giesecke & Tran, 2010) by making this feature to be net foreign liabilities (Fig. 1).

Regarding the elasticities of substitution between primary factors (labour, capital and land), THORANI and TRAVELTHAI follow CAMGEM with the different values across industries. The substitutions between workers are priori set as 0.5 for all industries. This parameter will be altered when dealing with more types of labour in TRAVELTHAI. Armington elasticities are set as 2.0 for all cases, PARA has estimated with the values of 69 commodities centered around 1.0–2.0. Output sigma is set 0.5 for all industries.

The Frisch parameter is a negative reciprocal of the share of supernumerary expenditure in total household expenditure (see details in Dixon et al., 1982). This study set it at −3.696399. This study follows Wattanakuljarus (2006) for the values of EPS or household expenditure elasticities. Export demand elasticities are set as 4 for all commodities. Only Agriculture is set 0.1 for individual export commodity. Inbound tourist collective elasticity is set to be 4.

The balance check is necessary to prevent any error occurring along the process of database construction. Costs equal to sales conditions must be satisfied. Output of the domestic production must

		Absorption Matrix							
		1	2	3	4	5	6	7	8
		Producers	Investors	Household	Export	Government	Changes in Inventories	Inbounded Tourism	Domestic Tourism
	Size	← I →	← I →	← H →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Basic Flow s	CxS	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS	V7BAS	V8BAS
Margins	CxSxM	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	0	V7MAR	V8MAR
Commodity Taxes	CxSxT	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	0	V7TAX	V8TAX
Labour	O	V1LAB							
Capital	I	V1CAP							
Land	I	V1LND							
Production Taxes	P	V1PTX							

	MAKE	Import Duty
Size	← i →	← 1 →
C	MAKE	V0TAR

	Size	Frisch	Size	Flag Export
		← 1 →		← 1 →
Misc Parameters	H	FRISCH	C	ISINDIVEXP

	Size	Inbound Elasticity	Size	Dom Tour Armington
		← 1 →		← 1 →
Tourism Elasticities	I	Tour_Elas	S	SIGMA8

	Size	Primary Factor Sub	Output Substitution	OCC Substitution
		← 1 →	← 1 →	← O →
Elasticity	I	SIGMA1 PRIM	SIGMA1 OUT	SIGMA1 LAB

	Size	Collective Export	Size	Individual Export	Intermediate Armington	Investment Armington	Household Armington	Expenditure Price
		← 1 →		← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Elasticity	1	EXP_ELAST_NT	C	EXP_ELAST	SIGMA1	SIGMA2	SIGMA3	EPS

S = Number of Sources (2)
T = Number of Commodity Taxes (5)
O = Number of Occupations (1)
P = Number of Production Taxes (2)
C = Number of Commodities (40)
H = Number of Households (1)
I = Number of Industries (40)
M = Number of Margins (6)

	Size	Initial income tax rate on L, T	Initial income tax rate on L, T, Base	Initial income tax rate on L, T-1	Initial income tax rate on L, T-1,
Taxes		← 1 →	← 1 →	← 1 →	← 1 →
Dynamic Parameters	I	TAXL_R@1	TAXL_R@1_F	TAXL_R@2	TAXL_R@2_F

	Size	Min/Trend IK ratio	Max/Trend IK ratio	K Supply Curve	Trend IK ratio	Capital stock	Lagged Investment	Depreciation
K stock	Size	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Dynamic Parameters	I	K_GR_MIN	K_GR_MAX	COEFF_SL	TREND_K	QCAPATT_B	QINV_BASE	DEP

	Size	Dom Govt Debt, Initial	NFL Govt Start year, base	NFL Govt End year, base	NFL Priv Start year, base	NFL Priv End year, base	Interest rate foreign debt, public	Interest rate foreign debt, priv
NFL	Size	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Dynamic Parameters	I	DDEBT ISSUE_B	FDAT TG_B	FDAT TG_1_B	FDAT TP_B	FDAT TP_1_B	ROI FOREIGN_G	ROI FOREIGN_P

		Initial real pre-tax wage, T	Initial real pre-tax wage, T, Base	Initial real post-tax wage, T	Initial real post-tax wage, T, Base	Initial real pre-tax wage, T-1	Initial real pre-tax wage, T-1, Base	Initial real post-tax wage, T-1	Initial real post-taxwage, T-1,
Wage	Size	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Dynamic Parameters	I	RWAGE@1	RWAGE@1_F	RWAGE@1_PT	RWAGE@1_PT_F	RWAGE@2	RWAGE@2_F	RWAGE@2_PT	RWAGE@2_PT_F

		Slopes of K Supply Curve	Max K grow th rate	Level CPI Base	Lagged Level of CPI Base	Adjusts Dum_year1	Slope of L Supply Curve	Pub sector deficit to GDP, Base	Pub sector debt to GDP, Base
Misc	Size	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →	← 1 →
Dynamic Parameters	1	SMURF	DIFF	LEV_CPI_B	LEV_CPI_L_B	ADJDUM YEAR1	LAB_SLOPE	R_DEF GDP_B	R_PSD GDP_B

Fig. 1. TRAVELTHAI database in full format.

be equal to the total demand and the value of output by each industry must equal the total production cost. It is noteworthy here that this study checked the THORANI data file and performed the homogeneity test with the comparative static THORANI model, which is theoretically based on the

ORANI-G model as the key condition before layering the dynamic mechanisms and adding some other special features to develop it as the TRAVELTHAI (see the test in Horridge, 2003). These include, for example, additional dimensions of indirect taxes and subsidies and regional extensions.

Model closure

This section describes demand and supply shocks and discusses policy and forecast closures. Table 3 summarises external shocks given to TRAVELTHAI. For the behavioural effects, the information obtained in this study is from Ministry of Tourism and Sport (MOTS) and TAT. Inbound visitor arrivals were expected to experience a sharp decline of five percent whilst national visitors (domestic residents including outbound tourists) were assumed with the overall decrease of fifteen percent. The calculation of the sizes of the sub-total shocks for resource loss effects was based on the information obtained from the Labour Force Survey, Business and Industrial Census and Population Census of the National Statistical Office (NSO), the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), the Land Development Department, and the Ministry of Agriculture and Co-operatives (MOAC). Calculation for the losses in labour productivity was based on an overall decline of 9.6 percent for 2011 given by the Bank of Thailand, but the figures varied by industry. It was assumed that, for this 'national (and top-down)' and 'annual' type of model, the flood affected the labour productivity of 2011 for the whole period and the country as a whole; and the model sub-

Table 3
Summary of the effects of flood as tourism setbacks.

External shock				Notes and assumptions
Demand side: behavioural shocks				
Variable	Inbound tour	Dom tour		
Size in percentage	−5%	−15%		Flood lowered both domestic and inbound tourism demands
Supply side: resource loss shocks				
Sector	Labour	Capital	Land	Flood damaged factors of production
1: Accommodation	0.14	−0.30	–	Mixed effects as locals moved out of houses to stay in high-rise accommodation or out to unaffected areas
2: 2nd home	0.00	−0.30	–	Same as Sector 1
3: Restaurant	0.32	−0.30	–	MOTS estimation
4: Railway	−0.23	−0.30	–	Partly operable
5: Road	−1.29	−0.30	–	Inoperable in many affected areas, became canals
6: Waterway	−0.19	−0.30	–	Routing changed and partly turned to charity help
7: Air service	−0.96	−0.30	–	Don Muang Airport was inoperable. Domestic route moved to Suvannabhumi International Airport
8: Transport serv.	−0.24	−0.30	–	Supporting services changed; turned to charity help
9: Transport equip	−0.03	−0.30	–	Mixed effects as waterway-related devices in demand
10: Travel agent	−0.16	−0.30	–	Inoperable for locals of affected area; some operated outside
11: Cultural serv.	−0.08	−0.30	–	Inoperable for locals of affected area; some operated outside
12: Sporting serv.	−0.02	−0.30	–	Inoperable for locals of affected area; some operated outside
13–18: TC	Varied	−1.36	–	Assumes partial effects on Tourism out of total
19–27: TC	Varied	−1.36	–	Assumes partial effects on Tourism out of total
28–32: TC	Varied	−1.75 to 0.00	–	Assumes partial effects on Tourism out of total
33–40: NT	Varied	−2.08 to −0.89	−9.05*	Indirect shocks from Non-Tourism to Tourism

Source: Author's calculations and assumptions. Sizes of shocks are concerned with regional shares.
Note: Sectors 1–12 are direct-tourism sectors (DT). Sectors 13–32 are tourism-connected industries (TC). Sectors 33–40 are non-tourism sectors (NT).
* For land, only Sector 33 of NT was given the shock for agricultural land of -9.05 percent.

sequently perceived the effect as such. For the capital damages and losses, the estimation from ESCAP was used to calculate the percentage decreases in capital from the earlier year. For losses, this study needed to assume the degree of severity according to the availability of flood data.

The closures for the tourism tax cut simulation were adapted from the policy closures discussed in Dixon and Rimmer (2002). The exogenous variables were technical changes and shifters with the main external shock of a half percentage cut of the power of tax for inbound tourism introduced in addition to those demand and supply shocks (Table 3). In this policy closure, the short-run determination of investment is turned on and the rates of return are endogenised. The consumer price index is a numeraire. Table 4 summarises the closures.

Results

In this study, the policy simulation was aimed to examine the effects of a uniform half-percentage tax cut for inbound tourism on the macro-economy and the tourism sector. The tax incentive proposal acted as an inducement for inbound tourists to travel in Thailand in spite of the flooding and its aftermath. The 'flooding without any tax incentive' scenario is compared with the 'flooding with tax incentive for inbound tourism' scenario. Tables 5 and 6 show the deviations from baseline of macro and sectoral results of the flood both with and without tax incentive for inbound tourism.

Macro simulation results

The tax cut simulation showed that a half percentage cut causes the increase of 0.005 percent of real GDP relative to the baseline (Table 5). It suggested that the external shock of the tax incentive generally decreases the relative tax, and thus caused associated price decline by 1.778 percent. This would increase inbound visitors' demand by 5.220 percent of the real inbound visitors' demand accordingly. Higher real inbound tourism led to a 3.415 percent increase in travel receipts.

The sectoral output and related factors of production, especially direct-tourism industries, were greatly affected by higher inbound tourism demand. Table 6 illustrates that outputs of direct-tourism industries rose by 0.863 percent. The compositions of factors of production followed the output production. In response to the tax policy, real wage increased by 0.134 percent. With exogenous capital, workers were hired more in direct-tourism industries by 2.237 percent, and less in tourism-connected industries by 0.055 percent and non-tourism industries by 0.174 percent (Table 6). Output growth in the two industries decreased by 0.019 percent and 0.064 percent, respectively.

With fixed aggregate employment but allowing inter-sectoral movement, no change in technology, and exogenous capital, higher wage rate resulted in a rising ratio of capital to labour, which in turn, enhanced the terms of trade by 0.115 percent. The result showed a decrease in export prices by 0.342 percent but less than the fall in import prices. Exchange rates appreciated by 0.473 percent relative to the baseline. Rising inbound tourism demand would lead to higher prices of tourism products and real appreciation. Inbound tourism expansion induced higher demand for local currency. It was

Table 4
Status of some variables under the policy and forecast closures.

Variables exogenous in forecast closure, but endogenous in policy closure	Variables endogenous in forecast closure, but exogenous in policy closure
• Industry shift, ratio of I/K	• *Industry specific K growth shifter, yr-to-yr*
• Expected rate of return	• *Shifters in K accumulation equation for year t-1*
• Consumption to GDP ratio	• *National propensity to consume out of GNDI*
• Real wage	• *Shifter, sticky wage post-tax*
• Capital accumulation shifters	• *Ratio of investment to capital, shift*
• Change in private NFL	• *Shifts in private foreign debts*
• Change in public NFL	• *Shifts in public foreign debts*
• Change in domestic public debt	• *Shifts in domestic public debts*
• Change in inventories demand	• *Shifts in inventories demand*

Source: Adapted from Dixon and Rimmer (2002).

Table 5
Deviations from baseline of macro results with tax incentive (2012).

	External Shocks	With tax incentive		Without	Difference
	Endogenous variables	Tax Cut (t)	Annual total (w)	Annual total (w/o)	(w) – (w/o) Δ
1	Real GDP	0.005	−3.368	−3.374	0.006
2	Real aggregate consumption	−0.085	−2.025	−1.939	−0.086
3	Real aggregate investment	0.194	−6.089	−6.281	0.192
4	Real government spending	0.000	0.000	0.000	0.000
5	Real exports	−0.441	−3.980	−3.528	−0.452
6	Real imports	0.040	−3.467	−3.507	0.040
7	Real inbound tourism	5.220	3.386	−2.007	5.393
8	Real domestic tourism	0.000	−15.000	−15.000	0.000
9	Real outbound tourism	0.690	−16.058	−16.725	0.667
10	Travel receipts	3.415	1.642	−1.918	3.560
11	Travel expenses	0.357	−16.266	−16.609	0.343
12	Domestic tourism revenue	0.357	−16.266	−16.609	0.343
13	Aggregate employment	0.000	0.000	0.000	0.000
14	Real wage	0.134	5.516	5.377	0.139
15	Real devaluation	−0.384	−1.340	−0.976	−0.364
16	Terms of trade	0.115	1.027	0.908	0.119
17	*Change* in balance of trade	−36.969	−67.495	−29.120	−38.375
18	*Change* in balance of travel	22.889	49.542	25.587	23.955
19	Real GNP	−0.083	−1.755	−1.666	−0.089
20	Propensity to consume to GNP	0.370	−16.735	−17.087	0.352
21	GDP Price index	−0.090	1.814	1.910	−0.096
22	Aggregate investment price index	−0.047	−1.607	−1.549	−0.058
23	Exports price index	−0.342	1.549	1.887	−0.338
24	Imports price index	−0.473	0.512	0.975	−0.463
25	Inbound tourist price index	−1.778	−1.725	0.081	−1.806
26	Outbound tourism price index	−0.393	−0.041	0.345	−0.386
27	Domestic tourism price index	0.392	−1.491	−1.882	0.391
28	Average capital rental	0.095	−4.772	−4.859	0.087
29	Average land rental	−0.874	6.496	7.424	−0.928
30	Exchange rate	−0.473	0.512	0.975	−0.463

Source: Simulation results.

expected that a decrease in export price would increase export volumes accordingly; however, real exports dropped by 0.441 percent. Clearly, the appreciation of the Thai Baht dominated the results. Hence, this explained the reason why real exports fell despite a decrease in export prices in local currency. Foreign currency export prices became more expensive through exchange rate appreciation. The rise in terms of trade and activity level (with fixed technical change and tariff neutrality) induced more imports. Real imports increased by 0.040 percent accordingly.

The appreciation of exchange rate generally made it cheaper for outbound tourism. There was a decrease in price for outbound tourism by 0.393 percent whereas the price for domestic tourism increased by 0.392 percent. Outbound tourism rose by 0.690 percent accordingly. Domestic tourism was determined externally.

There was a real appreciation of 0.384 percent under the tax cut simulation implying that the growth of import c.i.f. price was less than the growth of GDP price index. The result showed that GDP price index decreases by 0.090 percent.

The aggregate investment increased by 0.194 percent reflecting a higher rate of return. ROR is shown higher from a fall in the general price of investment by 0.047 percent and a rise in rental price by 0.095 percent. The positive effect of the tax cut on investment and inbound tourism outweighed the trade deficit and a decline in consumption, since GDP slightly increased. Household consumption was determined by average propensity to consume (apc_gnp) and gross national products (GNP). The drop in GNP by 0.083 percent led to a decrease in real private consumption by 0.085 percent as reported in Table 5.

Table 6
Deviations from baseline of sectoral results with tax incentive (2012).

	External Shocks Endogenous variables	With tax incentive Tax cut (t)	 Annual total (w)	Without Annual total (w/o)	Difference (w) – (w/o) Δ
1	Direct-tourism industries—Output	0.863	−1.994	−2.898	0.904
2	Tourism-connected industries—Output	−0.019	−3.325	−3.307	−0.018
3	Non-tourism industries—Output	−0.064	−3.483	−3.418	−0.065
4	Agricultural sector—Output	−0.185	−3.722	−3.564	−0.158
5	Manufacturing sector—Output	−0.167	−4.004	−3.833	−0.171
6	Services sector—Output	0.104	−2.988	−3.097	0.109
7	Direct-tourism industries—Labour	2.237	−4.278	−6.495	2.217
8	Tourism-connected industries—Labour	−0.055	−4.221	−4.176	−0.045
9	Non-tourism industries—Labour	−0.174	1.567	1.743	−0.176
10	Agricultural sector—Labour	−0.538	−7.125	−6.607	−0.518
11	Manufacturing sector—Labour	−0.490	0.206	0.691	−0.485
12	Services sector—Labour	0.266	0.418	0.156	0.262
13	Direct-tourism industries—Capital	0.000	−0.295	−0.304	0.009
14	Tourism-connected industries—Capital	0.000	−1.092	−1.090	−0.002
15	Non-tourism industries—Capital	0.000	−1.284	−1.282	−0.002
16	Agricultural sector—Capital	0.000	−0.558	−0.558	0.000
17	Manufacturing sector—Capital	0.000	−1.325	−1.323	−0.002
18	Services sector—Capital	0.000	−1.149	−1.150	0.001

Source: Simulation results.

Tax incidence

The annual total with tax incentive (w) revealed some boons and banes over the annual total without tax incentive (w/o). The difference of the two scenarios is compared as shown in the last column in Tables 5 and 6.

The tax cut as an incentive for the inbound tourism created positive effects on real GDP and its composition. The annual total GDP with tax incentive (w) was greater than that of without tax incentive (w/o) scenario by 0.006 percent. The effects on the GDP composition were also slightly different comparing the tax cut sub simulation and the difference of (w) – (w/o) but all trending in the same direction. Real consumption and real exports were worse off under the tax cut with the decrease by 0.086 percent and 0.452 percent, respectively. These findings unlike the work of X. Meng (2014), who found that tax reduction would induce higher exports and unfavourably influence the terms of trade. The reason could be due to the use of industry specific tax policies targeted at the inbound tourism sector in this study, which greatly differs from the GST tax simulation of X. Meng (2014). Obviously, GST would affect prices across industries and hence significantly push down the value of the local currency. On the contrary, tax cuts on inbound tourism may be less effective in lowering export prices leading to opposite effects on the terms of trade. This highlights the importance of the appreciation of the Thai Baht. Moreover, Thailand and Singapore have different severity degrees of tourism crises, economic structure and economic development levels; this would also help explain the differences.

Under the tax cut scenario, the effect of the policy was an increase in real inbound tourism. This resulted in the annual total real inbound tourism rising by 3.386 percent, whereas the annual total without tax cut decreased by 2.007 percent. This gave the difference of a positive 5.393 percent. Travel receipts increased accordingly by 3.415 percent from the tax cut, which contributed to an increase in the annual total of 1.642 percent, in contrast to a decrease by 1.918 percent in the annual total without tax cut. The difference of (w) – (w/o) was thus about 3.560 percent. Consequently, there was an increase in the annual total balance of travel (49.542 billion Baht) with the tax cut compared with a surplus of only 25.587 billion Baht under the without tax cut case.

When considering the sectoral impacts, the tax cut generates more outputs in the direct-tourism industries than others, as expected. Nevertheless, an increase in outputs of 0.904 percent was not enough to make a positive outcome for the annual total (w). This was in line with the gap (2.217%) between the numbers of labour hired of the sector under two scenarios. In the difference (w) – (w/o) column of Table 6, it showed 0.045 and 0.176 percent falls in sectoral employment for tourism-connected industries and non-tourism industries, respectively. Both were worse off as labour moved to direct-tourism industries. Their output productions followed the fall in sectoral employment with a drop by 0.018 percent for tourism-connected industries and by 0.065 percent for non-tourism industries. Capital in direct-tourism industries decreased by 0.295 percent for annual total with tax cut accordingly. Tourism-related and non-tourism industries experienced larger declines by 1.092 and 1.284 percent, respectively. The difference (w) – (w/o) was positive by 0.009 percent for direct-tourism industries. The results were based on the assumption that there were no changes in technology, fixed resources such as capital but transferable between sectors in the short run. Hence, the increase in output was caused by an increase in employment and resource reallocation.

For macro-sectoral wise, the tax cut gave a positive value of 0.104 percent more to the output production of services sector, of which marked a decrease in the annual total with tax cut of 2.988 percent compared to that of 3.097 percent in the annual total without tax cut. This made the difference of 0.109 percent between the two. The agricultural sector and manufacturing sector experienced the declines in their output production by 0.185 percent and 0.167 percent from the tax cut. This made the annual total (w) with the further declines by 3.722 and 4.004 percent for both sectors, respectively. Hence, comparing the annual total without tax cut (w/o), there were further differences by −0.158 percent and −0.171 percent for both sectors. This may be due to the fact that labour moved to the services sector by 0.266 percent from the manufacturing sector (−0.490 percent) and agricultural sector (−0.538 percent) because of tax cut. The annual total (w) marked a drop in employment of 7.125 percent in the agricultural sector whereas employment in the manufacturing and service sectors increased by 0.206 percent and 0.418 percent, respectively. The differences of (w) – (w/o) showed the declines in employment by 0.518 and 0.485 percent for the agricultural and manufacturing sectors whilst the service employment rose by 0.262 percent.

After effect forecast growth to 2020

The after-effect tax cut forecasts growth of the deviations relative to the base case forecast from 2012 to 2020, where the results showed just a slight difference in most of the variables from the without tax cut scenario. Only real inbound tourism and tourism receipts changed drastically upon comparison of the two scenarios as shown in Fig. 2. For real inbound tourism, the after-flood growth was negative for the without tax cut scenario in the short run and recovers later on to be less negative in the long run. Under the tax cut scenario, the deviation from the base case forecast is positive and continues to grow further in the long run. Tourism receipts also demonstrated quite a similar growing pattern, only with a slight drop in the short run due to the flood. Nonetheless, the effect on the deviation of real GDP was very small and it revealed the same trend for both tax cut and without tax cut scenarios. In sum, the industry specific tax cut measure appears to be effective in inducing inbound tourism flows but its long term effect on the whole economy is marginal.

Conclusion

This study provides additional empirical evidence on tourism taxation and theoretical insights on the relationship between tourism tax cut and various macroeconomic variables. The proposed policy is an effective short-run flood remedy. Policymakers should consider alternative measures to achieve long term policy goals. The issues presented in this study can be applied to other countries experiencing losses from floods to a certain extent based on the Thai experience. It is possible that other studies would portray dissimilar findings strongly depending on disaster severity, economic importance of tourism sector, economic structure and the level of economic development.

Given the complexity of CGE modelling, tourism social science has rarely been studied in a CGE framework. This paper offers an innovative approach to studies in the social sciences. The analysis is unique and original, as this was the first time that the newly designed dynamic CGE model was

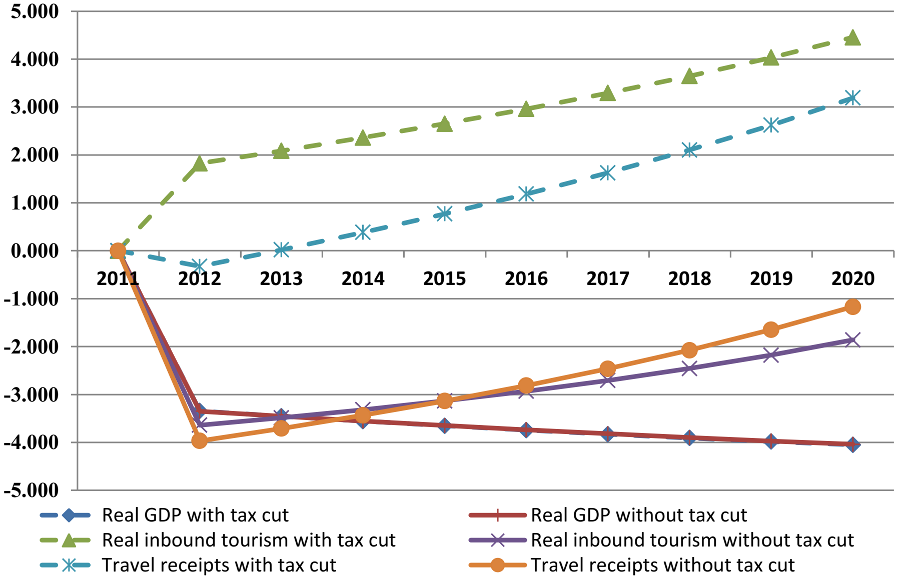

Fig. 2. % deviations from base case forecasts of real GDP, real inbound tourism, and tourism receipts.

employed for analysis of tourism taxation as a recovery measure for floods in a developing country context. In this paper, TRAVELTHAI, a dynamic computable general equilibrium (CGE) model for the Thai economy, was constructed for the analysis of economic impacts of tourism tax cuts as a response to the 2011 flood. It is argued that examining the impacts of the tourism setbacks on the Thai tourism and economy can be immensely improved by employing a dynamic CGE model which is capable of forecasting and analysing policy. The developed policy simulation is an example of model applications to tax policy and the effects of natural disasters such as floods. In the frail period of tourism setback like flooding, authorities are generally in search of policy measures to soothe flood affected businesses and the economy. This kind of policy simulation helps justify further policy recommendations.

The simulation results of forecast and policy scenarios illustrate that the inbound tourism tax cut could be presented as an effective incentive and alleviation program, effective in the short run. Tourism-related industries, especially direct-tourism, are better off, but at some expense of other industries. For the after effect tax cut forecast growth to 2020, only real inbound tourism and tourism receipts have considerable changes compared to the without tax cut scenario. Nonetheless, the effect on the deviation of real GDP is negligible.

Optimal tax policy for a developing country like Thailand is still in its initial stage of development. There are many challenges for comprehensive tax reform, for example, intricacy of tax structure and system. This study only investigates implications of reduction in the VAT on tourism goods and services which could be beneficial for tax reform efforts. However, other fiscal measures should be thoroughly and objectively assessed since they would affect macroeconomic stability and performance as well as the tourism industry. It is recommended that research on long term incentives such as investment measures, tax refunds, and/or transfers could be pursued to examine all inclusive effects other than the tourism focused taxation measure. Such what-if analysis in many policy scenarios would be helpful to understand the trade-off amongst economic agents and to minimise any incurring costs. There is a great need for systemically and inclusively designed fiscal policies coping with natural disasters in developing countries, however, the issue has not received much attention from researchers. This research's gaps are worth further investigation.

Another important contribution here is the explicit specification of tourism demand. The developed TRAVELTHAI contributes to our theoretical understanding. It integrates and provides information on three types of tourism, inbound, domestic and outbound. Hence, complete solutions for all aspects of the impacts could be achieved. Analysis of macroeconomic and sectoral implications of external shocks and policy changes enhances our understanding of appropriate government responses to tourism disasters. The core database for TRAVELTHAI using Tourism Satellite Accounts of Thailand (TSA) was constructed. This seeks to formulate the extensive data set which represents the structure and the relationships between tourism and other industries. Compiled with other important data, the calibration could be carried out further. The dynamic CGE model used in this research could be useful in helping researchers better evaluate tourism tax cut impacts and design fiscal interventions to fix problems caused by floods in other countries. The model is by far the best approach to evaluating impacts and analysing policy options (Dwyer et al., 2004).

TRAVELTHAI has certain flexibility concerning its variety of closures. Its structure captures many features of the Thai economy. Like other predecessors of dynamic CGE models, TRAVELTHAI can be applied to a wide range of economic analyses including trade liberalisation, investment and fiscal policies as well as the impacts of pandemics. Moreover, it could be extended to some tourism related areas such as economic efficiency, environmental costs and impacts of tourism, welfare effects of tourism and bottom-up approach for regional applications.

References

Bank of Thailand. (2012). *Balance of payments*. Retrieved from http://www.bot.or.th/Thai/Statistics/EconomicAndFinancial/Pages/index.aspx.

Bird, R. M. (1992). Taxing tourism in developing countries. *World Development, 20*(8), 1145–1158. http://dx.doi.org/10.1016/0305-750X(92)90006-H.

Blake, A. (2009). The dynamics of tourism's economic impact. *Tourism Economics, 15*(3), 615–628. http://dx.doi.org/10.5367/000000009789036576.

Blake, A., Arbache, J. S., Sinclair, M. T., & Teles, V. (2008). Tourism and poverty relief. *Annals of Tourism Research, 35*(1), 107–126. http://dx.doi.org/10.1016/j.annals.2007.06.013.

Blake, A., & Sinclair, M. T. (2003). Tourism crisis management: U.S. response to September 11. *Annals of Tourism Research, 30*(4), 813–832. http://dx.doi.org/10.1016/S0160-7383(03)00056-2.

Chancharat, S. (2011). Thai tourism and economic development: The current state of research. *Kasetsart Journal (Social Sciences), 32*(2), 340–351. Retrieved from http://kasetsartjournal.ku.ac.th/kuj_files/2011/A1110061100224677.pdf.

Chang, C. L., Sriboonchitta, S., & Wiboonpongse, A. (2009). Modelling and forecasting tourism from East Asia to Thailand under temporal and spatial aggregation. *Mathematics and Computers in Simulation, 79*(5), 1730–1744. http://dx.doi.org/10.1016/j.matcom.2008.09.006.

Chen, K., & Yang, H. (2010). Appraising the economic impact of the "opening up to mainland Chinese tourist arrivals" policy on Taiwan with a tourism-CGE model. *Asia Pacific Journal of Tourism Research, 15*(2), 155–175. http://dx.doi.org/10.1080/10941661003629961.

CoPs (2010a). *Maintenance manual of MyAGE: A dynamic CGE model of the Malaysian economy*. Centre of Policy Studies: Monash University.

CoPs (2010b). *Operation manual of MyAGE: A dynamic CGE model of the Malaysian economy*. Centre of Policy Studies: Monash University.

CoPs (2010c). *Theoretical manual of MyAGE: A dynamic CGE model of the Malaysian economy*. Centre of Policy Studies: Monash University.

Dixon, P. B., & Parmenter, B. R. (1996). Computable general equilibrium modelling for policy analysis and forecasting. In H. M. Amman, D. A. Kendrick, & J. Rust (Eds.), *Handbook of computational economics* (pp. 1–85). Amsterdam: Elsevier.

Dixon, P. B., Parmenter, B. R., Sutton, J., & Vincent, D. P. (1982). *Orani: A multisectoral model of the Australian economy*. Amsterdam: North-Holland Publishing Company.

Dixon, P. B., & Rimmer, M. T. (2002). *Dynamic general equilibrium modelling for forecasting and policy: A practical guide and documentation of Monash*. Amsterdam: North-Holland Publishing Company.

Dwyer, L., Forsyth, P., & Spurr, R. (2004). Evaluating tourism's economic effects: New and old approaches. *Tourism Management, 25*(3), 307–317. http://dx.doi.org/10.1016/S0261-5177(03)00131-6.

Dwyer, L., Forsyth, P., & Spurr, R. (2012). Wither Australian tourism? Implications of the carbon tax. *Journal of Hospitality and Tourism Management, 19*(1), 132–147. http://dx.doi.org/10.1017/jht.2012.18.

Dwyer, L., Forsyth, P., Spurr, R., & Hoque, S. (2013). Economic impacts of a carbon tax on the Australian tourism industry. *Journal of Travel Research, 52*(2), 143–155. http://dx.doi.org/10.1177/0047287512461568.

Forsyth, P. (2006). *Estimating the costs and benefits of regional airport subsidies: A computable general equilibrium approach*. Melbourne: Department of Economics and Tourism Research Unit, Monash University.

Forsyth, P., Dwyer, L., & Spurr, R. (2014). Is Australian tourism suffering Dutch disease? *Annals of Tourism Research, 46*, 1–15. http://dx.doi.org/10.1016/j.annals.2013.12.003.

Gago, A., Labandeira, X., Picos, F., & Rodríguez, M. (2009). Specific and general taxation of tourism activities: Evidence from Spain. *Tourism Management, 30*(3), 381–392. http://dx.doi.org/10.1016/j.tourman.2008.08.004.

Giesecke, J. A., Burns, W. J., Barrett, A., Bayrak, E., Rose, A., Slovic, P., & Suher, M. (2012). Assessment of the regional economic impacts of catastrophic events: CGE analysis of resource loss and behavioral effects of an RDD attack scenario. *Risk Analysis, 32*(4), 583–600. http://dx.doi.org/10.1111/j.1539-6924.2010.01567.x.

Giesecke, J., & Tran, N. (2010). *A general framework for measuring VAT compliance rates (General Working Paper No. G-206)*. Melbourne: Centre of Policy Studies, Monash University.
Goeldner, C. R., & Ritchie, B. (2006). *Tourism: Principles, practices, philosophies*. New Jersey: John Wiley & Sons, Inc.
Gooroochurn, N. (2009). Optimal commodity taxation in the presence of tourists. *International Economic Journal, 23*(2), 197–209. http://dx.doi.org/10.1080/10168730902901239.
Gooroochurn, N., & Milner, C. (2005). Assessing indirect tax reform in a tourism-dependent developing country. *World Development, 33*(7), 1183–1200. http://dx.doi.org/10.1016/j.worlddev.2005.04.005.
Gooroochurn, N., & Sinclair, M. T. (2005). Economics of tourism taxation: Evidence from Mauritius. *Annals of Tourism Research, 32*(2), 478–498. http://dx.doi.org/10.1016/j.annals.2004.10. 003.
Horridge, J. M. (2003). *ORANI-G: A generic single-country computable general equilibrium model*. Melbourne: Centre of Policy Studies, Monash University.
Ihalanayake, R. (2012). Economic effects of tourism tax changes in Australia: Empirical evidence from a computable general equilibrium model. *Tourism Economics, 18*(1), 181–202. http://dx.doi.org/10.5367/te.2012.0105.
Jensen, T. C., & Wanhill, S. (2002). Tourism's taxing times: Value added tax in Europe and Denmark. *Tourism Management, 23*(1), 67–79. http://dx.doi.org/10.1016/S0261-5177(01)00067-X.
Khamkaew, T., & Leerattanakorn, N. (2010). *Modelling Thai tourism demand for major destinations: A static and dynamic linear Almost Ideal Demand system approach (Working Paper)*. Chiangmai: Faculty of Economics, Maejo University.
Li, S., Blake, A., & Cooper, C. (2010). China's tourism in a global financial crisis: A computable general equilibrium approach. *Current Issues in Tourism, 13*(5), 435–453. http://dx.doi.org/10.1080/13683500.2010.491899.
Löfgren, H., Harris, L. R., & Robinson, S. (2002). *A standard computable general equilibrium (CGE) model in GAMS*. Washington, DC: International Food Policy Research Institute (IFPRI).
Madden, J. R. (2006). Economic and fiscal impacts of mega sporting events: A general equilibrium assessment. *Public Finance and Management, 6*(3), 346–394.
Mai, Y., Dixon, P., & Rimmer, M. (2010). *CHINAGEM: A Monash-styled dynamic CGE model of China (Working paper No. G-201)*. Melbourne: Center of Policy Studies.
Meng, S. (2014). The role of inbound tourism in the Singaporean economy: A computable general equilibrium (CGE) assessment. *Journal of Travel & Tourism Marketing, 31*(8), 1071–1089. http://dx.doi.org/10.1080/10548408.2014.895693.
Meng, X. (2014). Is a tourism subsidy the best response to the global financial crisis? A short-run CGE simulation for Singapore. *Asia Pacific Journal of Tourism Research, 19*(3), 325–341. http://dx.doi.org/10.1080/10941665.2012.742916.
Narayan, P. K. (2003). Economic impact of the 2003 South Pacific Games on FIJI. *Economic Papers: A Journal of Applied Economics and Policy, 22*(3), 60–73. http://dx.doi.org/10.1111/j.1759-3441.2003.tb01126.x.
NESDB (2012). *Quarterly gross domestic products 2011*. Bangkok: NESDB. Retrieved from http://www.nesdb.go.th/Portals/0/eco_datas/account/qgdp/data3_11/AlltableQ3_2011.xls.
Sugiyarto, G., Blake, A., & Sinclair, M. T. (2003). Tourism and globalization: Economic impact in Indonesia. *Annals of Tourism Research, 30*(3), 683–701. http://dx.doi.org/10.1016/S0160-7383(03)00048-3.
Tourism Authority of Thailand 2012a. *About Thailand*. Retrieved from http://www.tourismthailand.org/about-thailand/.
Tourism Authority of Thailand 2012b. *Tourism statistics*. Retrieved from http://www2.tat.or.th/stat/web/static_index.php.
Verikios, G., McCaw, J. M., McVernon, J., & Harris, A. (2012). H1N1 influenza and the Australian macroeconomy. *Journal of the Asia Pacific Economy, 17*(1), 22–51. http://dx.doi.org/10.1080/13547860.2012.639999.
Wattanakuljarus, A. (2006). *The nationwide economic and environmental impacts of tourism: A computable general equilibrium approach for Thailand*. Retrieved from http://web.idrc.ca/uploads/user-S/11738541401Anan_FReport.pdf.
Wattanakuljarus, A., & Coxhead, I. (2008). Is tourism-based development good for the poor?: A general equilibrium analysis for Thailand. *Journal of Policy Modeling, 30*(6), 929–955. http://dx.doi.org/10.1016/j.jpolmod.2008.02.006.
World Bank (2012). *Thai flood 2011: Rapid assessment for resilient recovery and reconstruction planning*. Bangkok: The World Bank.
WTO (1998). *Tourism taxation: Striking a fair deal*. Madrid: World Tourism Organization.