Global Trade Analysis Project
https://www.gtap.agecon.purdue.edu/

This paper is from the
GTAP Annual Conference on Global Economic Analysis
https://www.gtap.agecon.purdue.edu/events/conferences/default.asp

Tourism Crisis Management: adjusting to a temporary downturn

Adam Blake and M. Thea Sinclair
University of Nottingham, UK

ABSTRACT

There have been many instances where the tourism industry in one or more countries has suffered an unexpected and sudden downturn in demand. Policy makers are faced with the predicament of if and how they should respond to such crises in the absence of research into the relative effectiveness of different responses. The downturn in tourism demand in the United States following September 11 is a particularly vivid example of tourism crisis. If such a downturn is of a temporary nature, government policy tends to be aimed towards reducing the level of adjustment that takes place; if the downturn is judged to be permanent, government policies tend to be aimed towards making adjustment to a new equilibrium less costly. This paper examines the means of measuring the costs of adjustment within a CGE model and assesses how government policy can be most efficiently targeted towards reducing those costs.

We construct a computable general equilibrium model of the US to analyze the effects of the September 11-induced tourism crisis and potential and actual policy responses to the crisis. A CGE model is a useful tool in evaluating tourism crises because it allows tourists to purchase a bundle of commodities, accounts for general equilibrium effects and allows the modeling of government responses to crisis. The model is a static 98-sector model of the US economy, with the specification of 23 types of labor to enable the modeling of employment responses to September 11. Tourism demands are specified as CES functions over a variety of goods and services, with different demands from foreign, domestic, and intermediate business tourists, each of which undertake non-air travel and air travel tourism trips. Shocks are applied to air travel tourism to simulate the effects that September 11 has had on the demand for travel, and the resulting impact on welfare, GDP, employment is calculated. The levels of factor adjustment that take place in the economy are measured. Further to this, the efficiency of federal government measures to counteract the fall in demand for air transport are modeled. The efficiency of various other possible federal government actions is also modeled.

The model is built around a set of data taken from US national accounts sources. The input-output table is derived from the 1997 benchmark input-output table, with additional data on GDP by industry and national income and product account data used to update this table to construct a SAM that represents the US in 2001 without the effects of September 11. Other US national accounts sources are used to construct a matrix of tourist demands, by product and type of tourist.

We find that sector-specific targeted subsidies and tax reductions are the most efficient means of tourism crisis management. The initial federal government responses to the crisis were efficient in counteracting the fall in tourism demand, but were not large enough to fully insulate producers from the effects of that fall. Calls for more general tax relief to tourism and tourism businesses are far less effective at saving job losses in tourism related industries.

CONTENTS

1. Introduction

The contribution of tourism and travel to both industrialized and developing countries is now so great that any downturns in the level of activity in the industry are a cause for concern. The repercussions extend beyond activities directly associated with tourism, notably airlines, hotels and catering, to sectors that supply intermediate or final goods that are purchased by firms and employees in the industry, so that all sectors of the economy are affected to a greater or lesser extent. The general response by tourism and travel-related organizations to significant downturns in tourism demand is to lobby governments to implement a range of policies to offset the downturn. Policy makers are then faced with the difficult decision of what, if any, measures to take, particularly since the implementation of many policy measures is costly and the relative effectiveness of alternative measures differs.

Policy makers are confronted, in particular, by three issues that are relevant to any downturn in tourism activity. The first is the issue of whether the downturn is sufficiently large to merit offsetting measures. Information that is relevant to this issue includes the magnitude of the decreases in income in travel and tourism activities, the dispersion of induced effects across other sectors of the economy and the effects on welfare. The second is the issue of the duration of the downturn. If an economic shock is believed to be long lasting or even permanent, policy makers should concentrate their attention on minimizing adjustment costs as the economy moves towards a new equilibrium. If a shock is believed to be of temporary nature, the concern should be to insulate the economy from the adverse effects of the shock. The third issue concerns the choice of policies for implementation. In this context, policy makers need to evaluate the relative merits of alternative policy responses and consider the combination of policies and rates of relief that is most cost-effective in raising income and limiting adjustment costs.

Tourism demand is particularly sensitive to security and health concerns. The list of cases where tourism demand has taken a sudden and unexpected downturn is long, and includes the effects of the 1991 Gulf War on tourism in the Middle East, the Mediterranean and other European countries, terrorist attacks at Luxor in Egypt in 1997, the Kosovo conflict in 1999, the effects of the foot and mouth disease outbreak in the UK in 2001 and, more recently, the effects of the September 11 terrorist attacks in the US and of terrorist attacks in Bali and Kenya. In most of these cases, where governments have actually recognized the importance of the tourism downturn and acknowledged the need for a policy response, they have operated in an environment where very little research into the merits of offsetting policy responses has been conducted.

The case of the September 11 terrorist attacks in the US is a notable example of the difficult decisions that policy-makers confront. Following those events, falls in income and employment spread beyond travel and tourism throughout the entire US economy. Federal government response was swift, with the Air Transportation Safety and System Stabilization Act (ATSSSA) being passed on September 22. This act provided federal government loans and compensation to airlines, as well as other financial and safety measures. The Travel Industry Recovery Coalition, comprising 25 tourism and travel industry organizations, proposed a Six-Point Plan aimed at restoring the levels of activity in the travel and tourism industry in the US to those existing prior to the September 11 events. The Plan consisted of a series of policy measures covering traveler and workforce tax credits, business loan programs, the extension of allowances for net operating losses, and government and private sector funding for advertising to stimulate travel to and in the US. Government policy makers were faced with the difficult decision of how to respond, given the differing costs and relative effectiveness of the different measures.

The choice of policy responses should, ideally, be based on prior estimation of the magnitude and dispersion of the impact of the downturn and of the impact of alternative policy measures

across different sectors of the economy. Few other studies have quantified the effects of alternative policy responses to tourism crises from an economic perspective, although there have been a number of non-economic studies of tourism, terrorism and political instability. These include the review by Sonmez (1998) and the earlier volume by Pizam and Mansfeld (1996). More recently Sonmez, Apostolopoulos and Tarlow (1999) discussed the management of the impact of terrorism from the perspective of organizing crisis management task forces and preparing information. Cross-cultural differences in travel agents' perceptions of political instability have been examined by Seddighi, Nuttall and Teocharous (2001).

Estimation of the economic impact of changes in the demand for travel and tourism has, typically, been undertaken using input-output (IO) analysis (for example, Fletcher and Archer 1991; Archer, 1995; Archer and Fletcher, 1996; Henry and Deane, 1997). IO modeling is a well-established means of taking account of the inter-sectoral impacts of different types of exogenous 'shocks' to an economy. However, IO modeling relies on a number of assumptions, such as fixed prices and wages, which may not be appropriate for the circumstances of specific economies. Some of these assumptions have been relaxed in a number of studies, for example Andrew (1997), Wagner (1997), Jensen and Wanhill (2002). An alternative methodology that has been introduced to allow for flexibility in the prices of factors of production and final goods, as well as consistency of income and expenditure, is computable general equilibrium (CGE) analysis. To date, this methodology has been used to examine the economic impacts of tourism and travel in only a small number of countries, for example Hawaii (Zhou, Yanagida, Chakravorty and Leung 1997), Australia (Adams and Parmenter 1995; Dwyer, Forsyth, Madden and Spurr 2000), Indonesia (Sugiyarto, Blake and Sinclair 2002), Spain (Blake 2000), the UK (Blake, Sinclair and Sugiyarto forthcoming), and in more general cases (Alavalapati and Adamowicz, 2000). It has a strong track record in the field of international trade and development (reviewed by Deverajan, Lewis and Robinson 1982; de Melo 1988; Shoven and Whalley 1992; François and Reinert 1997).

IO modeling typically takes a change in final demand such as an increase (or decrease) in expenditure by tourists and traces the effects of this change through an economy, with each expanding (contracting) sector's demands for intermediate products leading to further expansion (contraction) in other sectors. The technique is often extended by allowing induced effects, following increases (reductions) in household and government income, to lead to increases (reductions) in private consumption and government expenditure. Crucially there is no constraint on the employment of factor services such as labor and capital, which are available in any quantity at unchanged wage rates. Prices are assumed to be constant because wage rates do not change, and also because of the simple production and competitive structures inherent in IO models. In reality, however, wages and prices do change when an economy adjusts to a substantial shock. After September 11 there was noticeable discounting of prices by tourism firms not only in the US but also around the world. Some workers who become unemployed as a result of a shock take up lower-paid employment in other sectors of the economy. Workers who retain their jobs may experience falls in average wages through immediate reductions of overtime working and, in the longer-term, through smaller annual wage increases or (more rarely) through actual wage decreases. Wage and price flexibility is an inherent part of the mechanisms through which an economy adjusts to a shock, and therefore it is important to include such flexibility when modeling the effects that a shock will have. IO analysis, by ignoring wage and price flexibility, ignores the ability of workers to find employment in other industries and therefore overestimates the effect that a demand reduction will have on GDP and unemployment.

IO models also have difficulties in modeling the effects of policies. The main focus of these models is to trace final demand shocks through to GDP, so they are incapable of modeling changes in tax rates or subsidies. CGE models, by allowing a difference between the price that consumers pay for products and the price that producers receive for producing them, can

incorporate taxes and can allow these tax rates to be changed. Therefore, while an IO model could (under the restrictive assumptions of such models) examine the effects of a change in government expenditure, it could not examine the effects of a change in tax rates or subsidies. The ability of governments to give targeted subsidies or tax reductions to specific industries is a significant form of response to tourism crises, and therefore needs to be incorporated into a model that seeks to examine government responses.

CGE modeling is therefore well suited to examining the economic impacts of exogenous changes in the demand for travel and tourism, such as those associated with acts of terrorism, as well as the impacts of a range of related policy measures. As in the case of the Six-Point Legislative Plan in the USA, these include alternative types of government expenditure, taxation and credits. A CGE model can take account of differing contexts; for example, differences in the degree of flexibility of money or real wages, changing returns to capital, changes in productivity, alternative levels of capacity in different economic sectors, and alternative constraints on the public sector borrowing requirement. The main limitations of the CGE model are the dependence of the results on the estimated values of key parameters and the lack of provision of statistical confidence intervals for the results that are obtained. However, these can be overcome by ensuring that the parameter values are accurate estimates and/or by undertaking sensitivity analysis to evaluate the responsiveness of the results to changes in the parameter values. The model relies on the use of data from an IO table estimated for a period other than that of the incident in question; for example, the CGE model for the US uses data from an IO table based on 1992, updated with data for 2001. This is not a serious limitation as, in practice, the structural relationships between the different sectors of the economy rarely change significantly over short time periods. Those cases in which structural relationships do change significantly, such as the case of the oil price shocks, are easy to identify, so that the model can be modified to take them into account. The CGE model is, therefore, appropriate for examining the impact of alternative combinations of microeconomic measures within different macroeconomic settings.

This paper will use a CGE model to estimate the impact of the downturn in travel and tourism, caused by the September 11 events in the US, on different sectors of the economy. This will be the first time that tourism crisis management in the US has been examined using such an approach and will build on the record of the immediate impacts of the September 11 attack provided by Goodrich (2002). The model will be used to estimate the impact of different policy responses included within the ATSSSA and the Six-Point Plan. This will provide information that is useful for evaluating the relative effectiveness of different policy responses in terms of their impacts on different sectors of the economy, as well as in relation to alternative impact criteria, notably income generation, labor and capital adjustment costs and employment generation. The approach used in the paper is applied to the case of the US, so that the results are specific to the effects of September 11 on the US economy. However, the approach is of general applicability and the case study illustrates the ways in which the model can be used to quantify the effects of alternative types of crises and of the range of possible policy responses, in order to identify those that are most effective in different circumstances. This is straightforward within a CGE modeling context, in which model parameters can be changed to suit different real world circumstances.

The next section of the paper will briefly document the policy responses that occurred after the September 11 crisis and some of the other policies that were proposed. The model of the US economy and the relative merits of different policy interventions are then discussed. The results from the model are provided and the relative magnitudes of the effects are compared across economic sectors. The effects of the different measures in contributing to income and employment generation are also given. The final part of the paper provides some conclusions and implications for tourism management policies.

2. Policy Responses to September 11

The magnitude of the tourism downturn following September 11 was large, as is evident in Figure 1, which shows the annual growth rates of domestic and international passenger enplanements at US airports from January 2000 to June 2002. A clear downturn is observed in September 2001 in both figures. The percentage changes in enplanements in September 2001 compared with the previous twelve months are –34% for domestic travel and –23% for international travel. While the September figures include a period in which all commercial air traffic in the United States was grounded, the October figures do not; they show falls of 22% and 33% compared with the previous 12 months – international travel being even lower in October than it was in September - demonstrating the ongoing effects of the crisis. By June 2002 some recovery had taken place, with enplanements down by 11% and 7% over the preceding 12 months. This is still less than the growth that the airline industry would have expected if the September 11 attacks had not occurred.

[Insert Figure 1 around here]

Federal Government Responses to the Crisis

The immediate government responses to the September 11 attacks included law enforcement activity, disaster relief and security measures. Eleven days after the attacks, Congress passed the Air Transportation Safety and System Stabilization Act (ATSSSA), to "preserve the continued viability of the United States air transportation system" (Library of Congress, 2001a). This Act provided (i) federal credit to airlines totaling $10bn; (ii) compensation to airlines totaling $5bn; (iii) compensation for airlines facing increased insurance premiums; (iv) limitation of the extent of liability by airlines for the results of terrorist acts; (v) allowances for airlines to make late payment of excise taxes; (vi) compensation for individuals killed or injured in the September 11 attacks; and (vii) spending of $3bn on airline safety.

The ATSSSA measures can be categorized into two types: first, measures designed to keep the airline industry in operation as a result of the September 11 attacks and, second, measures designed to compensate those harmed, physically and economically, as a result of the attacks. The offer of federal credit to airlines, limitation of liability against future terrorist actions, allowances for late tax payments and measures to increase airline safety were all intended to increase confidence in air travel and prevent the airline industry from grinding to a halt. Without these measures, airlines would have been unable to borrow capital and would have been refused insurance by brokers. Compensation payments to airlines, compensation of airlines facing increased insurance premiums and compensation of individuals were all measures aimed at providing compensation for harm suffered as a result of the September 11 attacks.

The compensation payments given to airlines under the ATSSSA are only applicable where an airline can show that it has suffered economic harm as a result of the September 11 attacks. An airline can claim compensation equal to the lower amount of (a) the economic harm it has suffered, and (b) its August 2001 market share, multiplied by $4.5bn, for passenger traffic, and its market share in August 2001 of cargo traffic multiplied by $500m. As of the end of 2002, a total of $4.6bn had been paid out to 410 air carriers (Department of Transportation 2002), and examination of pending claims points to all of the $5bn allocation for compensation being paid to airlines. The issue of whether the compensation paid to the industry fully offsets the cost incurred is open to question. Three cases are possible: (i) the amount of economic harm caused to airlines was between $4.3bn and $5bn, and all the compensation paid to airlines has exactly offset these losses; (ii) airlines incurred less than $4.3bn in losses, but the ATSSSA rules enable them to claim for more damages than were incurred; or (iii) airlines incurred more than $5bn in losses but the upper limit on compensation prevents them from claiming more. The third case seems to be the more likely, given that initial estimates of the cost of September 11 to the airline industry exceeded this figure. Jones (2001), for instance, in a news report on

September 13 estimated that the grounding of aircraft immediately after September 11 would cost airlines $10bn.

The ATSSSA also places some restrictions on any airline that receives compensation or a loan under the act. Most significantly, any such airline must ensure that communities that received air travel services prior to September 11 continue to do so. In other words, the airline cannot withdraw all its routes from airports where there are no other airlines operating, although the ATSSSA is not specific about maintaining each specific route or the frequency at which flights must continue. The Act also places restrictions on the levels of compensation that such airlines can pay to their own employees.

The ATSSSA was extended on November 19 2001 with the Aviation and Transportation Security Act (ATSA) (Library of Congress, 2001b) which (i) provided additional security measures, such as the introduction of air marshals, improvements to airport security and permission for flight-deck crews to be armed with non-lethal weapons; (ii) provided $1.5bn to airports to pay for these additional security measures; (iii) provided $70m for research and development of airport security equipment; (iv) extended the ATSSSA's compensation payments to cover air tour operators and some other air operating companies not previously included in the compensation scheme; and (v) limited the liability of New York City for the events of September 11. Further acts were passed by the federal government in the course of 2001 and 2002, relating to airport security and compensation of victims of terrorism (Library of Congress 2001c, 2001d).

The Travel Industry Recovery Coalition Plan

The Travel Industry Recovery Coalition (TIRC), a group of industry members formed to lobby government for more action in response to September 11, proposed an additional Six-Point Plan for public policy designed to "restore the economic health of the U.S. travel and tourism industry to pre-September 11 levels". The six points were that the federal government should: (i) provide a $500 tax credit for travel originating and occurring within North America on air, cruise, train, bus, rental car, hotel and motel expenditures; (ii) expand loan programs to small businesses; (iii) provide a workforce tax credit for employment in the travel and tourism industry; (iv) provide substantial federal funding for marketing campaigns; (v) expand tax allowances to enable businesses to offset losses sustained because of September 11 against future earnings; and (vi) restore full tax deductibility for business entertainment expenses that are currently only 50% deductible.

The TIRC plan addresses issues not tackled in the ATSSSA. Although the ATSSSA provided compensation to airlines, it did not provide compensation to other travel and tourism businesses. The TIRC plan is not focused on the airline industry but aims to provide support for the whole travel and tourism industry – notably including businesses in other transportation sectors. The measures included in the TIRC plan can be classified into two categories: first, measures designed to stimulate economic activity across the whole industry in order to offset the downturn caused by the September 11 events and, second, measures aiming to increase liquidity and to prevent firms from incurring major costs and possibly going out of business. Loan programs and tax allowances fall into the second category. The first category of measures provides direct subsidies for production by the tourism industry, such as the compensation provided for airlines, and for consumer expenditure on it, for example the proposed tax credits for expenditure on tourism. The first category of measures has effects on the economy that are amenable to quantification. They are also measures that incur significant costs for government, so that it is particularly useful for the government to have some knowledge of their relative effectiveness. The CGE model will be developed to estimate the relative magnitudes of this category of policy measures.

Budget Measures

On 12 December 2001 the President of the USA introduced an economic security plan to Congress that was still under consideration by the Senate in mid August 2002. The Budget for 2003 (OMB, 2002:406,409) includes provisions for this economic security plan, budgeting for tax cuts of $62bn in 2002 ($65bn in 2003) and $27bn increased expenditures in 2002 ($8bn in 2003). The economic security plan is focussed on the Economic Security and Worker Assistance Act (ESWAA), which would, if passed by the Senate, (i) reduce some business tax rates; (ii) provide temporary assistance for needy families; and (iii) provide tax benefits for business and private property in New York City that was damaged as a result of the September 11 attacks (limited to a total of $15bn). In addition, the ESWAA includes other measures to extend a number of tax provisions that would otherwise expire, provide tax provisions for disaster victims, and other miscellaneous and technical provisions. It should be noted that the largest economic effects of the economic security plan entail tax breaks on direct personal and business taxation, which have distributional implications but are otherwise intended as being a fiscal measure to stimulate general economic activity.

The 2003 budget also contains extra September 11 related expenditure on defense and homeland security. The defense budget is set to rise from $306bn in 2001 to $331bn in 2002 and $369bn in 2003 (OMB, 2002:101). $48bn of the 2003 expenditure is an increase over previous plans (Tobin, 2002). Homeland security expenditure is a category created in response to September 11, and will rise to $37.7bn in 2003 (OMB, 2002:399). Tobin (2002) sees the increased expenditures on defense and homeland security as having a fortunate by-product of being a direct fiscal stimulus to the economy, and discusses the merits of tax reductions covered in the economic stimulus package relative to these expenditures. He concludes that the defense and homeland security measures should be brought forward from 2003 and introduced as early as possible as a means of stimulating the US economy. It should be noted that the combined increase in expenditures on these categories is $86bn, which is significantly larger than the tax reductions in the economic security plan, and also larger than the ATSSSA/ATSA measures and the TIRC's Six-Point plan. Therefore they entail greater costs to the federal government in terms of its economic policy response to September 11

3. Modeling Travel and Tourism in the Wider Economy

The effects of the September 11 crisis and the relative impacts of the different policy responses on tourism and travel can be examined using a CGE model of the US economy. The model includes 98 sectors and commodities with 53 manufacturing sectors, 35 service sectors and 10 primary sectors. Each sector uses tourism intermediate inputs and other intermediate inputs of each of the 98 commodities, together with capital services and inputs of 23 types of labor. Each sector produces one or more of the 98 products, although most sectors mainly produce their own product. Each sector is taxed at a rate which encompasses all forms of indirect taxation in the US economy. A representative private household receives all factor income, pays income taxes to the government and spends its income on resident tourism, private (non-tourist) consumption and savings. The government receives all tax income and spends it on tourist and non-tourist government consumption. Trade occurs under the assumption (Armington, 1969) that goods produced in the USA differ from goods in the same classification imported from abroad. Exports are also qualitatively different from goods produced for the domestic market. The model allows for unemployment in each of the 23 labor markets and for under-utilization of capital.

Tourism flows exist for private households – domestic resident tourism and tourism imports – government, non-residents and for each of the 98 production sectors that purchase goods that are used for business travel and tourism. For each of these tourism flows, separate flows are modeled for travel and tourism trips including air travel and travel and tourism trips not including air travel. Substitution can occur between air travel trips and non-air travel trips for

example in response to cheaper flights due to ATSSSA compensation payments. The parameters in the demand functions for tourism are changed to simulate the effects of September 11 on the demand for tourism, with air travel trips becoming less attractive.

The CGE model includes production, consumption, trade and market equilibrium relationships for 98 commodities and production sectors. Model equations consist of two general types: accounting relationships such as market equilibrium equations for each commodity and factor of production and income-expenditure equations for each production sector, private consumers and the government; and behavioral equations such as production functions and utility functions. These behavioral functions are drawn from the constant elasticity of substitution (CES) family of equations that allow a parameter to control the degree of substitution possibilities between inputs. Second order equations are derived from these relationships that ensure that producers are profit maximizing and that consumers are utility maximizing.

Production Sectors

Production functions are defined as:

$$Q_j = \Theta_j K_j^{\lambda_j} \left(\sum_l a_{l,j} L_{l,j}^{((\sigma-1)/\sigma)} \right)^{(1-\lambda_j)(\sigma/(\sigma-1))} \tag{1}$$

which defines a Cobb-Douglas relationship between industry output Q_j, capital inputs K_j and a CES function of labor inputs $L_{l,j}$ where j is the set of 98 industries and l is the set of 23 types of labor. σ_j is the elasticity of substitution between labor types (set equal to 2 to allow greater substitution between labor types than between labor and capital) and Θ_j, λ_j and $\delta_{l,j}$ are calibrated parameters. Industry output Q_j is spread across the output of more than one commodity (although the 'make' matrix indicates that the majority of each industry's output is of the corresponding commodity) through a constant elasticity of transformation (CET) function with elasticity of unity:

$$Q_j = B_j \Pi_i S_{i,j}^{\beta_{i,j}} \tag{2}$$

where $S_{i,j}$ is the supply of commodity i by industry j; B_j and β_j are calibrated parameters. Income-expenditure consistency is ensured through an equation that sets industry revenues equal to production costs:

$$\begin{aligned} \sum_i PP_i \left(1 - t_j\right) S_{i,j} = r.K_j + \sum_l w_l L_{l,j} \\ + \sum_i P_i Q_j \left(\alpha_{i,j}^N + \alpha_{i,j}^{AT} \left(1 + t_{BAT}\right) + \alpha_{i.j}^{NT} \left(1 + t_{BNT}\right) \right) \\ + P_M \alpha_j^M Q_j \end{aligned} \tag{3}$$

where PP_i is the producer price of commodity i prior to the deduction of an indirect production tax t_j. r and w_l are the wage rates of capital and each type of labor. Inputs of each commodity (purchased at price P_i) are a linear function of output (Q_j). These inputs appear three times in equation 3: inputs of non tourism products, inputs of products purchased in air tourism trips and inputs of products purchased in non-air tourism trips. The total paid for intermediate products that are not tourism related is $\sum_i P_i Q_i \alpha_{i,j}^N$. With the inclusion of a tax on the two tourism components, which is zero in the base and used only when modeling the marginal impact of additional policies, the total paid for air-trip tourism related inputs is

$\sum_i P_i Q_i \alpha_{i,j}^{AT} \left(1 + t_{BAT}\right)$ and the total paid for non-air tourism related inputs is $\sum_i P_i Q_i \alpha_{i,j}^{NT} \left(1 + t_{BNT}\right)$. Inputs of non-competitive imports (purchased at price P_M) are also a linear function $\alpha_j^M Q_j$ of output.

Equations 1, 2 and 3 are combined under the profit maximizing assumption to create input demand equations for K_j and $L_{i,j}$ which are used in the model.

Markets

Domestic production (the sum of supply of good i by each industry j) is allocated to export and domestic markets according to a CET function:

$$\sum_j S_{i,j} = T_i \left(\chi_i X_i^{((\tau-1)/\tau)} + \left(1 - \chi_i\right) D_i^{((\tau-1)/\tau)} \right)^{(\tau/(\tau-1))} \tag{4}$$

where X_i is exports of good i and D_i is domestic supply of domestically produced goods. τ is the elasticity of transformation between exports and domestic goods; T_i and χ_i are calibrated parameters. The accounting identity that ensures that payments received by producers equals the value of exports plus the value of domestic products is:

$$\sum_j S_{i,j} PP_i = D_i DP_i + X_i XP_i \tag{5}$$

Total uses in the domestic market U_i is a product of domestically produced products and imports M_i. This function is CES:

$$U_i = \Omega_i \left(\theta_i D_i^{((\mu_i-1)/\mu_i)} + \left(1 - \theta_i\right) M_i^{((\mu_i-1)/\mu_i)} \right)^{(\mu_i/(\mu_i-1))} \tag{6}$$

where μ_i is the elasticity of substitution between imports and domestic goods, commonly known as the Armington elasticity. Values for these elasticities are taken from estimates for the US by François and Hall (1997). The corresponding accounting equation is:

$$U_i P_i = D_i DP_i + M_i MP_i \tag{7}$$

where P_i is the price paid by producers for intermediate inputs in equation 3 and also by consumers, and MP_i is the import price. Supply and demand equilibrium ensures that total uses are equal to intermediate demands for products plus consumer demands, government demands, investment demands and tourist demands.

Tourism Demand

Foreign tourism demand F is equal to a function of tourism prices:

$$F = \Psi \left(PFT / FE \right)^{\varepsilon} \tag{8}$$

where PFT is the aggregate price of the commodities purchased by foreign tourists, FE is the price of foreign exchange (the exchange rate), ε is the price elasticity of foreign tourist demand (set equal to 2) and Ψ is a shift parameter that allows foreign tourism demand to be exogenously changed. PFT is a result of the CES nesting of tourism demand:

$$F = \Upsilon\left(\sum_i \pi_i TD_i^{((\rho-1)/\rho)}\right)^{(\rho/(\rho-1))} \tag{9}$$

where TD_i is tourism demand for each individual commodity, ρ is the elasticity of substitution of tourists between commodities (set equal to 2 to allow substitution between commodities), and Υ and π_i are calibrated coefficients. The corresponding accounting equation for foreign tourism is:

$$F.PFT = \sum_i TD_i P_i\left(1+t_{FT}\right) \tag{10}$$

where t_{FT} is a tax rate that can be applied to foreign tourism, although it is zero in the base case and is only used to examine marginal tax efficiency.

Domestic tourism demand is a part of private consumption:

$$U = \Gamma.SAVE^{\gamma_{SAVE}}.NT^{\gamma_{NT}}.DT^{\gamma_{DT}} \tag{11}$$

where U is the utility level of the representative household, $SAVE$ is the level of real savings, NT is the level of real non-tourism consumption and DT is the real level of tourism consumption. Γ, γ_{SAVE}, γ_{NT} and γ_{DT} are calibrated parameters. Domestic tourism is itself composed of air-trip tourism AT and non-air tourism NAT components:

$$DT = \mathrm{E}\left(\varpi AT^{((\omega-1)/\omega)} + \left(1-\varpi\right)NAT^{((\omega-1)/\omega)}\right)^{(\omega/(\omega-1))} \tag{12}$$

where ω is the elasticity of substitution between air- and non air- trips. This elasticity is set to a value of 2 to allow substitution between the types of tourism. Both types of tourism are themselves a Cobb-Douglas function of purchases of individual commodities:

$$AT = \mathrm{A}\prod_i C_{i,AT}^{\phi_i} \tag{13}$$

$$NAT = \mathrm{N}\prod_i C_{i,NAT}^{\varphi_i} \tag{14}$$

where $C_{i,AT}$ and $C_{i,NAT}$ are the levels of real consumption of commodities used by domestic tourists on air trips and on trips that do not involve air travel. A, N, ϕ_i and φ_i are calibrated parameters. The budget constraint for the private household is:

$$Exp = SAVE.PSAVE + \sum_i C_{i,N}P_i + \sum_i C_{i,AT}P_i\left(1+t_{RAT}\right) + \sum_i C_{i,NAT}P_i\left(1+t_{RNAT}\right) \tag{15}$$

where $PSAVE$ is the price of savings (the price of purchasing one unit of new capital), $C_{i,N}$ is consumption of goods for non-tourism purposes, t_{RAT} and t_{RNAT} are tax rates on resident air tourism trips and resident non-air tourism trips. These tax rates, in common with t_{BAT}, t_{BNT} and t_{FT} are zero in the base case and are only used when assessing the marginal impact of subsidies to tourism activities.

The equations shown above do not completely define the CGE model. Other equations that are not shown here account for household and government incomes, private consumption behavior, as well as the operation of investment, imports and exports and the balance of payments. Further assumptions that are often grouped under the term 'model closure' include: (i) the government balances its' budget through the savings and investment market, in other

words the changes that are being applied to the model will lead to changes in the government deficit but will not be substantial enough to lead to changes in levels of taxation or government expenditures; (ii) the trade balance (including tourism flows) is fixed, which follows from an assumption that the events being modeled will not lead to changes in US net capital flows; (iii) the US faces exogenous world prices for its' exports and purchases imports at an exogenous world prices; (iv) unemployed labor moves into employment (and employed labor moves out of employment) when real wages change. This final point allows job savings to be modeled, as the effects of September 11 lead to a fall in real wages in occupations that are related through patterns of employment to tourist expenditures, and therefore employment of labor in these occupations falls. Targeted subsidies can, partially at least, prevent this fall in employment.

Only a few of the many variables in the model are reported here. Constant dollar GDP is a standard measure of economic activity. The net effect on the government budget is the net change in (federal, state and local) tax revenues minus extra expenditures incurred as a result of September 11. Constant dollar factor adjustment is a measure of capital and labor adjustment, given in dollar terms. More specifically, it is the constant dollar value of all factors that move from their original sector of employment, either into another sector or to become unemployed or, in the case of capital, underutilized. It does not measure the costs of adjustment, of retraining, retooling and payments of unemployment benefit, but it is an indicator of the relative size of these adjustment costs. Relative factor adjustment is a similar measure, but is given as a percentage of all factor employment rather than in constant dollars. Constant dollar employment shows the real value of labor employment which, unlike the previous two measures, includes the net effect of labor being re-employed in other sectors. FTE employment shows the net employment pattern in terms of full-time equivalent workers, while FTE jobs lost shows the number of jobs lost as workers are displaced from their original sector of employment, either to be unemployed or re-employed in another sector. Two further indicators show the number of jobs lost in (i) airlines and (ii) hotels and other accommodation establishments.

Data are obtained from various Bureau of Economic Analysis (BEA) sources. The benchmark input-output table for 1992 (Lawson 1997) is used in conjunction with data for GDP by originating industry (Lum and Moyer 2001) and national income and product account (NIPA) data (Bureau of Economic Analysis 2002) to construct an input-output table for the second quarter of 2001. Data from the prototype tourism satellite account (Okubo and Planting 1998; Kass and Okubo 2000) are combined with estimates of tourists' use of motor vehicles and vacation homes (Okubo, Fraumeni and Fahim-Nader 2001) and updated using NIPA data to provide estimates of tourism consumption in the second quarter of 2001. These are similar to the BEA's own release of updated quarterly tourism satellite account results except for the inclusion of tourists' use of motor vehicles and vacation homes, as recommended by Okubo et al. (2001). Employment data are obtained from the Bureau of Labor Statistics (BLS 2002) and updated using GDP by originating industry and NIPA data to provide data on employment by labor type in the second quarter of 2001.

4. The Effects of September 11 on Tourism

The first set of results from the model indicate the effects of the September 11 events in the absence of any offsetting policy responses. It is clear that there are severe effects in terms of a variety of criteria, including income, government revenue, labor and capital adjustment costs, employment and job losses, as is shown in Table 1. As the first column of the table shows, the fall in tourism expenditures reduces Gross Domestic Product (GDP) to almost $30 billion less than it would otherwise have been, and worsens the government budget by over $7 billion. Factor adjustment, the amount of capital and labor that leave their original sector of employment, is $31 billion. The loss of employment is high, at 383 thousand full time

equivalents (FTE). A total of 559 thousand jobs are lost, of which 203 thousand are in airlines and 174 thousand are in accommodation establishments.

[Insert Table 1 around here]

The tourism effects of September 11 can be decomposed into the effects of reduced demand for air travel and tourism trips by non-residents and by US residents, as is shown in the second and third columns in Table 1. It is apparent that the reductions in demand by US residents are dominant for all types of effects, but particularly for factor adjustment costs and for FTE jobs lost in the airline industry. This demonstrates the importance of domestic tourism and travel in the US economy and the significant effects that decreases in domestic demand can bring about. The effects of the reductions in demand by non-resident tourists are lower but are spread more widely across the economy.

5. Alternative Policy Responses

Given the finding that the effects of the decreases in tourism demand brought about by September 11 are severe, the related question is whether the implementation of crisis management policy responses succeeded in offsetting the downturns. The CGE model of tourism and travel was used to estimate the effects of all of the quantifiable policy measures that were implemented by the ATSSSA and ATSA; *i.e*. compensation to airlines and individuals, spending on airline safety and expenditure on marketing and the effects of September 11 with and without these crisis management responses are included in Table 2.

[Insert Table 2 around here]

Perhaps the most important finding in the table is that the policy responses are very effective in offsetting the adverse effects of the crisis. The fall in GDP is much lower than it would otherwise have been, at under $10 billion compared with nearly $30 billion in the without-policy case. The measures worsen net government revenues by the relatively large amount of around $11 billion, which includes $5 billion in airline compensation and $4.5 billion in security spending outlined in the ATSSSA and ATSA acts. The policies are less effective in decreasing the factor adjustment costs relating to the crisis, almost halving the value of the labor and capital that leave their original sector of employment. The loss of employment is less than half of what it would otherwise have been, so that the number of people affected is below 150,000 compared with almost 400,000 in the non-response case. The number of FTE jobs lost is around 60% of the total that would otherwise have occurred, at 335,000 compared with over half a million without a policy response. The number lost in the airline industry is 93,000 jobs (28% of all jobs lost) after the policy response, compared with over 200,000 (36% of all jobs lost) without a policy response.

The model was also used to estimate the relative and absolute effectiveness of the ATSSSA and ATSA measures on the worst hit sectors of the economy, with respect to the different measurement criteria (changes in income, labor and capital adjustment and job loss). The results are provided in Tables 3 and 4.

[Insert Table 3 around here]

Table 3 shows the fall in constant-dollar employment in the ten sectors that are affected the most by the crisis. Air transport is the worst hit sector prior to the policy responses, but when policy responses are included, hotels are the worst hit sector. A total of 35 of the 98 sectors lose out in terms of factor employment from September 11, with 31 of these sectors still losing after the policy response.

[Insert Table 4 around here]

Table 4 shows the results of modeling several different possible policy responses to the crisis. Each of these responses involves a specific type of subsidy scheme, which can be interpreted

as an equivalent tax reduction. The different types of crisis management responses are divided into five main types in Table 4: subsidies to production, subsidies to consumers' expenditure, subsidies to labor employment, subsidies to capital profits, and more general fiscal stimulus measures. The former provides a direct subsidy to sectors that are particularly affected. Subsidies to consumers' expenditure subsidize (or provide tax relief to) tourism and travel expenditure. Subsidies to labor and capital give specific support to these factors of production (in the case of labor, to all of the 23 types of labor). Thus, for example, compensation to airlines is included in the former, while tax credits for personal and business expenditure on tourism and travel are included in the second category and a workforce tax credit is included in the third category. This enables the effects that these policies have after September 11 and the initial policy responses of the ATSSSA and ATSA to be compared. Marginal changes are made to the appropriate subsidy instrument to facilitate comparisons of the effects of the policies. The change in constant dollar GDP and the other indicators shown are divided by the change in net government revenue as a result of the marginal subsidy change to give the marginal effects per million dollars of subsidy expenditure.

A production subsidy to the airline sector (which can also be interpreted as a tax reduction) increases GDP by $3.1 million for every million dollars in subsidy. It has a minimal effect on the net government budget, as it is so effective at halting the decline of the airline sector and reducing unemployment that the stimulated economic activity generates almost as much revenue through direct and indirect taxation as is spent on the airline subsidy. Every $1 million of airline sector subsidy reduces factor adjustment by $1.6 million and reduces the total number of jobs lost by 27.8, of which 20.7 jobs are saved in the airline sector itself, but only 0.1 jobs are saved in the accommodation sectors.

The results in the table show that the provision of subsidies targeted to the airline industry are the most effective policy response according to most criteria. An airline production subsidy outperforms all other types of production subsidy in each of the criteria with the exception of the number of accommodation jobs lost. While more efficient in these terms, however, an airline subsidy fails to take account of job losses outside the airline industry that are caused by the fall in demand from tourists who would have traveled by air. The provision of subsidies to hotels and other accommodation establishments, though less effective than a subsidy to airlines, is reasonably effective at boosting GDP and saving jobs in accommodation. These subsidies are significantly more effective than subsidies to catering and entertainment. In fact, subsidies to the latter can have the effect of worsening GDP and labor and capital adjustment, as they encourage workers to move out of the airline and accommodation industries, thereby increasing the job losses in these sectors. This demonstrates that poorly targeted subsidies can not only fail to alleviate adjustment costs, but can also add to them.

Consideration of the effects of subsidizing tourism and travel consumers shows that the provision of subsidies for air travel expenditure is more effective than the provision of a more generalized subsidy for all types of tourism and travel expenditure - as shown by the item 'all domestic tourism'. The results for the latter are indicative of the effects of providing consumers with a tax credit for expenditures on air, cruise, train, bus and rental car travel, hotels and motels, as requested in the first point of the TIRC Six-Point Plan. Such a subsidy performs badly because it is not focussed on the types of expenditures that have fallen since September 11 – tourist expenditures on trips involving air travel. Similarly, subsidies for expenditure on all resident trips are less effective than those directed solely towards air travel. Subsidies for business air trips are the most beneficial in terms of GDP (though not in terms of adjustment costs) because business travel, as an input into production in other sectors, increases the efficiency of those other sectors. Subsidizing non-resident trips has the greatest effect in reducing adjustment costs and job losses and has the second largest effect on preserving jobs in the airline industry. Subsidizing resident air trips preserves more jobs in the airline industry per $ million of subsidy than any of the other tourism and travel expenditure

subsidies. Subsidizing all air trips spreads the effects of the job savings more evenly across the airline and accommodation sectors.

Subsidies to employment in airlines are just as efficient in terms of GDP and net budgetary effect as airline production subsidies, but have a much greater impact on saving jobs in the airline industry, as would be expected. Profit subsidies perform just as well in terms of GDP and factor adjustment, but perform badly in terms of saving jobs. However, while there is inevitably some political pressure to minimize job losses, there is also a need to minimize the adjustment costs to capital. The employment and capital subsidies to all tourism sectors (airlines, hotels and other accommodation) perform similarly to the production subsidy on these sectors, but with different employment implications.

Cuts in direct taxation and military expenditure both perform relatively poorly in terms of stimulating GDP, reducing factor adjustment and saving jobs in sectors affected by September 11. They are also expensive in budgetary terms, as very little of the tax cut and military expenditure is returned to the government through increases in other forms of taxation, as the net budget effect of every $1 million spent is close to $-1 million. While these policies may perform better in the context of a government response to general economic recession, they are not a particularly efficient means of counteracting the fall in tourism demand following September 11.

6. Conclusions

Three issues of central importance to tourism crisis management were posed at the beginning of this paper: first, that of whether the downturn in activity associated with the crisis is sufficiently large to merit offsetting measures; second, whether the shock is sufficiently long-lasting to merit measures to minimize adjustment costs; and third, what types of policies should be implemented. The analysis of travel and tourism in the US and the application of the CGE model to the case of the September 11 events has provided substantive answers to these questions. The results provided by the model indicate that, in the absence of offsetting policies, the terrorist attacks would have had the effect of decreasing GDP by almost $30 billion, with the airline industry, followed by hotels and other accommodation, being particularly badly affected. The total number of jobs lost would have exceeded half a million. Hence, it is clear that the downturn in activity was, indeed, a serious cause for concern.

The magnitude of the adverse effects stemming from the September 11 events was so great that any possibility that they would be of short duration was precluded. Moreover, examination of statistics for international enplanements showed that the decreases in the month of October were even greater than those in September and that the decreases below the averages for the same months in the previous year were ongoing. The associated declines in the use of labor and capital in affected sectors, notably airlines and accommodation, are not matched by immediate increases in their use elsewhere, owing to imperfections in information, costs of inter-sectoral factor mobility and other frictions within the market. For these reasons, along with the social costs of unemployment and dislocation, there is a clear case for policies to decrease the adjustment costs associated with the September 11 events.

Policy responses to crises can be considered under two categories. The first involves relatively low cost measures to restore confidence and increase liquidity. These include the provision of credits or loans that involve subsequent repayment, measures to limit the liability of businesses to acts of terrorism, deferred tax payments and low cost tax allowances. The second category involves significant costs and, as governments have scarce resources, pose the question of which policy or policies are most cost-effective. Examples include expenditure on compensation for airlines and measures to increase airline safety, included within the ATSSSA, and proposals for tax credits for consumers or workers in tourism and travel, included in the TIRC Six-Point Plan.

Examination of the cost-effectiveness of different types of policy response using the CGE tourism model demonstrated that the implementation of crisis management policies is very effective in reducing the adverse effects of the September 11 events. However, the relative effectiveness of the different policy responses varies considerably. The results from the model showed that a policy of directing assistance towards the airline sector in the form of subsidies is the most efficient instrument for dealing with the travel and tourism crisis in terms of the majority of the criteria considered. Subsidies for air travel, particularly by business people, are also an effective policy response, although subsidies for air travel are a less effective way of saving jobs and maintaining GDP than the provision of assistance to the airlines themselves. The provision of a subsidy for accommodation is very effective in preserving jobs in the accommodation sector at a fairly small cost in terms of the net government budget. Its effects on GDP are two-thirds those of the airline production subsidy although the value of factor adjustment saved is lower. The effects on total jobs saved are lower than those resulting from the airline production subsidy because the accommodation sector was less severely affected than the airline sector and is also used on trips that do not involve air travel. The TIRC proposal for an individual tax credit for travel and tourism expenditures corresponds closely to subsidizing all resident trips. This form of subsidization is relatively ineffective in terms of its impact on GDP and on reducing adjustment costs.

The overall conclusion is that directing subsidies to the sector that is most severely affected by the crisis is the most efficient policy response in terms of both GDP and the total number of jobs saved. Policy makers should be very careful in their decisions as to which sectors to assist, as the provision of subsidies for sectors that are relatively unaffected can even be counter-productive. This was indicated by the case of the increases in job losses and adjustment costs that a subsidy for the entertainment sector would have brought about. A related overall conclusion is that subsidies for production are more beneficial than subsidies for consumers' expenditure on tourism and travel. In the case of the September 11 events, the provision of compensation to US airlines was the most appropriate policy, even though the level of ATSSSA compensation payments to an airline was related to the airline's market share prior to September 11. An alternative form of subsidies would be to relate them to an airline's current level of output. This would have the advantage of providing airlines with further incentives to reduce ticket prices, thereby stimulating traffic volumes. A policy of subsidies to accommodation would be particularly beneficial in saving jobs in this labor-intensive sector, so that a strategy of assistance for both sectors could be considered.

Although these conclusions relate to the case of the September 11 events, it is probable that they can be generalized to other types of crises in tourism and travel. Thus if, for example, the hotel and catering sector were affected most adversely by particular events, it is likely that a policy of direct subsidies for hotels and catering would be the most effective response. Examination of the relative effectiveness of different types of policy responses to different types of crises in different countries could be undertaken using a modeling approach similar to that employed in this paper. Further research on this issue would assist governments and tourism organizations to formulate their policy responses so as to manage tourism crises, and maintain income and employment, in the most effective manner.

References

Adams, P., and B. R. Parmenter (1995). An Applied General Equilibrium Analysis of the Economic Effects of Tourism in a Quite Small, Quite Open Economy. *Applied Economics*. 27:985-994.

Air Transport Association (2002). *Monthly Passenger Traffic Report*.

Alavalapati, J., and W. Adamowicz (2000). Tourism Impact Modeling for Resource Extraction Regions. *Annals of Tourism Research*, 27:188-202.

Andrew, B. (1997). Tourism and the Economic Development of Cornwall. *Annals of Tourism Research*. 24:721-735.

Archer, B. (1995). Importance of Tourism for the Economy of Bermuda. *Annals of Tourism Research*, 22: 918-930.

Archer, B., and J. Fletcher (1996) The Economic Impact of Tourism in the Seychelles. *Annals of Tourism Research*. 23:32-47.

Armington, P. (1969). A Theory of Demand for Products distinguished by Place of Origin. *IMF Staff Papers*. 16:159-178.

Blake, A. (2000). *The Economic Effects of Tourism in Spain*. Tourism and Travel Research Institute Discussion Paper 2000/2. <http://www.nottingham.ac.uk/ttri/series.html>

Blake, A., M. T. Sinclair, and G. Sugiyarto (2003 forthcoming). Quantifying the Impact of Foot and Mouth Disease on Tourism and the UK Economy. *Tourism Economics*. forthcoming.

Bureau of Economic Analysis (2002). *National Income and Product Accounts*.

Bureau of Labor Statistics (2002) *Occupational Employment and Wage Estimates*.

de Melo, J. (1988). Computable General Equilibrium Models for Trade Policy Analysis in Developing Countries: a Survey. *Journal of Policy Modeling*. 10:469-503.

Department of Transportation (2002). *U.S. Department of Transportation*: <http://www.dot.gov/affairs/carrierpayments.htm>

Devarajan, S., J. Lewis, and S. Robinson (1982). *General Equilibrium Models for Development Policy*. New York: Cambridge University Press.

Dwyer, L, P. Forsyth, J. Madden, and R. Spurr (2000). Economic Impacts of Inbound Tourism under Different Assumptions regarding the Macroeconomy. *Current Issues in Tourism*. 3:325-363.

Fletcher, J., and B. Archer (1991). The Development and Application of Multiplier Analysis, in C. P. Cooper (ed.) *Progress in Tourism, Recreation and Hospitality Management, vol. 3*. London: Belhaven.

François, J., and H. Hall (1997). Partial Equilibrium Modeling, chapter 5 in François and Reinert 1997.

François, J., and K. Reinert, eds. (1997). *Applied Methods for Trade Policy Analysis*. Cambridge: Cambridge University Press.

Goodrich, J. (2002). September 11, 2001 Attack on America: a Record of the Immediate Impacts and Reactions in the USA Travel and Tourism Industry. *Tourism Management*. Forthcoming.

Henry, E., and B. Deane (1997). The Contribution of Tourism to the Economy of Ireland in 1990 and 1995. *Tourism Management*. 18:535-553.

Jensen, T., and S. Wanhill (2002). Tourism's Taxing Times: Value Added Tax in Europe and Denmark. *Tourism Management*. 23:67-79.

Jones, L. (2001). American airlines, others face $10 bln in costs. Bloomberg news, September 13 2001.

Kass, D., and S. Okubo (2000). U.S. Travel and Tourism Satellite Accounts for 1996 and 1997. *Survey of Current Business*. July 2000:8-24.

Library of Congress (2001a). *Air Transport Safety and System Stabilization Act*, U.S. Library of Congress bill H.R.2926.ENR

Library of Congress (2001b). *Aviation and Transportation Security Act*, U.S. Library of Congress bill S. 1447.

Library of Congress (2001c). *Airport Security Federalization Act of 2001*, U.S. Library of Congress bill S.1447 EAH.

Library of Congress (2001d). *Victims of Terrorism Tax Relief Act of 2001*, U.S. Library of Congress bill H.R.2884.ENR

Lawson, A. (1997). Benchmark Input-Output Accounts for the U.S. Economy, 1992. *Survey of Current Business*. November 1997:20-34. Bureau of Economic Analysis.

Lum, K., and B. Moyer (2001). Gross Domestic Product by Industry for 1998-2000. *Survey of Current Business*. November 2001:17-33. Bureau of Economic Analysis.

OMB: Office of Management and Budget (2002). *Budget of the U.S. Government, Fiscal Year 2003*. Office of Management and Budget <http://www.whitehouse.gov/omb>.

Okubo, S., B. Fraumeni, and M. Fahim-Nader (2001). *Expanded U.S. Travel and Tourism Satellite Accounts: Extension to Include Imputed Services of Motor Vehicles and Vacation Homes*. Paper presented at Tourism Satellite Accounts Conference, Vancouver, May 2001.

Okubo, S. and M. Planting (1998). U.S. Travel and Tourism Satellite Accounts for 1992. *Survey of Current Business*. July 1998:8-22. Bureau of Economic Analysis.

Pizam, A., and Y. Mansfield, eds. (1996). *Tourism, Crime and International Security Issues*. Chichester: John Wiley.

Seddighi, H., M. Nuttall, and A. Theocharous (2001). Does cultural background of tourists influence the destination choice? an empirical study with special reference to political instability, *Tourism Management* 22:181-191.

Shoven, J., and J. Whalley (1992). *Applying General Equilibrium*. Cambridge Surveys of Economic Literature.

Sonmez, S. (1998). Tourism, terrorism and political instability, *Annals of Tourism Research* 25: 416-456.

Sonmez, S., Y. Apostolopoulos, and P. Tarlow (1999). Tourism in crisis: managing the effects of terrorism, *Journal of Travel Research* 38:13-18.

Sugiyarto, G., A. Blake, and M. T. Sinclair (2002). *Economic Impact of Tourism and Globalisation in Indonesia*. Tourism and Travel Research Institute Discussion Paper 2002/2. <http://www.nottingham.ac.uk/ttri/series.html>

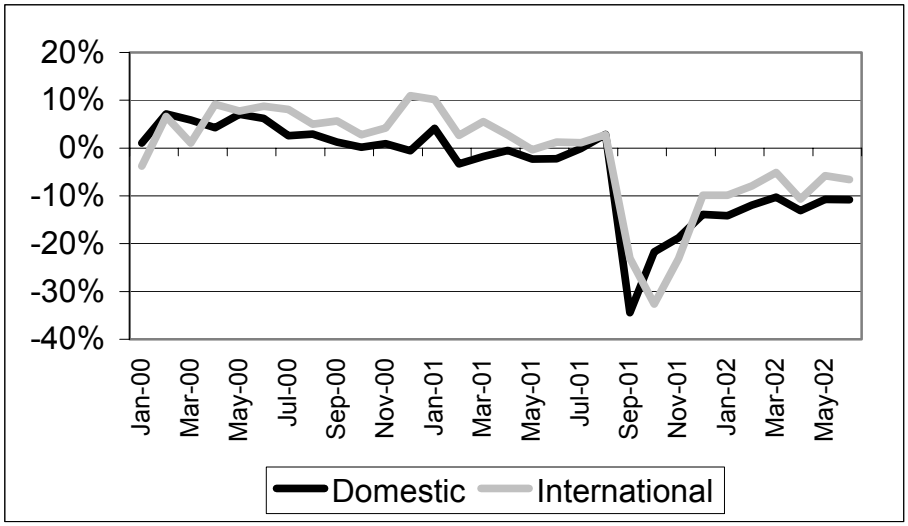
Tobin, J. (2002). *Macroeconomic Strategy in Wartime*. Cowles Foundation Discussion Paper No. 1357, Yale University.

Wagner, J. (1997). Estimating the Economic Impacts of Tourism. *Annals of Tourism Research*. 24:592-608.

Zhou, D., J. Yanagida, U. Chakravorty, and P. Leung (1997). Estimating Economic Impacts of Tourism. *Annals of Tourism Research*. 24:76-89.

Figures and Tables

Figure 1: Annual Growth Rates of Passenger Enplanements



Source: Air Transport Association (2002)

Table 1: Effects of Reductions in Tourism Demand following September 11

	Effects of September 11, without policy responses	Effects of reduced demand by non-residents	Effects of reduced demand for domestic air travel and tourism
Total change in tourist spending ($bn)	-50.69	-15.89	-40.88
Constant dollar GDP ($bn change from base)	-27.27	-10.54	-17.97
Net effect on government budget ($bn change from base)	-7.27	-2.60	-4.94
Constant dollar factor adjustment ($bn)	30.93	12.88	21.44
Relative factor adjustment (%)	0.75	0.32	0.49
Constant dollar employment ($bn)	-13.57	-5.96	-7.85
FTE Employment ('000)	-383	-155	-248
FTE Jobs lost ('000)	559	198	414
FTE Jobs lost in airlines ('000)	203	42	160
FTE Jobs lost in hotels and other accommodation establishments (‘000)	174	42	146

Note: columns two and three do not sum to column one because of increased demand for domestic travel and tourism by non-air transport.

Table 2: Effects of September 11 without and with ATSSSA and ATSA Measures

	Effects of September 11, without ATSSSA and ATSA policy responses	Effects of September 11, including ATSSSA and ATSA policy responses
Total change in tourist spending ($bn)	-50.68	-37.47
Constant dollar GDP ($bn change from base)	-27.27	-9.34
Net effect on government budget ($bn change from base)	-7.27	-11.14
Constant dollar factor adjustment ($bn)	30.93	17.42
Relative factor adjustment (%)	0.75	0.49
Constant dollar employment ($bn)	-13.57	-3.65
FTE Employment ('000)	-383	-144
FTE Jobs lost ('000)	559	335
FTE Jobs lost in airlines ('000)	203	93
FTE Jobs lost in hotels and other accommodation establishments (‘000)	174	141

Table 3: Fall in Constant-Dollar Factor Employment by Industry ($bn change from base)

	Effects of September 11, without ATSSSA and ATSA policy responses	Effects of September 11, including ATSSSA and ATSA policy responses
Hotels	-7.3	-5.9
Air transportation	-11.0	-5.0
Eating and drinking places	-1.9	-1.2
Food and kindred products	-1.2	-0.9
Arrangement of passenger transportation	-1.5	-0.7
Construction	-1.1	-0.6
Other accommodation establishments	-0.7	-0.6
Fitness, sport and recreation clubs	-0.7	-0.6
Drugs and cleaning preparations	-0.4	-0.3
Theatres and entertainers	-0.3	-0.2

Table 4: Marginal Effects of Alternative Subsidy Schemes after the ATSA and ATSSSA

	GDP ($m)	Net budget effect ($m)	Factor adjustment saved ($m)	Total jobs saved	Airline jobs saved	Accommodation jobs saved
per $1m production subsidy to:						
Airlines	3.1	-0.02	1.6	27.8	20.7	0.1
Hotels	2.0	-0.4	0.6	11.9	-0.1	12.4
Other accommodation	1.8	-0.1	1.6	23.7	-1.5	24.2
Eating & drinking places	0.7	-0.8	0.7	22.8	0.2	-1.0
Other entertainment industries	-0.1	-1.1	-0.2	0.6	-0.2	-4.0
Airlines, hotels and other accommodation	2.5	-0.2	1.1	20.2	10.2	6.5
Per $1m consumption subsidy on:						
Business air travel trips	2.7	-0.3	0.5	7.8	1.3	0.4
All business trips	2.4	-0.3	0.4	6.7	0.8	0.3
Non-resident trips	2.0	-0.04	1.1	19.4	5.1	4.9
All air trips	1.6	-0.4	0.7	12.5	4.7	2.1
Domestic air trips	1.4	-0.6	0.5	9.0	4.5	0.7
All tourism trips	1.3	-0.6	0.4	7.7	2.2	1.6
All domestic tourism	1.1	-0.7	0.2	4.8	1.5	0.8
Resident air travel trips	0.3	-0.9	0.5	10.2	7.4	1.0
All resident trips	0.2	-0.9	0.1	3.7	1.9	1.0
Per $1m employment subsidy in:						
Airlines	3.1	-0.01	1.6	32.4	25.5	0.04
All tourism sectors	2.6	-0.2	1.2	28.4	12.9	12.5
Per $1m subsidy to profits in:						
Airlines	3.1	-0.1	1.6	10.1	2.3	0.2
All tourism sectors	2.3	-0.3	1.0	-2.0	0.7	-5.8
Per $1m of:						
Direct tax cuts	0.2	-0.9	-0.1	-0.5	-0.02	0.05
Military expenditure	0.2	-1.0	0.3	-2.3	-0.1	-0.1