Implications of a long term increase in oil prices for tourism

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1.   Introduction

Concern over the availability of oil as a finite natural resource has been prevalent since the oil crises in the 1970s. More recently, speculations about peak oil have sparked substantial interest, reflected in an increasing number of scientific publications, dedicated websites (e.g. www.theoildrum.com) and media coverage. Examples include "Global downturn cushioned peak oil impact" (Waters, 2010, ABC news) and "A new era of cheap oil is just wishful thinking" (Halligan, 2008, Telegraph). Despite differences in the various oil assessments (Bentley, 2002; Campbell & Laherrere, 1998; Greene, Hopson & Li, 2006; Hirsch, 2008), there now seems to be a wide belief that conventional oil is likely to decline in the near future, probably before 2020 but no later than 2030 (UK Energy Research Centre, 2009). The International Energy Agency's (IEA) World Energy Outlook (2009) estimates that non-OPEC conventional oil production peaks around 2010, which means that the predicted global oil

demand growth of 1% p.a. from 2007 to 2030 needs to be meet with oil from increased production of OPEC countries and of non-conventional resources (e.g. oil sands).

A large number of factors influence the price of oil in the short term, but long term prices are driven by world oil demand and supply, which is ultimately limited by resources. Several studies show the negative economic impacts of oil supply shocks for net oil-importing countries (Blanchard & Gali, 2007; Jones, Leiby & Paik, 2004). Countries' oil vulnerability depends on a range of market and supply factors, such as share of oil costs in national income, the intensity and technical efficiency of use of oil in production, flexibility of the labour market, the ratio of value of domestic reserves to oil consumption, exposure to geopolitical risks, and the availability of alternative energy sources and the ability to substitute to these (Gupta, 2008; Peersman & Robays, 2009). Also, some individual industries are more vulnerable to high oil prices than others. The aviation industry alone, for example, currently consumes 6.3% of world refinery production (Nygren, Aleklett & Höök, 2009).

Tourism is clearly dependent on oil, largely because of its inherent transport component (Becken, 2008). Additionally, there are a range of particularly vulnerable tourism activities, such as recreational activities that depend substantially on fossil fuels (e.g. scenic flights, jetboating, and boat cruises, Becken & Simmons, 2002). Countries that rely strongly on tourism as an export industry are potentially relatively more vulnerable than those that do not rely on people being transported between and within destinations. Current tourism forecasts, both by the United Nations World Tourism Organisation for global travel and by national agencies such as the New Zealand Ministry of Tourism indicate on-going growth, ignoring potential impacts of higher oil prices. This oversight is risky, especially when major investments, such as expansions of airports, are made based on expected demand increases.

Tourism has proven relatively resilient to many adverse events, including terrorism, pandemics, flight disruptions due to the volcanic ash cloud in April 2010, climate change concerns and high fuel prices. However, the extreme increase in operating costs for airlines in 2008 due to unprecedented prices for aviation fuel also meant, that despite the introduction of fuel charges, the global airline industry recorded record losses (in the order of US$ 5.2 billion for the year 2008, International Air Transport Association, 2008). Even if alternative fuels become commercially available for airlines they are still likely to be more expensive than present aviation fuel. Higher airfares in the future are likely to lead to reductions in travel and cause tourists to shift from more distant to closer destinations (e.g. Gillen, 2004). While some of the economic responses to higher oil prices are obvious, assessing the overall economic impacts on tourism is difficult. Long-term changes in global oil price rises will be concomitant with global changes in other commodity prices, exchange rates, and incomes. It is therefore important to consider the impacts of high oil prices on tourism from a general equilibrium perspective, rather than relying only on bottom-up, partial equilibrium approaches.

This paper describes a two-stage modelling approach to construct and analyze high oil price scenarios for New Zealand. In the first stage, we use a global general equilibrium model to simulate a negative productivity shock to global oil production that causes a 100% increase in global oil prices. From these simulation results, we determine (a) macroeconomic impacts on tourist origin countries and so the effect on tourism demand from these countries, (b) the changes in relative prices of goods and services imported to and exported from New Zealand, and (c) changes in demand for New Zealand's non-tourism exports. These changes are then analysed using a purpose-built CGE model of New Zealand, which focuses on describing tourism supply and demand in some detail.

2. Background

Research in Scotland (Yeoman et al., 2007) and more recently in New Zealand (Becken, 2008; Becken & Schiff, 2011) suggests that tourism is likely to suffer in an environment of high oil prices. Given that tourism destinations typically receive tourists from a range of origins it would be useful to understand if some countries are more vulnerable to increasing oil prices than others. Several studies provided evidence that net oil importing countries are more vulnerable to higher oil prices than oil exporting countries (Gupta, 2008; International Monetary Fund, 2006). For the particular case of New Zealand, Figure 1 shows the top ten countries of origin for international visitor arrivals and the percentage of net oil imports or exports in their GDP. Only Canada is a net oil exporter.
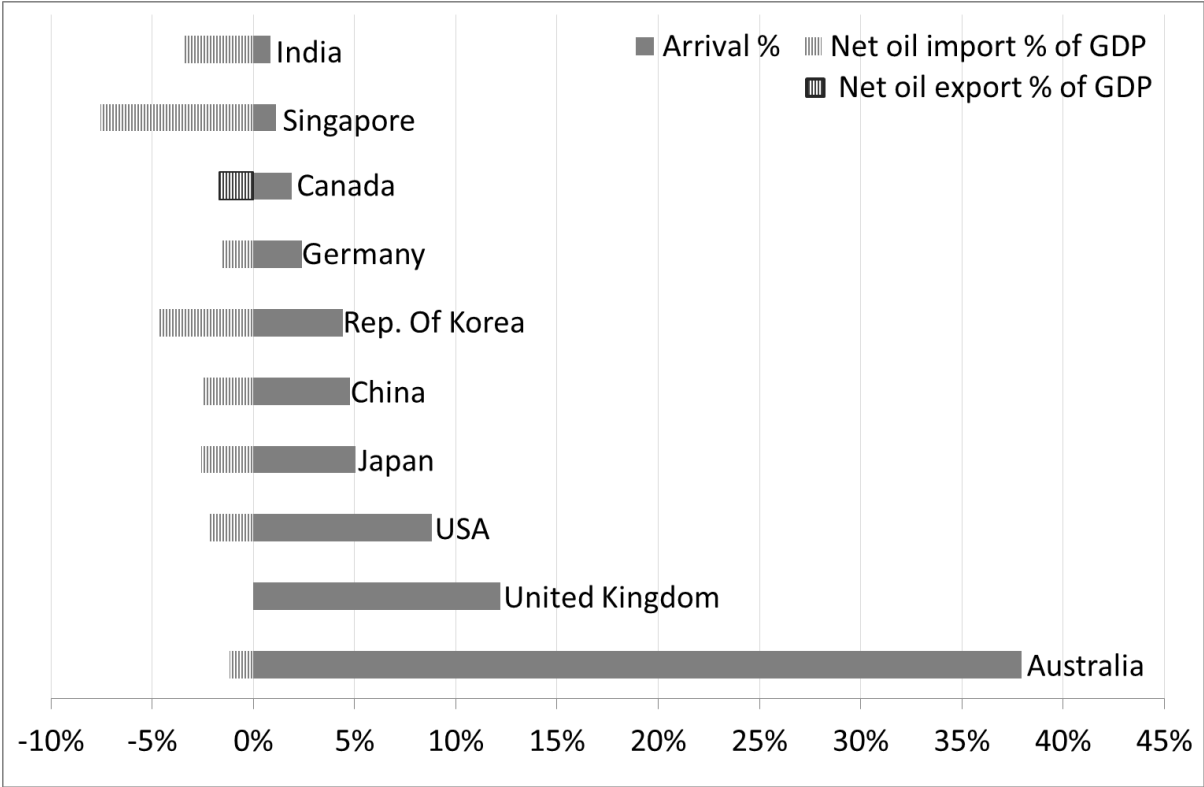

Fig. 1. Top 10 countries of origin for New Zealand international visitors and importance of oil in GDP (*Source:* NZ Ministry of Tourism, 2009, UN Statistics Division, 2008) (Note: Singapore differs from the other countries in that it is a major oil refiner and trade hub).

New Zealand is a long-haul destination for all of its major markets, except for Australia, and major increases in the cost of international air transport threaten international tourism to New Zealand (Becken, 2008). Recent work by Small and Sweetman (2009) indicates that based on tourist arrivals between 1996 and 2008, changes in the oil price and airfares each had significant but weak effects on tourist arrivals to New Zealand. Other macroeconomic variables are generally found to be more important, especially income (Davis & Mangan, 1992; Dritsakis, 2004; Munoz & Amaral, 2000). Income in countries of origin influences both travel propensity and distance (Nicolau, 2008; Lim, Min & McAleer, 2008). In many cases, higher oil prices are likely to be associated with negative income effects that are likely to reduce global tourism and redistribute flows (Becken, Ngyen & Schiff, 2010). Reduced economic activity is also likely to result in reduced volumes of business travel (Njegovan, 2005).

While both economic theory and empirical studies (e.g. on income effects) indicate negative impacts on tourism demand, the exact effects of higher oil prices for specific destinations are far from clear. First, different market segments show different sensitivities to price changes. It is plausible that visitors to long haul destinations are generally wealthier than average and therefore potentially less affected, as energy costs would be a smaller proportion of their income compared with those from less wealthy groups. No research could be found on such differential effects in countries of origin. Second, oil prices do not linearly translate into higher transport costs, especially not on air routes that are highly competitive and that are maintained for strategic reasons. Third, many other factors shape tourists' decision making, including emotional drivers or those related to images, fashions and perceptions. Increasing environmental awareness of tourists could also be an important factor in the future (Becken, 2007).

Apart from international transport, tourism is also reliant on oil for most in-country transport and many tourism activities. For example, tourism in New Zealand is comparatively energy intensive, largely due to high use of cars, vans and domestic air transport. More recently, Becken and Schiff (2010) have analysed the impact of transport prices[1] on tourists' travel choices within New Zealand, finding that travel patterns are rather price-insensitive but differ significantly between market segments based on tourist origins and other characteristics. A related study on price elasticities established quite different values for 18 international tourist market segments. This research also highlighted the importance of exchange rate both for arrivals to New Zealand and consumption of tourism products and services within the country (Schiff & Becken, 2011). It can therefore be assumed that an increase in prices (due to oil or other factors) will affect both the market composition and tourist behaviour.

Changes in tourism activity clearly have wider economic implications, especially in countries like New Zealand where tourism is very important to both the national and local economies. Detailed information on the supply of tourism characteristic industries (e.g. domestic aviation and accommodation) and tourism related industries (e.g. retail) may be found in Tourism Satellite Accounts. As well established in the tourism literature, tourists' expenditure will filter through the entire economy and may provide an important impetus for overall economic activity. The flow-on effects of tourism expenditure to other industries may be quantified using input-output multipliers.

Much of the literature on macroeconomic impacts of oil prices has focussed on price shocks resulting from events that are discrete and relatively short-lived (embargoes, wars, etc.). The

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[1] The analysis of transport prices included changes in fuel costs between 1997 and 2007; the higher oil prices of 2008 are not reflected in the analysis due to data availability at the time.

long-run implications of enduring changes to supply- and demand-side conditions may differ qualitatively, for example due to investment responses of producers, consumers and governments in alternative energy sources and more energy-efficient plant, vehicles and infrastructure. Only a few recent studies begin to address the issue from this perspective (e.g. Schubert & Turnovsky, 2011). It is the aim of this present study to analyse the implications of a long term increase in oil prices for a specific tourism destination, namely New Zealand.

3. Building and testing the model

3.1 Modelling approach

Computable general equilibrium (CGE) models are widely used to study economy-wide impacts of domestic or external economic shocks and may be used in studying long-run impacts of supply- and/or demand-side developments in the energy sector. For example, Ciscar, Russ, Parousos and Stroblos (2004) use the GEMINI-E3 model to simulate supply-side restrictions yielding a US$30 increase in the oil price. Here we adopt a similar modelling approach using the commercially available Global Trade Analysis Project (GTAP) model to simulate a global negative productivity shock in the oil sector, yielding a 100% increase in world oil prices. Our choice of the GTAP model is motivated in part by the relatively high (for a global CGE model) number of countries (including New Zealand) and industries that may be distinguished, as well as by purely practical considerations (commercial availability and familiarity).

'General purpose' CGE models such as GTAP do not, however, provide an explicit or detailed representation of tourism demand, nor a detailed representation of tourism characteristic industries. Supply or demand-side shocks leading to high oil prices are liable to affect both tourism demand and costs of tourism characteristic industries. We therefore adopt

a two-stage approach, first using the GTAP model to construct a coherent global scenario involving a doubling of oil prices, and then use results from this scenario to shock the tourism-specific New Zealand Tourism General Equilibrium Model (NZTGEM) (Lennox, 2010). The simple linking approach adopted (Horridge & Ferreira-Filho, 2003) allows us to account for both global general equilibrium effects, as well as to model in detail impacts on the New Zealand tourism sector and wider economy, incorporating features and data that could not easily be built directly into a global CGE model.[2]

The main limitation of our approach is that global interactions within the tourism sector (e.g. substitution between destination countries) are not well accounted for. Modelling such effects within a global CGE model would, however, be empirically very challenging, given current limitations of global datasets and scarce estimates of key behavioural parameters (i.e. elasticities). We are aware of only one attempt (Berrittella, Bigano, Roson & Tol, 2006) to model tourism within a global CGE model.

3.2 GTAP scenarios

We use the GTAP model to simulate negative supply-side shocks to oil sector productivity in all countries that result in a long-term doubling of global oil prices.[3] This scenario is designed not so much for its realism as for its simplicity and illustrative value. Constructing a 'realistic'

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[2] A technically superior, but more complicated approach would be to 'hard-link' the two models (Bohringer & Rutherford, 2009); effectively *replacing* the representation of New Zealand in GTAP with NZTGEM.

[3] While the GTAP v7 benchmark data nominally pertain to the year 2004, this doubling of oil prices should not be interpreted with reference to the *particular* average oil price level in 2004, but to *any* doubling of average oil prices from a 'reasonably' similar initial level. Indeed, as we model a long-run response, the 'average price' refers to a period of several years, if not longer.

future scenario would require consideration of differential rates of economic growth, technological improvement, depletion of oil resources, development of alternative resources, etc. Given the wide range of possible developments along many of these dimensions, this would not add greatly to our analysis of impacts on New Zealand tourism.

We aggregate countries in GTAP distinguishing New Zealand and eight individual countries of importance for tourism (Australia, United States of America, Canada, United Kingdom, Germany, Japan, China and South Korea) and three other country groups (Rest of the European Union 15, oil exporting countries, and the rest of the world). We distinguish 50 commodities so that we can link GTAP with NZTGEM at a relatively fine commodity resolution (Lennox, 2010). The GTAP scenario outputs used are: i) Real and nominal gross domestic product (GDP) for each country/group, ii) Consumer price index (CPI) for each country/group, iii) New Zealand export prices and quantities, and iv) New Zealand import prices.

3.3. *Modelling tourism and economy-wide impacts in New Zealand*

NZTGEM models the New Zealand economy, providing a detailed representation of tourism demand and supply, distinguishing five types of accommodation and seven modes of domestic transport. The model and the underlying tourism social accounting matrix (SAM) are described in detail in Lennox (2010). Non-tourism features are based largely on the model described in Lennox and van Nieuwkoop (in press). NZTGEM builds on a now well-established tradition of tourism-specific CGE modelling, to which early contributions were made by Blake (2000) and by Madden and Thapa (2000), studying the economic impacts of tourism in Spain and Australian State of New South Wales respectively. Naturally, a great deal of attention has been paid to very small tourism-dependent economies (e.g. Blake,

Sinclair & Sugiyarto, 2003; Narayan, 2004; Sinclair, Blake & Gooroochurn, 2005; Yeoman et al., 2007), but this is the first such model developed for New Zealand.

For this study, we have specified foreign demands for non-tourism exports with finite rather than infinite elasticities (as in the standard NZTGEM model). This is necessary to replicate the changes in export demands simulated using GTAP, reproducing percentage changes in both export prices and quantities. Elasticities were derived from the GTAP model. We retain our specification of import supply as infinitely elastic. Consequently, we can replicate only the percentage changes in import prices (not quantities) simulated with GTAP.

We distinguish international tourism demand from ordinary export demands and domestic leisure tourism demands within household consumption. The 18 international plus one domestic tourist market segments differ in the composition of expenditure and in behavioural parameters (elasticities). Data on the composition of tourist expenditure is based on an analysis of the 'consumption bundles' of 18 market segments (Becken, Carboni, Vuletich & Schiff, 2008). In these, tourist expenditure is disaggregated based on five spending categories: accommodation, air transport within New Zealand, other transport, fuel, and other (including hospitality, attractions and retail) (Figure 2). In addition, information on tourists' expenditure on international airfares provided through the International Visitor Survey was analysed. The typical expenditure for air travel to New Zealand was taken as the median airfare reported for each segment in 2006[4].

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[4] The median was used rather than the mean to minimise the effect of some excessively high and low airfares that have been reported in the IVS historically.
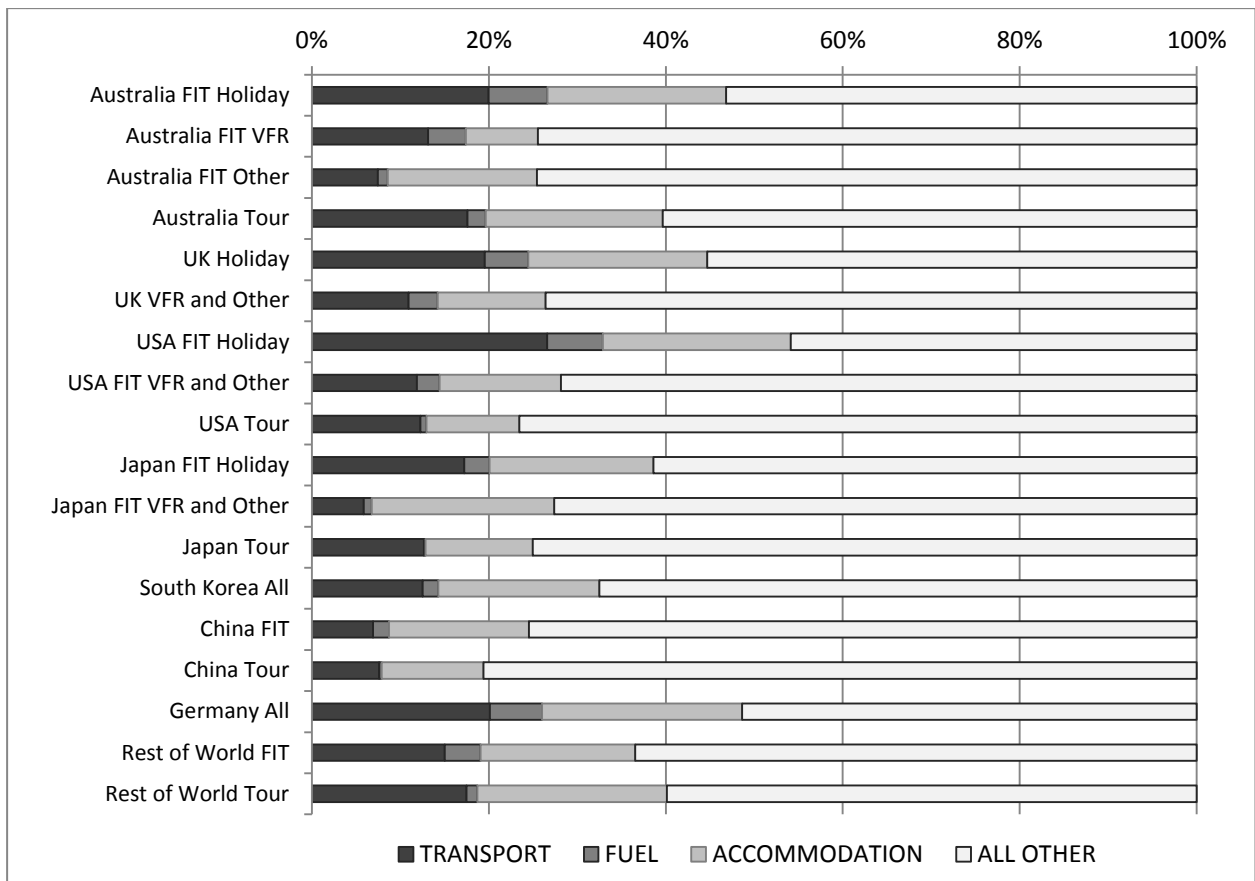
Fig. 2. Consumption bundles for 18 market segments in New Zealand for 2007 (for better readability domestic air and land transport were combined into 'transport') (based on Becken et al., 2008).

We model substitution at a number of levels. At the lowest level, we allow for some substitution between specific products types (e.g. within the category of accommodation: hotels, models, camping, backpacker, other commercial and other non-commercial). At an intermediate level, we allow for substitution between the accommodation, travel in-country, and other expenditure. At the top level, we allow for substitution between in-country consumption and travel to and from New Zealand (Table 1). As we model behaviour at the aggregate level of market segments, rather than at the level of individual tourists, these substitution possibilities encompass both individual responses and changes in market composition (within a segment) in response to relative price changes. They also encompass

changes in quality attributes and length of stay. We model product substitution in the domestic leisure market in the same way, as well as substitution between domestic leisure tourism and international air travel, which we take as a proxy for outbound international tourism. A composite of domestic leisure and outbound international tourism is then substitutable with non-tourism consumption of households.

For inbound international tourists, we model the influences of the overall price level for New Zealand tourism (including international air travel) and of income in a reduced form. That is, we model responses with price and income elasticities, rather than attempting to model tourist behaviour more comprehensively (accounting for substitution between alternative international and domestic destinations and for the overall price and income elasticities of tourism consumption).

Table 1 Elasticities for 18 tourist segments to New Zealand

Segment	Own-price elasticity of NZ tourism	Elasticity of substitution between International Air and In-Country
Australia FIT Holiday	-1.69^{**}	0.54^{**}
Australia FIT Other	-1.89	0.12
Australia FIT VFR	-1.27^{**}	0.16
Australia Tour	-1.42^{**}	0.16^{*}
UK Holiday	-1.81^{**}	0.25^{**}
UK VFR and Other	-1.28^{**}	0.31^{*}
Germany All	-1.295^{+}	0.33
USA FIT Holiday	-0.78^{**}	0.56^{**}
USA FIT VFR and Other	-0.95^{**}	0.44^{*}
USA Tour	-1.66^{**}	0.97^{**}
Japan FIT Holiday	-0.67	0.32
Japan FIT VFR and Other	-0.57	0.21
Japan Tour	-1.31^{**}	0.53^{**}
China FIT	-0.72^{+}	0.44^{+}
China Tour	-1.31^{+}	0.52^{**}
South Korea All	-1.50	0.6
Rest of World FIT	-0.74^{++}	0.42
Rest of World Tour	-1.43^{++}	0.57^{**}

FIT = Free, independent traveller; VFR = visiting friends and relatives; Tour = tour group

Elasticities of substitution between international air travel and in-country consumption tend to be relatively low (all but one of the statistically significant values is below 0.6). This seems intuitively reasonable. International travel is effectively an unavoidable component of any individual tourists' visit. Individual tourists may, however, vary the length of their visit to New Zealand and/or vary the quantity and quality of in-country goods and services. Furthermore, at the level of aggregate visitor markets, individual tourists may enter or exit NZ inbound markets. We have not estimated the elasticity of substitution between domestic leisure travel and outbound international travel econometrically, but assume an elasticity of substitution of 2. This is justified on the grounds that (at least for leisure tourism) domestic and international travel are gross substitutes. This seems intuitively logical and is supported empirically by e.g. Njegovan's (2006) finding of positive cross-price elasticities for the UK. Differences in destination characteristics and travel purpose clearly preclude a very high elasticity. However, we choose a value greater than 1 given the affordability and relatively similar characteristics of major Australian destinations for New Zealanders. We also test the sensitivity of the results to a lower value of 1.

Since high oil prices involve significant changes in national income, we also attempt to account for the income effects on demand for New Zealand tourism. We assume that percentage changes in tourists' income are identical to percentage changes in national income of their origin countries. Also, we have not estimated income elasticities of demand for New Zealand tourism econometrically, but assume values of 2.0 for all international market segments. This is generally consistent (if not conservative) with studies in the literature that find high income elasticities for international travel (e.g. Bonham et al., 2009 [elasticities of

2.23-3.96]; Davies & Mangan, 1992 [elasticity of 2.10]; Dritsakis, 2004 [elasticities of 2.16-6.02]; Munoz & Amaral, 2000 [2.07]).

As the values of most of these elasticities are quite uncertain, we test the sensitivity of the results to these uncertain parameters by running alternative simulations, halving each elasticity or set of elasticities (i.e. for all international markets simultaneously) in turn.[5]

4.   Results

The results will be presented in two sections. The macroeconomic effects as modelled through GTAP will be shown first, followed by tourism-specific results which are derived from the national NZTGEM.

4.1 Countries of origin

Impacts on real income differ vastly between the nine countries in the model, following oil price increase up to 100%. South Korea, followed by China, suffers the greatest fall in real income in the order of 4-6% (Figure 3). The seven developed countries fall into two groups: one, comprising the USA, Japan and Australia, suffering slightly less reduction of real income than New Zealand, Germany, UK and the Rest of the European Union 15. These results are consistent with other findings that developing countries are generally likely to be worse affected by higher oil prices than developed countries (Gupta, 2008).

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[5] We found the effects to be approximately symmetric when elasticities are doubled instead of halved, so present results only for the latter cases.
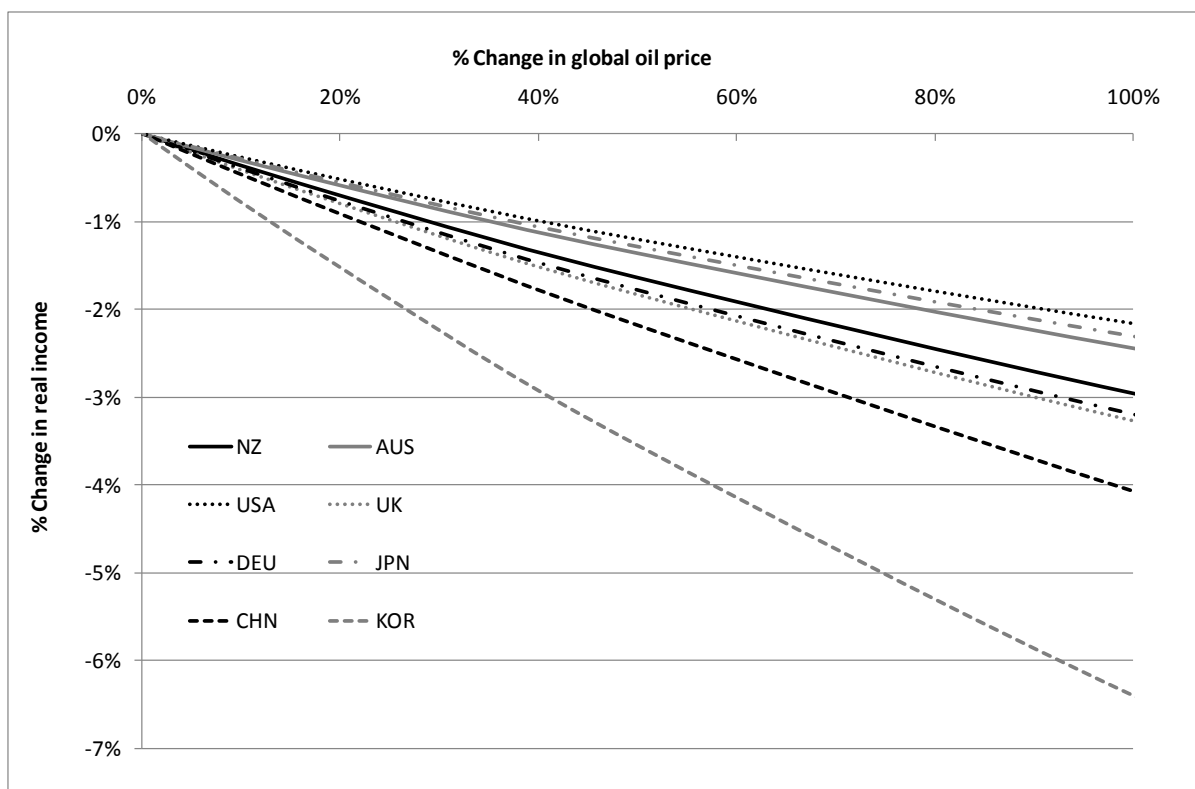
Fig. 3. – Changes in real income resulting from changes in oil price as simulated by uniform global changes in crude oil production efficiency (RoEU15: Rest of the European Union 15).

The real exchange rate effects (Figure 4) are smaller in absolute value than the real income effects for all the origin countries. Real exchange rates are defined as the ratio of general price levels in different countries. Increases in the general price level in tourism origin countries relative to the price of tourism in New Zealand should (other things being equal) increase consumption of the latter. In other words, tourists from Korea, Rest of EU15, Germany and the United Kingdom will find their exchange rate provides a small advantage to their purchasing power, whereas those with negative changes in exchange rate (USA, China, Japan and Australia) will find New Zealand relatively more 'expensive'. The latter ones represent the major markets for New Zealand.
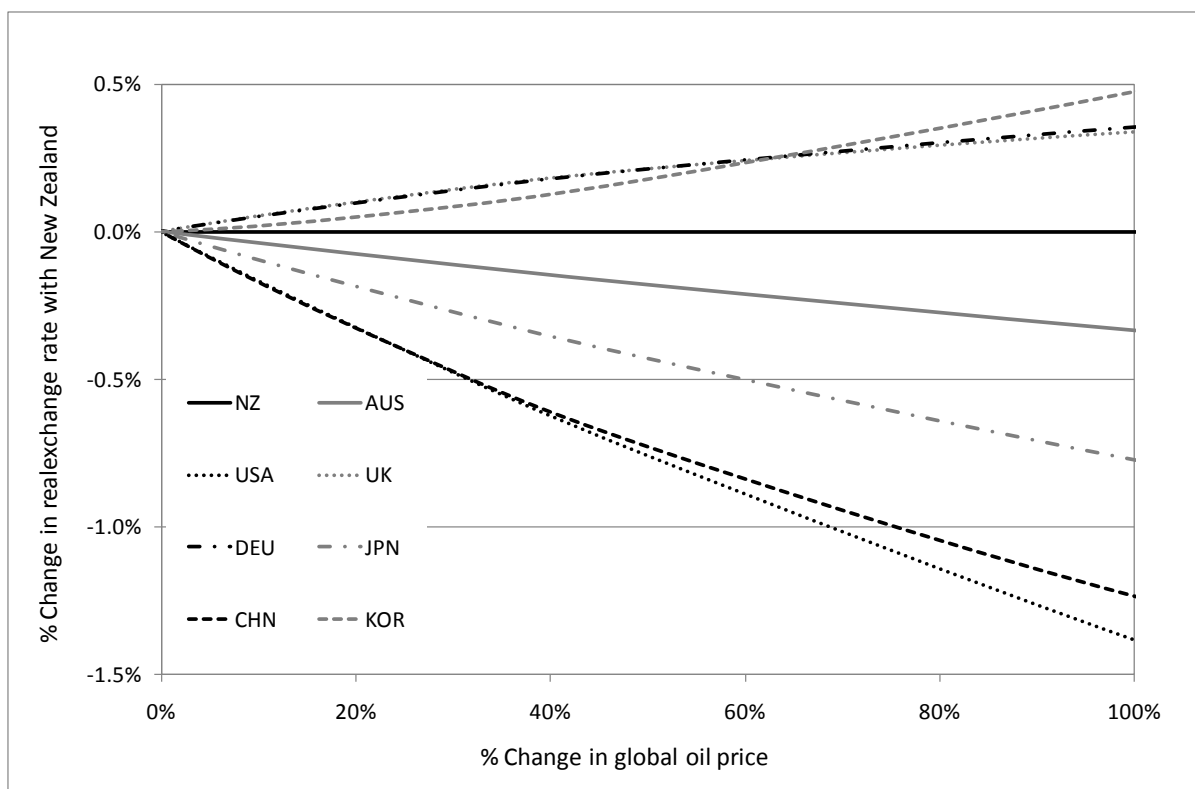
Fig. 4. – Changes in real exchange rates (relative to NZ$) resulting from changes in oil price as *4.2*

New Zealand macroeconomic impacts

A 100% increase in world oil prices leads to a 0.9% decrease in gross domestic product
(GDP) and a 1.7% decrease in real gross national disposable income (RGNDI). Higher import
prices, particularly for oil and petroleum products, cause the aggregate volume of imports to
fall 3.8%, although the real value of imports decreases only 1.0%, due to the higher world
prices of petroleum in particular. Decreases in demand for exports cause their aggregate
export volumes to fall by 2.6% and their real value to fall 2.4% (Table 2). Tourism is affected
much more severely, with exports falling 11.0% in volume and only slightly less (9.0%) in
value. The accommodation sector, which is central to tourism supply, is modelled to decrease
by 4.6% in volume and slightly more (5.8%) in value. Tourists demand less accommodation
and its real price falls in response to reduced demand. This could reflect not only reduced

arrivals, but reduce length of stay and reductions in the 'quality' of accommodation consumed.

Table 2 Macroeconomic changes in New Zealand under the assumption of a 100% increase in oil price

	% change in volume	% change in real value
Real GDP	-0.9	n.a.
RGNDI	n.a.	-1.7
Imports	-3.8	-1.0
Exports	-2.6	-2.4
Tourism exports	-11.0	-9.0
Accommodation gross output	-4.6	-5.8

4.3 New Zealand market-specific impacts

Considering first the impacts on total tourist consumption (i.e. international airfare plus in-country consumption) in Table 3 (left half), the large variation of price and quantity changes both within and between countries can be noted. The largest price increase of 10.0% is observed for tourists from the United Kingdom who travel for visiting friends or other reasons (usually business) (UK VFR Other). This is despite a slightly favourable exchange rate effect. The smallest price increase is only 1.5%, namely for Australian tour group visitors. Other Australian markets also see relatively small increases in price, explained by the relatively small component of airfares in the total tourism consumption bundle and relatively lower jet fuel costs as a share of the airfare compared with long-haul flights.

Changes in prices affect markets differently because of large variations in price elasticities of New Zealand tourism. In addition, changes in income significantly affect demand in all markets. Hence, even those markets that experience similar real price changes can respond quite differently. For example, a price increase of 3.1% for South Korea is accompanied by a quantity decrease of 17.2%, while price increases of between 3.5 and 5.0% for different

Japanese market segments are accompanied by decreases in quantity of between 6.8 and 9.4%. For the British markets, a price increase of 7.9% for holiday visitors is accompanied by a 18.6% decrease in quantity, while UK VFR Other respond less strongly (decrease in quantity of 17.5%), despite a more pronounced price increase of 10.0%. Demand from Chinese tour group visitors and South Korean tourists will reduce substantially under the selected high oil price scenario. In the case of China, effects of higher tourism prices due to higher oil prices are exacerbated by real exchange rate effects.

The real value of tourist consumption – as opposed to changes in quantity – is important as it gives an indication of how much tourists spend. Value represents a combination of changes in price and quantity, and it can be seen that while tourist expenditure (value) decreases for all market segments in terms of total tourism consumption, it does so to a lesser degree than quantity, because real prices of tourism rise overall (Table 3). The greatest effect can be observed for British VFR and Other tourists, where a large decrease in quantity (17.5%) is associated with a much lesser (9.2%) decrease in real expenditure.

Table 3 Impacts on inbound international and domestic tourism consumption (% change)

	Total consumption			In-country consumption		
	Price	Quantity	Value	Price	Quantity	Value
Domestic Leisure	n.a.	n.a.	n.a.	6.3	0.7	7.0
Australia FIT Holiday	3.8	-10.8	-7.4	2.1	-10.0	-8.4
Australia FIT Other	2.1	-8.7	-6.8	-0.4	-8.4	-9.1
Australia FIT VFR	3.5	-9.2	-6.0	0.8	-8.8	-8.4
Australia Tour	1.5	-7.1	-5.7	-0.2	-6.9	-7.4
UK Holiday	7.9	-18.6	-12.2	0.4	-17.1	-16.5
UK VFR and Other	10.0	-17.5	-9.2	0.2	-15.1	-14.6
Germany all tourists	6.2	-13.7	-8.3	0.3	-12.0	-11.4
USA FIT Holiday	7.3	-9.7	-3.1	2.7	-7.5	-6.4
USA FIT VFR and Other	5.9	-9.6	-4.3	1.6	-7.9	-7.8
USA Tour	4.8	-11.5	-7.3	0.9	-8.2	-8.7
Japan FIT Holiday	5.0	-8.0	-3.4	0.5	-6.7	-7.0
Japan FIT VFR and Other	3.5	-6.8	-3.5	0.1	-6.1	-6.8
Japan Tour	3.8	-9.4	-5.9	-0.1	-7.5	-8.3
China FIT	4.0	-11.0	-7.4	0.5	-9.7	-10.4

China Tour	6.3	-15.4	-10.0	0.2	-12.7	-13.8
South Korea All	3.1	-17.2	-14.7	-1.2	-15.1	-15.8
Rest of World FIT	7.2	-11.7	-5.4	-0.4	-9.0	-8.8
Rest of World Tour	5.3	-13.5	-8.9	-1.1	-10.4	-10.9

FIT = Free, independent traveller; VFR = visiting friends and relatives; Tour = tour group.

The right-hand half of Table 3 shows changes to in-country consumption, i.e. focusing on tourism within New Zealand and excluding international travel to and from New Zealand. The most significant price increase is observed for domestic leisure tourism. This is largely driven by petrol and diesel prices for transport. The two international market segments that see significantly higher prices within New Zealand are American and Australian FIT holiday tourists. These market segments are also characterised by considerable fuel cost shares (5.5% for the Australian and 3.1% for the American segment, respectively). In contrast, the Japanese FIT holiday segment has a fuel cost share of only 1.1%, and the in-country price increase is just 0.5%. A number of segments (e.g. South Korea) observe real price reductions as a result of general equilibrium effects; in some cases, despite unfavourable changes in the real exchange rate.

In-country consumption decreases significantly for all market segments, including domestic tourists. This is less a result of increased prices, but of flow-on effects from reduced demand for New Zealand tourism as discussed earlier in relation to 'total consumption'. Reduced demand is driven to a large extend by higher international airfares and lower real incomes. However, the quantity changes for in-country consumption are somewhat smaller than those for overall tourism consumption. This difference is greatest for tour group visitors from the USA, for whom total consumption falls 11.5% while in-country consumption falls only by 8.2%. This can be explained by substitution at the individual and, more importantly, the aggregate market segment level between international air travel and in-country assumption.

For example, the fewer tourists who arrive may have a longer average length of stay. They might also consume a greater quantity or higher quality of products during their stay. It might be that higher prices for tourism overall will discourage price-conscious tourists, but not more affluent and high-spending tourists.

Changes in the value of in-country consumption are generally relatively similar to changes in quantity. This means that from a tourist perspective, expenditure for in-country products and services is relatively unaffected. For some markets, value actually decreases more than quantity, for example for Chinese tour group visitors (-13.8% compared with -12.7%). The value of domestic tourism increases by 7.0%, mainly due to an increase in the overall price level for domestic tourism driven primarily by higher prices of petroleum products..

4.4 Sensitivity analysis

To test the importance of a range of key variables and assumptions, sensitivity analyses have been carried out. More specifically, four sensitivity analyses have been performed, halving in turn:

1. Income elasticity of demand for all inbound international tourism markets

2. Price elasticity of demand for all inbound international tourism markets

3. Elasticity of substitution between international air travel to/from New Zealand and in-country tourism consumption for all inbound international tourism markets

4. Elasticity of substitution between domestic leisure tourism and outbound international air travel (as a proxy for outbound international tourism) for New Zealand residents.

Compared with the 'central' scenario of quantity changes in demand (second column, Table 4), following a 100% increase in global oil prices and using the assumptions as detailed in the methodology, reductions in the elasticities of income and price have the greatest effects (columns 3 and 4 in Table 4, respectively). For example, halving income elasticities (from 2 to 1) for the Korean market means that the reduction in total tourism consumption (i.e. quantity change in international air travel and on-the ground) is lessened (from -15.1% to -8.4%). This highlights that the degree to which tourism is a 'luxury good' (i.e. income-sensitive) has great bearings on the reductions in tourism demand for New Zealand. It also shows the importance of income changes (here in all cases, reductions) in different origin countries under high oil price scenarios.

Price elasticities are also important; in some cases even more important than income elasticities. For example, reducing the price elasticity for the British holiday segments lessens the reduction in tourism consumption substantially (from -17.1.0% to -11.5%). For the Australian segments, changes in income and price elasticities have approximately equal effects, whereas for the Japanese segments, the income effect dominates the own-price effect.

Changes in the elasticity of substitution between international air travel and on-the-ground tourism products have very minor effects. This is to be expected, given the strong complementarities between them for New Zealand. We also find that the aggregate tourism demand is insensitive to changes in the elasticity of substitution between domestic leisure travel and outbound international travel of New Zealanders, even though this elasticity significantly affects the response of the domestic leisure market (Table 4, row 1).

Table 4 Sensitivity analysis for total consumption (% change in quantities for each case)

	Central	Low income	Low price	Low air-OTG	Low domestic – outbound air*
Domestic leisure tourism*	0.7	0.8	0.8	0.6	-1.0
Australia FIT Holiday	-10.0	-7.5	-7.3	-10.4	-10.0
Australia FIT Other	-8.4	-5.8	-6.7	-8.6	-8.4
Australia FIT VFR	-8.8	-6.3	-6.9	-9.0	-8.8
Australia Tour	-6.9	-4.4	-5.9	-7.0	-6.8
UK Holiday	-17.1	-13.9	-11.5	-17.9	-17.2
UK VFR and Other	-15.1	-11.8	-10.0	-16.4	-15.1
Germany all tourists	-12.0	-8.8	-8.7	-12.9	-12.0
USA FIT Holiday	-7.5	-5.3	-5.1	-8.6	-7.4
USA FIT VFR and Other	-7.9	-5.8	-5.6	-8.8	-7.9
USA Tour	-8.2	-6.1	-4.8	-10.0	-8.2
Japan FIT Holiday	-6.7	-4.3	-5.2	-7.3	-6.7
Japan FIT VFR and Other	-6.1	-3.7	-5.3	-6.5	-6.1
Japan Tour	-7.5	-5.2	-5.4	-8.5	-7.5
China FIT	-9.7	-5.6	-8.5	-10.4	-9.7
China Tour	-12.7	-8.7	-9.3	-14.2	-12.7
South Korea All	-15.1	-8.4	-13.3	-16.2	-15.1
Rest of World FIT	-9.0	-5.6	-6.8	-10.4	-9.0
Rest of World Tour	-10.4	-7.0	-7.2	-12.1	-10.4

FIT = Free, independent traveller; VFR = visiting friends and relatives; Tour = tour group
*Domestic leisure tourism values pertain to domestic tourism only, not to total tourism consumption of New Zealand residents.

5. Discussion

This research examined the effects of a long-run 100% increase in global oil prices resulting from decreased global oil supply on the New Zealand economy, focussing particularly on tourism. New Zealand itself is a net oil importer, even though it currently produces about 55,000[6] barrels per day (about a third of its own consumption). Approximately two thirds of electricity are generated from hydro, with additional renewable contributions from geothermal and wind (Ministry of Economic Development, 2009). While New Zealand's energy portfolio may provide some buffering against the direct consequences of global oil supply shocks, the

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[6] Ministry of Economic Development figures http://www.med.govt.nz/upload/37172/A-oil-tables-1.xls

economy is also exposed to indirect impacts, such as higher import costs and decreased demand for exports . This is particularly the case for international tourism, where our results suggest that they key factors are changes in economic conditions in tourists' home countries and/or in the cost of international air travel.

The macroeconomic effects for New Zealand identified in this present research are consistent with findings in other countries, where higher oil prices led to reductions in economic activity (Naccache, 2010). An IEA (2004), for example, showed that OECD countries were vulnerable to oil price increases despite the reduction in the degree of oil dependency in their economies over time. For New Zealand, we modelled that a doubling of world oil prices would lead to a 0.9% decrease in GDP and a 1.7% decrease in real gross national disposable income (RGNDI[7]). While these might sound relatively small, a comparison with the recent recession highlights the potential seriousness of such reductions; notably, if such impacts are realised rapidly and/or in the context of an otherwise weak economy. In New Zealand, the year 2009 saw a reduction in GDP by 1.6% and a contraction of RGNDI of 1.0%. Unemployment rose to 7.3% by the start of 2010, the highest rate since 1999 (Statistics New Zealand, 2009).

Tourism is likely to be more adversely affected than the wider New Zealand economy by high oil prices, with tourism exports falling 9.0% in real value. International visitors spent a total of NZ$9.313 billion in New Zealand in 2009 (Statistics New Zealand, 2010b). Thus, a reduction of 9.0% would currently mean a loss of export revenue of NZ$959 million. The Ministry of Tourism (2010) estimated that the global recession led to a decrease in tourist

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[7] RGNDI takes into account changes in the terms of trades (imports versus exports), as well as real gains from net investment and transfer of income with the rest of the world. As such it measures the "volumes of goods and services that New Zealand residents have command over" (Statistics New Zealand, 2010a: 9).

expenditure by 2.2% ($136 million) in 2009 compared with the previous year. Long-term doubling of oil prices could increase such losses substantially unless accompanied by strong growth in international tourism demand. The analysis highlighted the potential compensatory role played by domestic tourism in such a scenario. Due to a shift away from outbound international towards domestic travel, the accommodation sector (which is central to tourism supply) was slightly less affected than tourism as a whole. As a whole, the accommodation sector is also buffered by a shift away from oil-intensive products (particularly air and rental vehicle transport) towards accommodation and other less oil-intensive products. However, this implies that accommodation and other tourism businesses located in less accessible destinations may be particularly badly affected.

Tourism is currently New Zealand's second largest export earner (after dairy) and therefore an important pillar of the economy. However, the results show that tourism is relatively more affected by high oil prices than most other economic sectors in New Zealand. There are two main reasons for this. One is that tourism is a discretionary activity (our model used an income elasticity of 2) and at times of lower incomes consumers are likely to reduce travel or substitute to destinations closer to home (Nicolau, 2008). The inverse trend has recently been demonstrated by Lim et al. (2008), who observed that as incomes increase for the Japanese market, outbound tourism shifts from short haul to longer haul destinations. The other reason is that international travel (especially long haul) is dependent on aviation, which in turn relies on high inputs of fossil fuels. Fuel costs as a percentage of an airline's operating cost are in the order of 30% for long haul flights and around 17% for short haul flights (Ringbeck et al., 2009). Compared with energy inputs of between 5-10% as proportion of revenue in other, land-based tourism sectors these are relatively high (Becken & Carboni, 2008). The findings presented here, therefore suggest that tourism-dependent countries might be relatively more

vulnerable to oil price increases than those relying on other (diversified) portfolios; however more research in other destinations would be required to ascertain this assumption.

Impacts of oil prices are likely to be unevenly distributed across countries (Jiménez-Rodríguez (2008). The income and exchange rate effects in our simulations suggest that different countries of origin as well as destinations have differing degrees of vulnerability. There are a wide range of reasons for differential vulnerability (Gupta, 2008), including, for example, the ratio of domestic oil production to oil imports. In Gupta's analysis Australia and the United States were least vulnerable, whereas the Philippines, Korea, India and China were the most vulnerable. New Zealand was classified as medium vulnerable. Negative income effects in major countries of origin are the greatest concern, as these not only influence travel propensity in general (e.g. Munoz & Amaral, 2000), but also moderate choice of holiday and travel distance (Fleischer & Rivlin, 2008).

In line with this literature, our analysis suggests that of the countries considered, Korea and China would suffer the greatest negative income impact in response to higher oil prices. Both are important markets for New Zealand, ranking fourth and sixth of all international markets. At the same time, these markets displayed the highest tourism growth rates following the recession, hence presenting important future opportunities for New Zealand tourism. Close monitoring of these markets in the light of increasing oil prices might prove beneficial. On the other hand, the USA, Japan and Australia face the least notable income effects. Together these three markets currently comprise 52.4% of all international arrivals (Ministry of Tourism, 2010). The sensitivity analysis highlighted the importance of income elasticity across all market segments. Reducing elasticity values from two to leads to substantially reduced negative effects for New Zealand tourism in response to higher oil prices. Different effects

were also found for exchange rate, where tourists from the USA and China face the greatest relative losses due to unfavourable exchange rates. Exchange rates are important factors in tourists' decision making. A recent analysis of tourism demand for New Zealand illustrated that exchange rate fluctuations have been more pronounced than inflation-based increases in the tourism price index (Schiff & Becken, 2011). Again, the sensitivity analysis of price (which incorporates exchange rate effects) highlights the importance of this factor for New Zealand tourism.

Clearly, changes to New Zealand tourism are not uniform across markets. Apart from different impacts on incomes and exchange rate, tourists from different origin countries are also characterised by different consumption patterns (Becken et al., 2008) and price sensitivities (Schiff & Becken, 2011). For example, the segment of Australian holiday tourists who travel free and independently is characterised by a large consumption of transport services and less consumption in the areas of retail, restaurants and activities. In contrast, these latter categories are very important for Chinese tour group visitors, who in turn spend relatively less on transport and accommodation whilst in New Zealand (see Figure 1). Such differences in consumption behaviour result in differentiated effects of price increases, depending largely on the oil-intensity of the demanded products. In addition to in-country consumption, the relative importance of the price of airfares as part of the total tourism consumption plays an important role. So, while the Australian FIT holiday tourists face the highest price increase within New Zealand, the remain relatively less affected due to smaller increases in international airfares (e.g. relative to tourists from the United Kingdom). Most of the Asian markets (apart from Japan) are also characterised by substantial decreases in tourism quantity and value, both for total and in-country consumption.

Domestic tourism is a very important component of New Zealand tourism. It generated expenditure of NZ$ 12.424 billion in 2009 – more than that of international tourists. Domestic tourism partly compensates for losses in international tourism, because New Zealanders' propensity to travel overseas reduces with higher oil prices. However, domestic tourism expenditure is also heavily dominated by transport. The three largest items of domestic expenditure are on automotive fuels ($1.9 billion), air transport ($1.8 billion) and other transport ($1.5 billion). In contrast, domestic tourists spent only $789 million on accommodation in 2009 (Statistics New Zealand, 2010b). As a result, the price of the domestic tourism consumption bundle increases substantially (6.3%), although quantity increases slightly (0.7%) due to substitution away from outbound international travel, causing an increase in overall domestic tourism expenditure of 7.0% under the scenario of a doubling of oil price.

The findings of this study have important management implications. First, it is important to understand a destination's overall vulnerability to higher oil prices, both in general and specifically in relation to its tourism sector. Second, differences in vulnerability of different market segments might influence investment decisions for marketing campaigns. For example, in the case of New Zealand, marketing in Australia and the USA might prove more viable in the long term than marketing efforts in the United Kingdom or some Asian countries. Facilitating smoother travel between New Zealand and Australia (both for Australian tourists and for those who visit both countries) might also be a useful strategy to maintain visitation. It is important to note, however, that oil prices and changes in tourist behaviour are only one factor that might influence such decisions. However, in terms of exposure to oil prices, the current analysis may provide additional impetus for the New Zealand Government and industry to invest into alternative energy sources and non-fossil fuel

based transport systems. While international air travel remains a challenge, reduced dependency on oil within New Zealand would reduce vulnerability substantially. It would also have beneficial effects on the price of tourism for New Zealanders holidaying at home. The price of oil might also be a consideration in product development at the business level.

6.   Conclusion

This research showed that global oil scarcity leading to high oil prices has not only general negative macroeconomic impacts on net oil-importing countries, but strong negative impacts on international tourism, especially in long-haul markets. Oil is a finite resource, and while the debates about the peaking of its global production and the availability of alternative liquid energy sources are on-going, there is little doubt that oil prices are likely to rise over the medium term future. International tourism is a discretionary and at the same time oil-intensive activity and therefore more vulnerable than many other economic activities. For long-distance destinations, in particular, this means that careful analyses of future markets are warranted. Such analysis should consider income effects in source countries, exchange rate changes, price sensitivities and different consumption behaviours. Other factors, such as ethical concerns and carbon footprints, are also increasingly important for some markets. It should also be noted that many of the factors driving global oil prices may also influence tourism impacts: for example, rising oil prices may reflect in part rising incomes in China and many other developing countries, which are likely to positively affect tourism demand for New Zealand and other destinations.

The two-stage CGE modelling approach presented in this paper proved useful to understand better the economic implications of higher oil prices at a number of levels, including differentiated responses by 18 different market segments to New Zealand. The main

limitation of this approach is its inability to account for substitution effects involving competing international tourism destinations. Developing partial or general equilibrium models that to account for international destination choices is empirically challenging. However, such models could have a wide range of application in research on international passenger transport and international tourism.

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