

## **Economic resilience to changes in Covid-19 driven tourism demand: an ex-post modelling contribution**

Topic: Input-Output Analyses and Input-Output Modelling of Disasters - I

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The focus of this paper is the measurement of resilience of tourism-facing industries following the COVID-19 pandemic. Tourism activities across the world have been massively impacted by COVID-19, with the economic consequences propagating beyond the narrowly defined tourism industry to other economic activities. Several studies have used multi-sectoral economic models such as Input Output (IO) and Computable General Equilibrium (CGE) to capture the whole-economy impact of reduced tourism activities for various economies around the world. In parallel to these modelling applications, a significant strand of research since the start of 2020 has examined the changes in tourism activity during the COVID-19 period, including the development of metrics of “tourism resilience”.

A common approach in the tourism resilience literature is to quantify resilience as the degree to which tourism activities have returned to their pre-pandemic capacity, measured as a percentage. A key issue is that the measures of resilience found from such studies aggregate the result of a combination of both the ability of tourism-facing activities to continue to operate despite public health measures in place during COVID restrictions - for example by increasing distancing, more frequent sanitisation, inputs substitution - and the policies and interventions that have fostered resilience through mitigation, such as finding new products and markets.

This paper brings conceptual insights from the resilience literature on the whole economy modelling of natural disasters to the tourism literature and illustrates how “ for an observed change in tourists’ accommodation spending during 2020 in Scotland “ Input-Output (IO) and Computable General Equilibrium (CGE) models can be used to describe situations where different elements of resilience are introduced in a controlled setting.

The basic idea is that incorporating different modelling assumptions and behavioural responses into economic models can generate “ for the same change in tourism spending - different tourism activity and whole economy outcomes for resilience. Our paper shows that the analyst’s choice of model and its specification can rule out possible resilience responses, which can lead to an underestimation the degree of resilience in an economy. The extreme case of hypothetical extraction in an IO system reflects a situation where essentially no resilience is present in the system and establishes a maximum business interruption scenario. Demand driven IO modelling assumes that inputs are used in fixed proportions and are linearly related to output. Hence, these models cannot capture the ability of industries to reorganise their supply chain and select cost minimising inputs but can consider the ability of hotels to gradually reopen (at reduced capacity) for certain periods of the year. CGE models can capture input substitution following an economic shock through price sensitivity behaviour. By calibrating a set of IO and CGE models for Scotland on a common 2019 Input Output table, and using data on reduced demand for accommodation in 2020, we demonstrate how increasing the degree of endogenous responsiveness of economic models can help to explain broad categories of resilience. By comparing the change in the accommodation industry gross value added estimated by our different models with the maximum business interruption case we are able to calculate a measure for resilience for each model.

An additional novelty of the paper is that we use data on the actual changes in gross value added in the accommodation industry in Scotland in 2020 to assess the performance of the IO and CGE

models in predicting the impact of the shock to accommodation. We find that in most cases economic models tend to over-estimate the impacts of a demand shock to the accommodation sector. However, the performance of the models improves when flexibility is introduced in the model specifications to account for potential resilience strategies such as input substitution. We find that our CGE model explains about 80% of the variation in gross value added in the Scottish accommodation sector in 2020. This sheds important light on the selection and use of models for exploring the sector and economy-wide impacts of tourism shocks.