TOURISM ECONOMICS

AN OXFORD ECONOMICS COMPANY

CALCULATING THE INDIRECT AND INDUCED IMPACTS OF TOURISM IN THE BAHAMAS

TECHNICAL REPORT

FEBRUARY 2021

THE ISLANDS OF THE bahamas

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To discuss the report further please contact:

Matthew Dass: mdass@oxfordeconomics.com

Tourism Economics
an Oxford Economics company
303 W. Lancaster Ave, Suite 2E
Wayne, PA 19087
Tel: +1 610-995-9600

www.tourismeconomics.com

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1. INTRODUCTION

1.1 CONTEXT AND RATIONALE FOR THE STUDY

According to the most recent Tourism Satellite Account (TSA) for The Bahamas, completed for 2012, visitors represent an integral part of the economy. Direct tourism GDP accounted for $1.6 billion or 15% of Bahamian GDP in 2012.

By monitoring the visitor economy, policymakers can inform decisions regarding the funding and prioritization of the sector's development. They can also carefully monitor its successes and future needs.

The TSA measures the **direct effects** of tourism. That is, the immediate effects of the additional tourism demand on the production processes and supply of goods and services within an economy—in terms of additional goods and services that are produced, and the additional value added and jobs that are supported.

However, it is also important to consider the impacts of such increased economic activity on the country as a whole. This includes not only the impact of actual spending by tourists but also the downstream effects of this injection of spending into the Bahamian economy. These additional channels of activity can be grouped into two core channels of impact: indirect and induced effects.

- **Indirect effects** stem from supply chain spending, where each directly affected sector also purchases goods and services as inputs (e.g. food wholesalers, utilities) into production.
- **Induced effects** are generated when employees, whose wages are generated either directly or indirectly by travel and tourism, spend those wages in the local economy.

Considering the direct, indirect and induced impacts together equates to the **total economic impact of tourism.**

1.2 STUDY OBJECTIVES

Tourism Economics were asked by The Bahamas Ministry of Tourism and Aviation to develop a functioning input-output (I-O) tourism impact model for The Bahamas to calculate the indirect and induced impact of tourism.

This report presents the technical steps we worked through in order to develop this model. This is part of a collection of deliverables associated with this project. Other key deliverables include:

- A functioning tourism-focused input-output model, based on the Department of Statistics supply and use tables and national accounts.
- Calculations for indirect and induced tourism impacts in connection with the TSA results for 2012 based on this input-output model.
- A report of findings with industry detail of direct, indirect and induced impacts for output, value added, compensation of employees and employment. This report highlights key findings and the overall importance of tourism to the economy of The Bahamas.

We have organised the steps of developing an IO model into two sections:

1. Transforming supply and use tables (SUTs) into a domestic IO table.
2. Building the IO model and generating indirect and induced impacts.

The subsequent chapters of this report explain these two steps in detail. To develop the theoretical aspects of these chapters we drew from the following sources:

- Office of National Statistics, *Input-output analytical tables: methods and application to UK National Accounts,* 2017
- Office of National Statistics, *United Kingdom Input-Output Analytical Tables*, 2010
- Eurostat, *Manual of Supply, Use and Input-Output Tables*, 2008
- UNWTO, OECD, Eurostat, the United Nations Statistics Division, *Tourism Satellite Account: Recommended Methodological Framework*, 2008
- OECD, *Understanding National Accounts*, 2014

2. TRANSFORMING SUTS INTO A DOMESTIC IO TABLE

IO tables are derived from Supply and Use tables (SUT), by using data from the supply table to transform the use table into an IO table. In this chapter we examine the content and structure of SUTs as well as setting out the key steps of moving from SUTs to an IO table.

2.1 SUPPLY AND USE TABLES

Supply and use tables provide a detailed picture of the processes of production, the use of goods and services and the income generated from production within an economy.

Moreover, these tables provide a consistent framework for balancing national accounts and allow for the calculation of GDP using production, income and expenditure approaches. The tables produce a single and balanced estimate of GDP, across the three methods of calculation, that integrates the components of value added, output and final demand.

SUTs are presented as two matrices—one for supply and one for use. The supply table shows the supply of goods and services by type of product of an economy for a given period of time. Supply is shown from domestic industries at basic prices (see box below for definitions of different prices) plus imports as well as valuation matrices for distributors' trade margins attached to products and taxes less subsidies on products. Summing across these categories gives the total supply of products at purchasers' prices (see box below).

The supply table enables the transformation of supply at basic prices (total domestic output at basic prices and imports including the cost of insurance and freight) to purchasers' prices; this mapping connects demand-side with supply-side measurements of economic activity. Fig. 1 presents the basic framework of a supply table.

Fig. 1. Basic supply table template

<table>
<tr><th rowspan="2">Products</th><th colspan="4">Output of industries</th><th rowspan="2">Imports CIF</th><th rowspan="2">Total supply at basic prices</th><th colspan="2">Valuation</th><th rowspan="2">Total supply at purchasers' prices</th></tr>
<tr><th>Industry 1</th><th>Industry 2</th><th>Etc.</th><th>Total domestic output at basic prices</th><th>Trade and transport margins</th><th>Taxes less subsidies on products</th></tr>
<tr><td>Product 1</td><td colspan="3" rowspan="3">Production matrix</td><td rowspan="4">Domestic output</td><td rowspan="4">Import matrix</td><td rowspan="4">Total supply at basic prices</td><td colspan="2" rowspan="3">Valuation matrix</td><td rowspan="4">Total supply at purchasers' prices</td></tr>
<tr><td>Product 2</td></tr>
<tr><td>Etc.</td></tr>
<tr><td>Total</td><td colspan="3">Total output of industries at basic prices</td><td colspan="2">Total</td></tr>
</table>

Source: Eurostat, *Manual of Supply, Use and Input-Output Tables*, 2008

BASIC AND PURCHASERS' PRICES

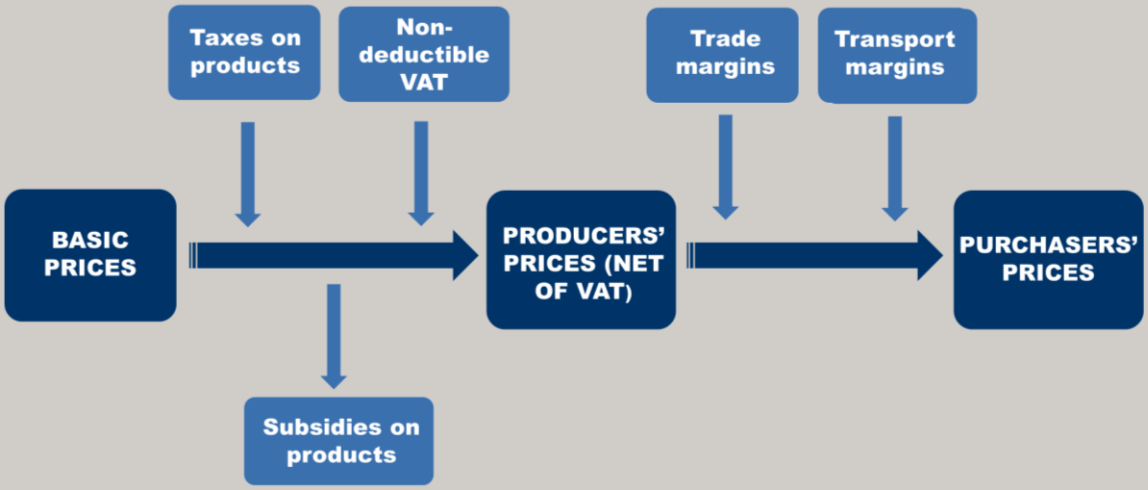
SUTs combine different types of valuation for the same variable, this is to reflect that the purchaser and producer of a good (or service) perceive the price of the good differently. To take account of these differences, SUTs present the value of transactions or variables in two different ways: basic prices and purchasers' prices.

Basic prices reflect the amount actually received by a producer for the good or service that they provide. The basic price is the amount received by the producer from the purchaser for a unit of goods or services produced as output. Basic price is presented minus any tax payable and plus any subsidy receivable on that unit as a consequence of its production or sale. It excludes suppliers' retail and wholesale margins as well as transport charges invoiced separately by the producer. This is the most relevant representation of prices for understanding decision making by suppliers and the inter-industry transactions within an economy.[1]

The purchaser's price is the amount paid by the purchaser, excluding any deductible sales tax, VAT or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchaser's price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place as well as supplier's retail and wholesale margins.[2]

The diagram below summaries the transition from basic prices to purchasers' prices.

Fig. 2. Output valuation criteria



Source: Eurostat, *Manual of Supply, Use and Input-Output Tables*, 2008

[1] Source: OECD glossary of statistical terms, basic price https://stats.oecd.org/glossary/detail.asp?ID=189

[2] Source: OECD glossary of statistical terms, purchasers price https://stats.oecd.org/glossary/detail.asp?ID=2202

The Bahamas Department of Statistics has produced a detailed supply table for 2012, detailing the components of supply for the supply of 124 products, an excerpt of this table is shown below—for practical purposes we have only shown total domestic output of a selection of products, however the Bahamian supply table splits the domestic production of each product across 44 sectors .

Fig. 3. Excerpt from The Bahamas supply table, 2012

Products	Total output at basic prices	Imports at basic prices	Total supply at basic prices	Subsidies	Taxes on imports	Other product taxes	Non-redundable VAT tax	Trade and transport margins	Total supply and purchasers' s prices
Accommodation services for visitors	1,040	37	1,077	0	0	44	0	0	1,120
Food serving services	590	16	607	0	0	0	0	0	607
Beverage serving services	131	2	133	0	0	0	0	0	133
Passenger transport services	62	0	62	0	0	0	0	0	62
Jitney	24	1	25	0	0	0	0	0	25
Taxi Services	64	2	66	0	0	0	0	0	66
Land transport services of freight	2	0	2	0	0	0	0	0	2
Air transport services of passengers	137	98	235	-23	0	45	0	0	257
Air transport services of freight	6	0	6	0	0	0	0	0	6
Water transport services of passenger	21	17	38	0	0	0	0	0	38
Water transport services of freight	66	0	66	0	0	0	0	-4	61
Trucking	2	0	2	0	0	0	0	0	2
Supporting transport services	546	76	622	0	0	65	0	0	687
FISIM	516	0	516	0	0	0	0	0	516
Financial and related services	344	0	344	0	0	0	0	0	344
Central Bank	29	0	29	0	0	0	0	0	29

Import table

Valuation matrix

Domestic output at basic prices

Total supply at purchasers' prices

The second matrix within SUTs is the use table which shows the *use* of goods and services within an economy. Specifically, the table details:

- the input structure of each industry within an economy by showing the use of goods and services by product and type of use for intermediate consumption by industry i.e. demand for goods and services to be used up or altered in the production processes of businesses.
- the value of the products and services absorbed by the components of the final demand including consumption expenditure, gross capital formation and exports—details of household consumption and labour costs (mentioned in the below bullet) are essential for estimating the wage-financed consumption (or induced) impact .
- the components of gross value added by industry, including labour costs, taxes less subsidies on production, profits etc—gross value added reflects the factor costs for primary inputs of each industry

Intermediate consumption and final demand sections of the table are both valued at purchasers' prices and include domestically produced and imported products; gross valued added is presented in basic prices. Figure 4 presents the basic framework of the use table.

Fig. 4. Basic use table template

	Input of industries				Final uses								
Products	Industry 1	Industry 2	Etc.	Total	Final consumption expenditure by households	Final consumption expenditure by non-profit organisations	Final consumption expenditure by government	Gross fixed capital formation	Changes in valuables	Changes in inventories	Exports	Total	Total use at purchasers' prices
Product 1	Intermediate consumption at purchasers' prices				Final demand at purchasers prices								
Product 2													
Etc.													
Total													
Compensation of employees	Gross value added at basic prices												
Other net taxes on production													
Consumption of fixed capital													
Operating surplus, net													
Gross value added at basic prices													
Output at basic prices													

Source: Eurostat, *Manual of Supply, Use and Input-Output Tables*, 2008

An extract of the use table developed by The Bahamas Department of Statistics is shown below. Like the supply table, the use table shows a breakdown of 124 products and presents a breakdown of output for 44 industries.

Fig. 5. Excerpt from The Bahamas use table, 2012

	Products	Sample of industries					Final demand						
		Air transport	Water transport	Hotels	Resturants	Total	Final Consumption Expenditure of Hhlds	Non- Profit Institutions Serving households	Public Admin & Defense	Public Education	Public Health	GFCF	Exports
Sample of inputs for intermediate consumption	Accommodation services for vis	0	0	0	0	45	35	0	0	0	0	0	1,011
	Food serving services	1	1	26	1	79	295	0	0	0	0	0	232
	Beverage serving services	0	0	6	1	19	19	0	0	0	0	0	95
	Passenger transport services	0	0	1	0	2	1	0	0	0	0	0	60
	Jitney	0	0	0	0	3	15	0	0	0	0	0	7
	Taxi Services	0	0	0	0	4	21	0	0	0	0	0	41
	Total intermediate consumption	158	158	158	158	6,974	6,579	235	918	214	272	3,360	4,087
	Other Taxes on Production	2	2	2	2	185							
	Wages & Salaries	60	60	60	60	0							
	Mixed Income	1	1	1	1	3,961							
	Net Operating Surplus	17	17	17	17	216							
	Consumption of Fixed Capital	17	17	17	17	4,783							
	Gross value added at basic pric	97	97	97	97	616							
	Total output	255	255	255	255	0							

Intermediate consumption at purchasers' prices

Gross value added at basic prices

Final demand at purchasers' prices

2.2 TRANSFORMING SUPPLY AND USE TABLES TO A SYMMETRIC IO TABLE

SUTs can be used to develop a symmetric IO table. The first step in developing the IO table is to transform SUTs from purchasers' prices into domestic basic prices by adjusting for imports, taxes and subsidies on products, and distributor trading margins. For the supply table, these variables are already itemised to the right of the table, see figure 3, so these columns simply have to be removed to put the table into basic prices.

The use table, on the other hand, does not itemise these variables and so we need to use the supply table to make a series of adjustments to the use table. We used the supply table to:

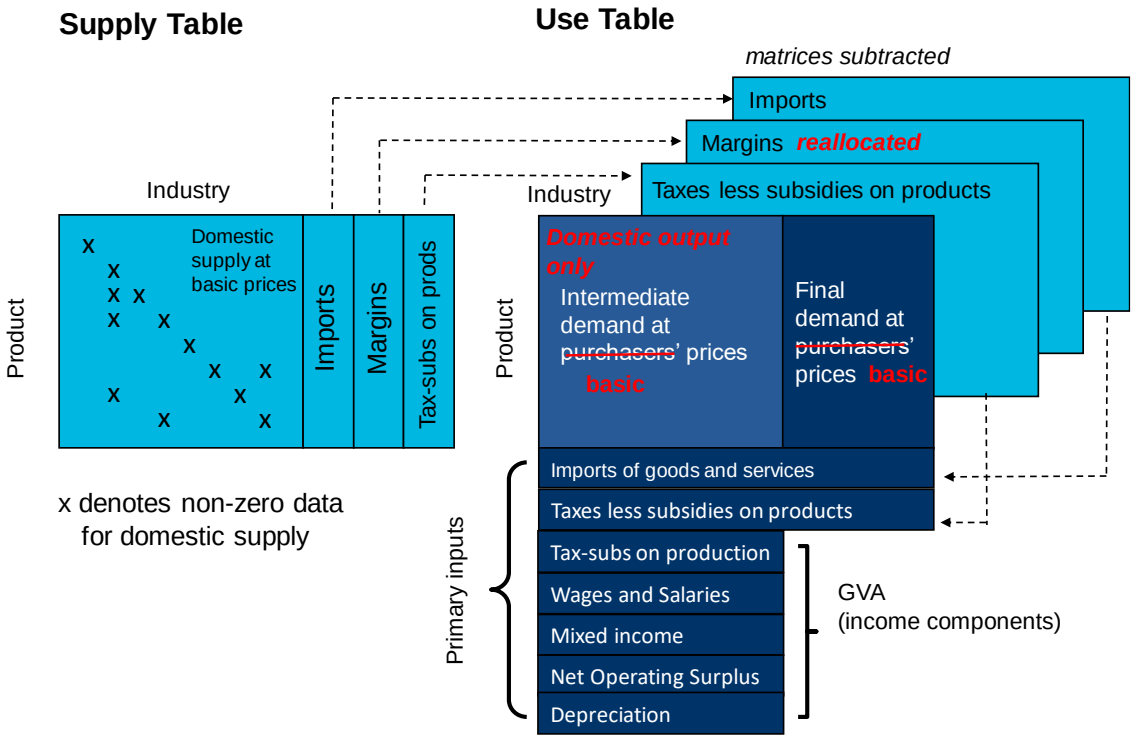
1. remove imports from the use table's product by industry matrix, creating a domestic use table—by estimating how imports of goods and services are used by different industries in an economy.
2. remove subsidies and taxes from the use table's product by industry matrix— by estimating how subsidies and taxes on production are allocated between sectors, depending on that sector's activities
3. redistribute trading margins within the use table—enabling us to accurately capture where margins (for example, logistics firms) are accrued.

To make each of these adjustments an effective use table has to be constructed for each of these components. We did this by calculating each of these supply elements as a share of total supply, for each product, and then applying these shares to the intermediate consumption and final demand components of the use table. The sum of these use matrices is called the transition matrix.

Once imports—which account for 23% of supply in The Bahamas—and net taxes are removed from the use table, separate rows for each these components are created in the primary inputs, leaving the industry output totals unchanged—since trade and transport margins are reallocated across the goods consumed and not removed from the table's product matrix this action is not required for this variable. Fig. 6 below demonstrates the process described above.[3]

[3] Source: Office of National Statistics, United Kingdom Input-Output Analytical Tables, 2010

Fig. 6. Transforming supply and use tables into domestic input-output model



Following this, SUTs must then be converted into square matrices i.e. the tables must be adjusted so that the number of industry and product groups are equal. The initial production matrix of the supply table and the intermediate part of the use table (see figure 1 and 4 for details) are usually presented in rectangular form—that is the number of industry and product categories do not match—as statistical agencies are often able to distinguish more products than industries within an economy (as noted above the SUT for The Bahamas presents a breakdown of 124 products and 44 industries).

When converting SUTS into a symmetric IO table there is a choice between the two types of tables for IO analysis depending on the aim of the study. You can either produce product-by-product tables or industry-by-industry tables. For this analysis we have produced industry-by-industry tables as we are primarily interested in understanding the inter-industry relations between the tourism sector and the wider economy. This allows calculation of the extent to which output in other industries is stimulated by additional output in a tourism facing industry.

To convert these tables into square matrices we had to make an assumption about the nature of the relationship between industries and products within the Bahamian economy. We made what is typically called a “fixed product sales structure assumption”. This assumption assumes that each product has its own specific sales structure, irrespective of the industry where it is produced, allowing us to align industries and products in both tables. This assumption was sourced from the Eurostat Manual of Supply, Use and Input-Output Tables

(2008). For a good example as to how this assumption works in practice please see page 316 of the manual.

Using this process, along with a series of necessary aggregations of the SUT industry breakdown, we developed an industry-by-industry domestic IO table for The Bahamas for 36 sectors. A list of these sectors is presented below.

1. Agriculture, forestry and fishing
2. Mining and quarrying
3. Manufacture of food products
4. Manufacture of beverages & tobacco products
5. Manufacture of textiles, wearing apparel, leather and related products
6. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; paper and paper products and printing and reproduction of recorded media
7. Manufacture of coke and refined petroleum products; chemicals and chemical products; pharmaceuticals; medicinal chemical and botanical products
8. Manufacture of rubber and plastics products
9. Manufacture of other non-metallic mineral products and basic metals
10. Other manufacturing
11. Electricity, gas, steam and air conditioning supply
12. Water collection, treatment and supply
13. Sewerage, waste management and remediation activities
14. Construction
15. Wholesale trade
16. Retail trade and repair of motor vehicles
17. Air transport
18. Water transport
19. Land transport
20. Warehousing and storage
21. Accommodation
22. Food and beverage service activities
23. Information and communication
24. Financial and insurance activities
25. Real estate agencies
26. Renting of own or leased real estate
27. Owner occupied dwellings
28. Professional, scientific and technical activities
29. Administrative and support service activities
30. Public administration and defence and compulsory social security
31. Education
32. Human health and social work activities
33. Arts, entertainment and recreation
34. Repair of computers and personal and household goods and other personal services
35. Activities of households as employers of domestic personnel
36. Activities of membership organisations

3. THE INPUT-OUTPUT MODEL

This chapter sets out the key steps in moving from an IO table to a tourism impact model. We explain how our model considers the wider supply chain and worker spending impacts supported by the tourism industry in The Bahamas. By adding these to the tourism's direct impact—derived from the 2012 TSA—we can estimate its total economic impact. We estimate this "footprint" in terms of the sector's overall contribution to GDP, jobs and wages in 2012.

3.1 INTRODUCING ECONOMIC IMPACT ANALYSIS

The economic impact of The Bahamas tourism industry is measured using a standard means of analysis called an "economic impact assessment". The three "core" channels of impact that comprise the sector's "economic footprint" are as below.

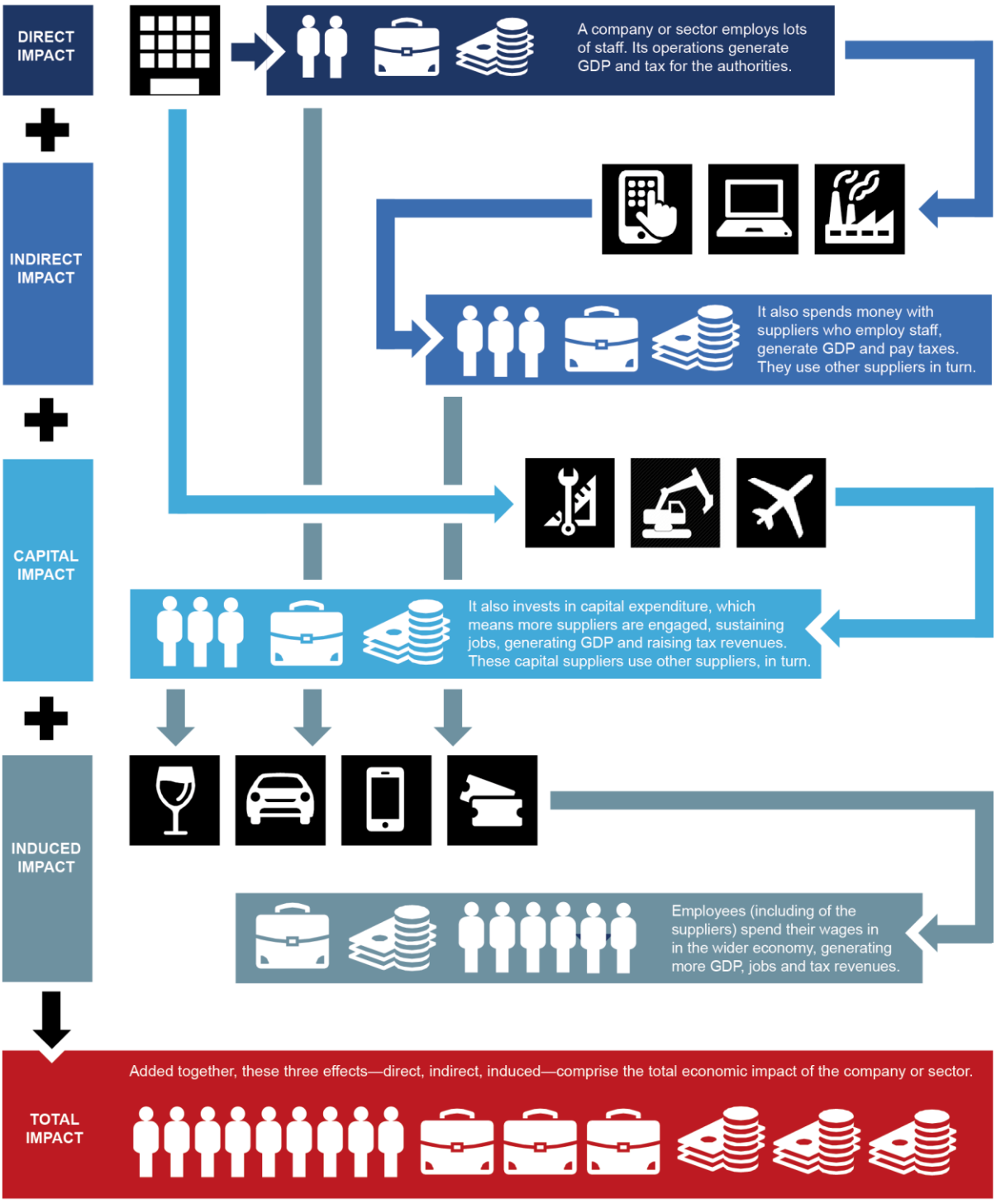
- **Direct impact**, which relates to the economic activity supported by firms which are integral to the tourism sector. This includes business that directly support visitor spending within The Bahamas such as accommodation providers, taxi operators, restaurants etc—results for the direct impact are solely derived from the 2012 TSA produced by The Bahamas TSA Committee. This is an inter-agency Committee of Ministry of Tourism & Aviation, Department of Statistics, and the Central Bank of The Bahamas.
- **Indirect impact**, which encapsulates the activity and employment supported in the domestic supply chains of the firms which make up the direct tourism impact. Our analysis estimates the impact of firms' capital investments, as well as that of their day-to-day purchases. Within the indirect we also consider the impact of collective government spending in general support of the tourism sector—this is consistent with the methodology used in the annual economic impact research published by WTTC.
- **Induced impact**, which comprises of the economic benefits that arise when those working within tourism-related businesses and their supply chains spend their earnings, for example in retail establishments.

Using these pathways, a picture of tourism's economic footprint is presented using three metrics:

- GDP, or more specifically, tourism's gross value-added contribution to GDP;
- employment, measured on a headcount basis; and
- compensation of employees, which includes the gross wages paid to workers but also includes benefits in kind and employer social security contributions (including pensions).

Adding together the direct, indirect and induced impacts across the metrics above provides an estimate of the total economic impact of The Bahamas tourism industry, as shown in Fig. 7

Fig. 7. Schematic of tourism's contribution to The Bahamian economy



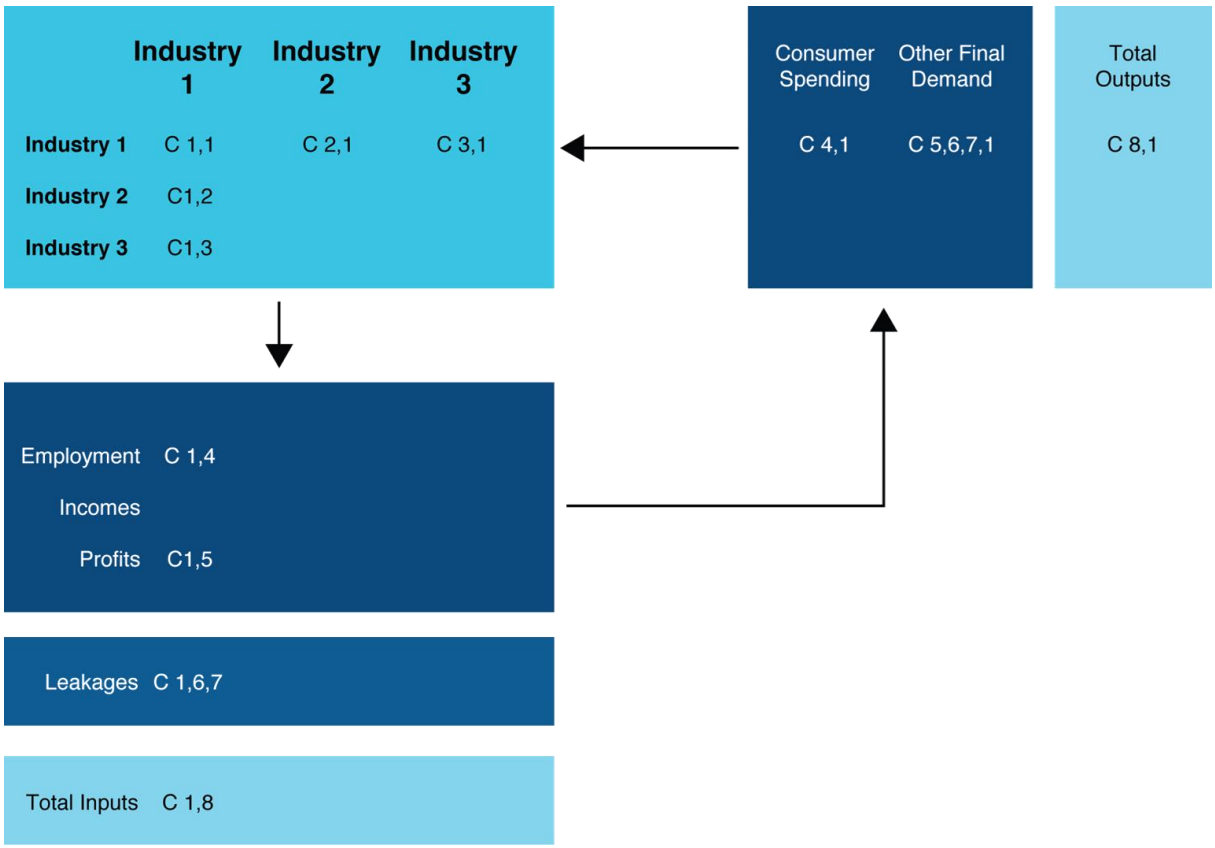
3.2 OVERVIEW OF INPUT-OUTPUT MODELLING APPROACH

IO tables are designed to give a snapshot of an economy at a point in time, showing the major spending flows. These include "final demand" (i.e. consumer spending, government spending and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other

sector—the supply chain); how much of that spending stays within the economy; and the distribution of income between employment income and other income (mainly profits). Input-output tables are therefore particularly useful when estimating indirect and induced economic impacts.

The idea behind the input-output table is that the economy can be divided into a number of producing industries, and that the output of each industry is either used as an input into another industry, or in final consumption. For example, grain produced by the farm sector becomes an input into flour milling; flour produced by the milling sector becomes an input into the baking sector; and so on. In essence an input-output model tracks who buys what from whom in the economy.

Fig. 8. A simplified input-output model



Reading across horizontally illustrates the distribution of each industry's output, split between intermediate demand from other industries (used as an input to production) and final demand (consumer spending, exports and other government consumption). Therefore, Industry 2 in Fig. 8 purchases an amount, C2,1 from Industry 1 as an input to their production process. Reading down vertically indicates what each industry purchases from other industries in the national economy by way of inputs which, when combined with imports from abroad (leakages), employment costs, operating surplus and any additional taxes or subsidies to production, gives total inputs and will equal total outputs. In the model illustrated in Fig. 8, C8,1 will equal C1,8.

This framework helps to develop an understanding of how an increase in activity and spending in one area filters throughout the rest of the economy. For example, an increase in consumer spending on the output of one industry will require input purchases from other industries as well as new labour inputs (employment and wages). In turn, these additional impacts will further filter through the economy with additional purchases from other industries.

A common application of domestic use IO tables is to create multipliers which can be used to illustrate how an increase in demand in one sector affects the whole economy:[4]

- **Type I multiplier**—estimates the impact on the whole economy of $1 spent in a given industry, through its supply chain.
- **Type II multiplier**—includes the Type I multiplier, but also includes the effect of spending by households as a result of the employment supported by the additional $1 spend.

To calculate the indirect and induced impacts for the tourism industry in The Bahamas, domestic-use IO tables (as developed in the previous chapter) were used to build an IO model. Amongst other things, this model enabled us to estimate the value of purchases the sector makes from other sectors of the economy. The calculation of the induced impacts is a discrete element of the model and incorporates the impact of purchases on labour costs and final household consumption.

[4] In a domestic IO table intermediate demand has been adjusted to remove the effects of imports. Imports are itemised in a different part of the IO table.

STEPS TO GENERATE MULTIPLIERS

The first step in generating multipliers from an IO table is constructing **a matrix of coefficients** for the economy. This is the matrix of inputs needed per unit of production and can be calculated by dividing each industry's intermediate demand and primary inputs by their total output. Carrying out this calculation for each industry within the IO table gives a complete picture of the underlying structure of the economy.

This matrix is the starting point for the multiplier analysis as it allows us to analyse the direct relationships in the economy by estimating the direct intermediate consumption required to satisfy one unit of output for each industry within an economy. However, it does not account for the indirect intermediate consumption required by the direct intermediate consumption.

The capture the indirect intermediate consumption requirements we must develop what is known as a **Leontief inverse matrix.** This matrix captures the indirect relationships within an economy by producing coefficients that measure the successive second order intermediate consumption effects on the economy as a result of the initial increase in production of a particular industry. For an algebraic derivation of the Leontief Inverse please see page 16 and appendix C of Office of National Statistics, United Kingdom Input-Output Analytical Tables, 2010.

The Leontief Inverse provides the central tool for multiplier analysis, which studies the effect of changes in final demand on output and related aspects of the economy

3.1 CALCULATING INDIRECT AND INDUCED IMPACTS FOR TOURISM

Our bespoke IO model enables us to estimate the further activity supported by the tourism sector's domestic supply chain (indirect impact). To estimate the impact for 2012, initial intermediate consumption (or supply chain) expenditures were derived from the 2012 TSA—Table 6. These expenditures were allocated to sectors based on the inter-industry links of the IO model. We then used our impact model to estimate the Type I multiplier effect of each of the initial purchases supported by the tourism industry. This initial indirect impact was then translated into output, gross value added and wages and salaries using industry-specific ratios from the IO model. We estimated employment using productivity estimates, which were based on other National Accounts data.

A similar process was then followed to estimate the indirect impact of private and public tourism-related capital expenditure, along with collective government expenditure. Capital expenditure estimates used in this research are consistent with the annual economic impact research published by WTTC (and produced in collaboration with Oxford Economics). Collective government expenditure was estimated using the 2012 TSA Table 9, which presents the level of government expenditure on tourism-related services over a specific time period.

As with the initial intermediate consumption, these expenditures were allocated to sectors based on the inter-industry links of the IO model. We then used our impact model to estimate the GDP and employment multiplier effects of these purchases.

To calculate the induced impact of workers in the tourism industry, we used the salary information from Table 6 of the TSA to estimate the resultant consumption impact within the Bahamas using our IO model. We then used our IO model to estimate the impact of this household consumption on the wider economy.

The induced impact of workers in the supply chain is calculated as a function of the IO model, by using our impact model to estimate the Type II multiplier effect of each of the initial purchases supported by the tourism industry. This impact is adjusted to take account of the indirect (type I) impact of initial supply chain activity to estimate the induced impact of supply chain workers. We express the induced impact in terms of output, gross value added, wages and salaries and employment, again using industry-specific ratios from the input-output model.

Estimates from this analysis are present in our key findings report on *"the Economic Impact of Tourism in the Bahamas 2012"*.

TOURISM ECONOMICS

AN OXFORD ECONOMICS COMPANY

Tourism Economics
an Oxford Economics company
303 W. Lancaster Ave. Suite 2E
Wayne, PA 19087
Tel: +1 (610) 995 1600

Global headquarters
Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London
4 Millbank
London, SW1P 3JA
UK
Tel: +44 (0)203 910 8000

Frankfurt
Marienstr. 15
60329 Frankfurt am Main
Germany
Tel: +49 69 96 758 658

New York
5 Hanover Square, 8th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Singapore
6 Battery Road
#38-05
Singapore 049909
Tel: +65 6850 0110

Europe, Middle East and Africa

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Asia Pacific

Singapore
Hong Kong
Tokyo
Sydney
Melbourne

Email:
mailbox@oxfordeconomics.com

Website:
www.oxfordeconomics.com

Further contact details:
www.oxfordeconomics.com/about-us/worldwide-offices