



Quantitative Tourism Industry Analysis

Introduction to Input-Output, Social Accounting Matrix Modelling and Tourism Satellite Accounts



Tadayuki Hara



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Dr. Tadayuki Hara



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Butterworth-Heinemann is an imprint of Elsevier



Butterworth-Heinemann is an imprint of Elsevier
Linacre House, Jordan Hill, Oxford OX2 8DP, UK
30 Corporate Drive, Suite 400, Burlington, MA 01803, USA

First edition 2008

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN-13: 978-0-7506-8499-6

For information on all Butterworth-Heinemann publications visit our website at elsevierdirect.com

Printed and bound in Canada

07 08 09 10 10 9 8 7 6 5 4 3 2 1

Typeset by Charon Tec Ltd., A Macmillan Company. (www.macmillansolutions.com)

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Dedication

The idea for this textbook came to me while teaching a tourism industry analysis course at the School of Hotel Administration (SHA), also known as the Hotel School, at Cornell University. My dissertation committee members, Jan deRoos, Neal Geller from the Hotel School, as well as Walter Isard and Sid Saltzman from the regional science program at City and Regional Planning, helped me embark on my new career as a lecturer and Jim. Susan and Jim Eyster, professor emeritus at SHA, Cornell University, have been my tacit morale supporters all through the process. As a newcomer, I received countless assistance from Sue Okubo and Mark Planting of the Bureau of Economic Analysis, US commerce department. Both Sue and Mark came to lecture to my students as guest speakers on tourism satellite accounts. David Welch from International Finance Corporation, World Bank Group, provided much moral support for analyzing poverty alleviation through the tourism industry.

I feel privileged to be working in a location where I can see the power of tourism as a prime mover of regional economy. I acknowledge moral support from Abraham Pizam, dean of the Rosen College of Hospitality Management, University of Central Florida (UCF), located in the heart of Orlando, one of the most popular tourism destinations in the world. Deborah Breiter, head of the Tourism, Event and Attractions Department at Rosen College of Hospitality Management, UCF, created an atmosphere conducive to research activities and allowed me to experiment with many unique teaching methods. Interactions with colleagues at UCF stimulated my academic activities and the tourism and hospitality professionals that I meet in Orlando turned out to be surprisingly inspiring. I have been inspired by guidance and advice kindly given to me during many academic conferences in regional science, peace science, hospitality management, and the tourism field.

I am much indebted to, and grateful for my interactions with, students at Cornell and UCF, both undergraduate and graduate, as they provided me with immediate feedback, about whether they felt the material was difficult, inspiring, intimidating, fascinating, or boring. It is to them that I owe the current outlay of this textbook, in terms of user-friendliness. I also wish to acknowledge the support I received from two PhD students at Rosen College of Hospitality Management: from Gerald Kock, for some literature research and candid feedback; and from Manuel Rivera, for some feedback and contribution on poverty issues. I feel indebted to the training that I received by many mentors at my former employers, the Industrial Bank of Japan, (currently Mizuho Corporate Bank), Ministry of Foreign Affairs of Japan, and the Four Seasons Hotels and Resorts.

My wife Valeriya and a daughter Julia rendered imputed help by refraining from demanding what a family would normally expect from a father in the summer and weekends, especially since we live in an area surrounded by theme parks, water parks, attractions, and events, in addition to the natural wonders of Florida.

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Epigraph

“When I was young, I made my career on steel industries. If you ask me which industry it would be today, I say tourism.”

[Dr. Walter Isard, at the time of the author’s completion of his
doctoral dissertation Ithaca, NY, US]

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Preface

Tourism is often associated with the pleasure of visiting a place away from home. Many people have some idea about the nature of tourism, although they may not all agree with the same definition. While many people may associate tourism with fun and pleasure, there appears to be a smaller yet growing number of people who are beginning to see its potential as something more serious than a mere object of pleasure.

It seems there is a gap between the existing material for social scientists, such as mainstream economists, and material for hospitality and tourism students and professionals, who wish to study the specifics of tourism as an industry. One economist recently said that due to lack of reliable data, tenure-track economists tend to stay away from the field of tourism and stick to subjects with better data, such as finance, trade, investment, when conducting career-advancing quantitative research.

Although more optimistic comments are found on the long-term prospects of tourism as an industry, one example of the skeptical view on the issue is as follows: 'Tourism economic analysis is somewhat limited by the reliability and validity of the numbers developed by primary research, be they collected privately or by government' (Lundberg et al., 1995).

In the meantime, tourism as an industry has been studied by economists from notable international institutions, such as the Organisation of Economic Cooperation and Development (OECD), the EU, The World Bank, the United Nations (UN), the International Monetary Fund (IMF), using the structure called tourism satellite accounts (TSA). Federal/national level research on tourism measurements were conducted by the small number of governments including but not limited to Canada, Australia, EU nations, and non-governmental organizations such as the World Tourism Organization (WTO) endorsed the concept and have been pondering on how to spread the concepts to larger numbers of audiences.

While the history of TSA and the entities that have endorsed the TSA concepts have been rather impressive, the imminent problem is that few hospitality-tourism management schools in North America actually teach the course on the specifics of TSA as a main topic. According to casual conversations with other scholars at tourism and hospitality programs in the rest of the world, the situation outside of the North America appears to be the same in that almost no tourism schools offer the course on TSA. The reason has been rather unclear, but Okubo stated that TSA is based on the input-output (I-O) framework (Okubo and Planting, 1998). These models are very sophisticated and the standard textbooks about them are usually full of rigorous mathematical explanations. Dr. Wassiley Leontief, to whom the development of the I-O framework has been widely attributed, was awarded the Nobel Prize in Economics in 1973, and Sir Richard Stone received the Nobel Prize in 1984 for the application of the social accounting matrix (SAM), which is the extension of the I-O framework.



In addition to technical difficulties associated with the models, we have another problem. Duchin (1998) clearly stated what many economists feel about the I-O model: 'Despite the award to Leontief of the Nobel Prize in Economics for 1973, input-output economics has failed to maintain the interest of academic theorists, who regard it as a simplistic form of general equilibrium analysis. Curiously, many input-output economists have accepted this indictment.'

I-O/SAM researchers, particularly regional scientists, who are, generally speaking, applied geographical economists, came out recently with rigorous solutions to stimulate and revive the interest in these models. Unfortunately, few students of hospitality and tourism programs are pursuing these areas of interest, but the emergence of TSA as a method of measuring tourism as an industry will sooner or later require that some, if not all of us, study the I-O/SAM.

Aim of the book

The aim of this book is to contribute towards stimulating those people working in the hospitality and tourism area, particularly students and practitioners, towards learning more about the TSAs and their underlying methodologies. Having identified a gap between the level of preparedness of hospitality-tourism students to learn TSA, and the overwhelming contents of generic I-O/SAM materials often written for PhD students in economics and regional sciences, my aim is to attempt to fill this gap by familiarizing hospitality and tourism readers with useful applications of the relevant economic modeling, with minimal contents of higher algebra, so that they can understand the concepts of TSA.

This book is not able to offer a panacea to all the problems of the tourism industry as an academic subject. It will most likely offer little new knowledge to advanced economics researchers in the field of tourism, while I sincerely hope that more students in hospitality and tourism programs around the world will be enticed to learn more about required methodologies for tourism economic impact studies and TSAs.

As I happen to be one of the few scholars having taught TSA as a main topic at two hospitality management schools, I have experimented one of the possible general paths for teaching TSA to non-economics students and to audiences in tourism and hospitality management field. The key for understanding the TSA, is first to take the long route, so that students can acquire a basic knowledge of two economic models – I-O model and SAM model – on which the TSA structure is based. By taking that route, readers may enjoy unexpected dividends along the way, such as a basic understanding of the application of various economic impact analyses.

This book is based on teaching material that was used with noneconomics majors, predominantly advanced undergraduate and graduate students, at Hospitality and Tourism management programs in the US. None of these courses have any prerequisites, which means the contents cater to students with little knowledge of economics, mathematics, linear-algebra (matrix computations), or programming skills in MS-Excel, while hoping that they know high-school level algebra. The author has been teaching the contents of economic impact analysis and TSA carefully, without intimidating students, and hopes to share the same contents with broader audiences. In this regard, the students' feedback and opinions were very helpful.

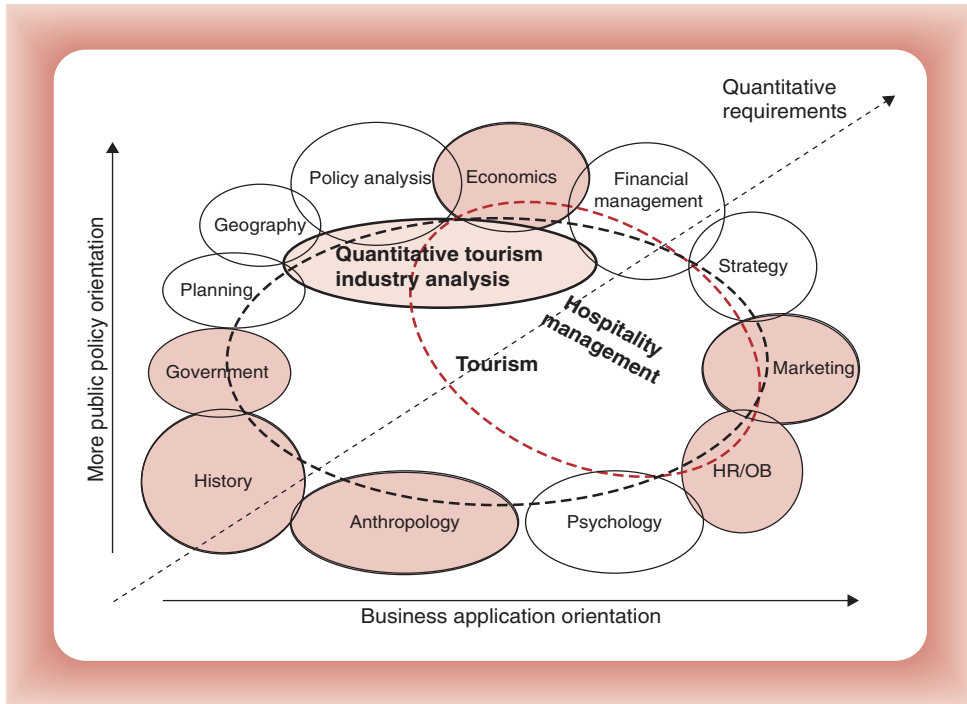


Figure P-1 Overall field of tourism and the niche among social sciences – relative to hospitality management field.

Source: Prepared by the author, 2002, with added modifications as a result of feedback received.

This book is not aimed at covering all the topics of tourism, and thus cannot serve as an introductory textbook of tourism. It focuses only on a part of the small area, which I call quantitative analysis of the tourism industry (see Figure P-1, for a visual representation), and can therefore be viewed as a technical textbook that covers part of the quantitative analysis of the tourism industry analysis.

Unlike many advanced technical textbooks, however, I designed this book as a practical textbook, to be used as part of a course in hospitality and tourism management, by adding a small numbers of questions at the end of main chapters. For certain parts of the contents, which students had either expressed difficulty with or required repeated explanations, I experimented with what I call cyberlabs, and used them as a series of tutoring, using a virtual teaching assistant. I will include these cyberlabs together and key spreadsheets for your review in the attached CD-R. A small packet of teaching material for instructors, including the answers to the questions, will also be available.

Structure of the book

The book comprises six chapters. Chapter 1 includes a general discussion on the reasons why we should study the topic of tourism as an industry. Chapter 2 includes a very brief



introduction to other quantitative methods for tourism industry analysis, including regression, time-series, and I-O/SAM, although I do not provide detailed theories and applications. I acknowledge the existence of a series of excellent books, including some books that focus on the field of tourism and hospitality, although I limit my discussions of those quantitative methods to brief summaries.

Chapter 3 is a formal introduction to the I-O model, in which students will be able to acquire some basic knowledge on I-O tables. They will not only learn how to read I-O tables, but also how to create the Leontief inverse matrix, all the way from a transaction table, so that they can enjoy calculating multipliers by themselves. In this chapter students will gain minimum pedagogical knowledge, together with a series of basic matrix operations and the required skills in order to calculate a series of matrix operations in MS-Excel spreadsheets. This chapter will give hospitality and tourism students the necessary foundations to proceed towards studying the SAM and TSA.

Built on the knowledge of I-O modeling, the topic of Chapter 4 of SAM can add some knowledge on technical aspects. But I found that the SAM can be a very challenging topic for students. Unless they understand dry concepts, such as factors and institutions, it is difficult for them to understand articulate interactions among three principal accounts, in a typical two-dimensional depiction.

After the calculated detour via hands-on learning experiences on I-O/SAM, Chapter 5 includes an introduction to TSAs. You may find the concepts and terminology presented in the previous chapters useful in following the logical depictions of series of tables in the TSA, because TSA is actually built along the concepts and framework of I-O/SAM. It is my hope that this chapter will enable students to start studying by themselves, and to explore the TSA as, for years, senior economists and high-ranking government officials in charge of tourism policies all across the world have contributed a large body of discussions on the specifics of TSA.

Chapter 6 includes a short discussion on possible explorations for the readers, having been introduced to the I-O/SAM methodology and TSA. While I strongly recommend that readers consult the relevant academic journals and associations in addition to this textbook, I introduce what I believe would be one of the possible directions for research in these areas, to try to mitigate problems in broader society and the world with the economic muscle of tourism as an industry.

For those who are in a hurry to learn about TSA, Chapters 3 and 5 will give enough knowledge to understand what the TSA are.

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Chapter **1**

Introduction to Tourism as an Industry





Tourism is a fascinating topic for study, and many excellent textbooks have been written on the subject. While tourism is often associated with fun, pleasure, and leisure, some of us study it within a historical or anthropological context. Some people are interested in sustainable coexistence of nature and humans, though humans sometimes threaten this very coexistence. Although tourism has a long history, it has seldom gained prime strategic attention as one of the viable industries for the development of a national economy. Prerequisites for tourism are peace and safety for travelers, which have not always existed throughout human history.

Agricultural production such as wheat, corn, and rice; extraction of natural resources, such as coal, timber, oil, and iron; and the trade of such tangible goods, were all very important activities to humankind, for thousands of years. After the industrial revolution, the importance of manufacturing industries increased in the nineteenth century. The basic industrial structures were formed in early twentieth century, when agriculture, mining, construction, manufacturing, transportation, trade, and financial services were considered the core industrial sectors to compete through turbulent times, which witnessed two world wars. This took place in the first half of the twentieth century, when the basic infrastructures of modern economies were formed, in terms of core industrial sectors.

It was not until the second half of the twentieth century that the numbers of travelers increased, as modern transportation systems, such as the railway, airplanes, and cars, developed, and became available to more people throughout the world. It was the jet age and the deregulation of the airline industry that made the cost of traveling relatively accessible to larger numbers of consumers. The hospitality industry, including hotels, developed a high level of efficient management styles, particularly in the US, and helped cater to large numbers of tourists. The relative importance of tourism-related industrial sectors developed, as the sales volume of these sectors was growing faster than the national economy. However, we should remember that the basic structure of modern economies had already been shaped a few decades before tourism as an industry took shape as a set of alternative economic activities of relative significance to regional and/or national economy. Tourism came a little late in order for it to be formally recognized as a powerful industrial sector. This late emergence of tourism as a viable industry at this critical moment in history will cast a long shadow. In the next section, we consider some examples of putting tourism in perspective, as an industry.

1.1 Relative position of the tourism industry in national and regional economies

1.1.1 The US tourism industry and the national economy

We begin by discussing the relative position of tourism-related sectors within the national economy. The data we use are from the US, the largest economy in the world. Before looking at the exact definition of the tourism industry, as we do in a later chapter, let us use data from hotels and from air transportation as proxies for the tourism sectors, since they have the largest tourism revenue dependency among tourism-associated industrial sectors at 80% and



76%, respectively. This means that 80% of the hotel sector's business and 76% of the airline sector's business derive from demands associated with tourism. We will elaborate on the issue of tourism demand dependency for each sector later in this section. Until then, we will refer to a group of industrial sectors that are associated with tourism as a 'tourism industry complex'.

We have extracted the gross domestic product (GDP) by industry table (Tables 1-1 and 1-2) and the employment by sectors table (Tables 1-3 and 1-4). To show the significance of the tourism industry in relative terms, we will compare the tourism industry with two other traditional industries: the steel and steel-fabricating industry and the oil-petrochemical industry. This way, we will see how each sector's share in the GDP changed and how the share of total employment in each sector changed over the period 1987–2001.

Regarding the share of GDP in 1987, the steel complex had a 2.05% share, the oil-petrochemical complex had a 2.24% share, and the tourism complex had a 1.50% share. The comparable shares in 2001 were 1.45%, 2.02%, and 1.68%, respectively. As the Bureau of Economic Analysis (BEA) pointed out in its 2002 reports, however, the tourism industry complex consists of several different industries and each sector's dependence on tourism-related revenues varies significantly. The BEA estimates that total direct sales for 2001 were of \$357 billion, which would represent 3.55% of the 2001 GDP; however, the potential of the tourism complex should not be underestimated. BEA also calculated the indirect sales effect generated from the tourism industry's economic activity, which amounted to \$675 billion, or 6.69% of the GDP share (Table 1-5).

Tables 1-5 and 1-6 show the trend in structural change in the US economy over the period 1987–2001, in detail. Unless we correctly introduce specific methods for compiling all tourism-related industries, such as the BEA's tourism satellite accounts (TSAs; based on the input-output (I-O) accounting), we are likely to continue to overlook the whole picture of the tourism complex, as an industry.

From the viewpoint of policy analysis, employment aspects should be reviewed. We will compile the BEA data on employment, by industrial sector.

The employment share in the national economy decreased for both the steel complex and the petrochemical complex, while the opposite occurred with the tourism complex. Once again, employment directly generated by the tourism industry accounts for 3.8% of the national employment figures, but this figure may be underestimated, if we take the indirect effects into consideration.

Based on the above analysis, we can conclude the following:

- The share of the tourism complex in the US economy is increasing, both in terms of GDP and of employment;
- More importantly, the potential of the tourism complex as an industry may have been underestimated, due to measurement difficulties;
- For a correct evaluation of the tourism complex as an industry, the BEA advocates the global use of TSAs, which corresponds to the applied I-O framework.

Table 1-1 US national economy at a glance – steel/steel fabricating, petrochemical complex versus tourism complex in perspective.

Industry Title	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	01/87%
<i>Gross Domestic Product by industry (1987 SIC basis) in millions of current dollars, 1987–2001</i>																
Gross domestic product	4 742 462	5 108 325	5 489 061	5 803 246	5 986 208	6 318 934	6 642 328	7 054 315	7 400 534	7 813 170	8 318 376	8 781 527	9 274 319	9 824 643	10 082 151	112.6%
Agriculture, forestry, and fishing	88 900	89 076	102 030	108 253	102 926	111 654	108 345	118 493	109 843	130 444	130 007	128 006	127 719	134 280	140 650	58.2%
Mining	92 167	99 182	97 064	111 875	96 700	87 633	88 380	90 224	95 651	113 037	118 919	100 248	104 147	133 082	139 040	50.9%
Construction	219 257	237 191	245 823	248 708	232 710	234 442	248 914	275 333	290 308	316 419	338 159	380 820	425 414	461 308	480 013	118.9%
Manufacturing	888 592	979 902	1 017 673	1 040 589	1 043 541	1 081 998	1 131 403	1 223 210	1 289 069	1 316 049	1 379 609	1 431 499	1 481 341	1 520 263	1 422 990	60.1%
Primary metal industries	34 510	43 114	45 294	43 210	39 901	39 560	43 040	47 572	52 990	50 842	52 564	53 116	50 461	50 188	45 144	30.8%
Fabricated metal products	62 625	67 385	68 497	69 396	67 263	69 516	73 396	83 225	87 168	93 144	97 607	101 666	106 927	109 637	100 760	60.9%
Nondurable goods	371 821	413 628	434 926	454 027	468 018	488 019	498 578	529 118	559 223	567 600	588 396	600 808	627 530	633 858	610 181	64.1%
Chemicals and allied products	83 802	95 464	103 255	109 946	113 946	119 100	122 669	138 719	150 812	153 648	164 757	164 763	167 255	169 009	163 456	95.1%
Petroleum and coal products	22 051	32 311	29 842	31 692	28 806	28 249	30 965	29 332	28 975	30 198	31 420	32 913	30 436	38 549	40 603	84.1%
Transportation and public utilities	426 173	448 981	468 657	490 903	518 310	538 475	573 269	611 396	642 586	666 327	688 406	732 016	770 124	809 251	819 464	92.3%
Transportation	158 816	169 223	172 225	177 404	186 113	193 422	205 981	223 217	233 379	243 397	261 750	288 660	301 893	313 662	306 085	92.7%
Transportation by air	34 275	42 710	43 898	45 341	46 994	50 329	56 425	62 454	67 667	70 807	78 557	85 756	89 971	91 932	80 221	134.1%
Electric, gas, and sanitary services	141 853	146 985	158 985	165 435	176 492	181 160	188 711	197 443	206 874	208 253	205 891	204 844	211 002	216 465	221 916	56.4%
Wholesale trade	308 900	346 557	364 736	376 144	395 630	414 611	432 499	479 172	500 632	529 575	566 848	607 872	645 341	696 827	680 683	120.4%
Retail trade	434 487	461 523	492 661	507 771	523 732	551 707	578 003	620 557	646 802	687 087	740 502	790 354	831 674	887 281	931 756	114.4%
Finance, insurance, and real estate	829 680	893 713	954 495	1 010 330	1 072 177	1 140 916	1 205 304	1 254 835	1 347 233	1 436 771	1 569 895	1 708 454	1 798 768	1 976 689	2 076 890	150.3%
Real estate	531 390	586 221	630 680	665 666	689 120	725 219	751 582	791 411	832 580	871 612	920 059	981 584	1 050 452	1 123 720	1 171 677	120.5%
Services	789 907	887 907	975 996	1 071 525	1 123 756	1 219 396	1 287 664	1 365 000	1 462 428	1 564 239	1 691 484	1 829 940	1 977 224	2 116 430	2 226 585	181.9%
Hotels and other lodging places	37 134	40 604	43 991	46 347	48 278	50 421	53 043	56 563	61 742	66 250	70 467	73 504	80 019	87 380	88 429	138.1%
Government	661 049	706 495	753 606	806 555	857 105	894 396	924 785	957 599	989 468	1 020 393	1 064 796	1 103 331	1 151 330	1 217 684	1 281 327	93.8%
Tourism Complex (based on BEA 2001 calculation of direct sales)																357 500
Tourism Complex (based on BEA 2001 calculation of Direct plus Indirect sales)																675 000

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.

Table 1-2 US national economy at a glance – steel/steel fabricating, petrochemical complex versus tourism complex in perspective (percentages).

Industry Title	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Gross Domestic Product by industry (1987 SIC basis) share of Gross Domestic Product (Percent)															
Gross domestic product	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Agriculture, forestry, and fishing	1.88	1.74	1.86	1.87	1.72	1.77	1.63	1.68	1.48	1.67	1.56	1.46	1.38	1.37	1.40
Mining	1.94	1.94	1.77	1.93	1.62	1.39	1.33	1.28	1.29	1.45	1.43	1.14	1.12	1.36	1.38
Construction	4.62	4.64	4.48	4.29	3.89	3.71	3.75	3.90	3.92	4.05	4.07	4.34	4.59	4.70	4.76
Manufacturing	18.74	19.18	18.54	17.93	17.43	17.12	17.03	17.34	17.42	16.84	16.59	16.30	15.97	15.47	14.11
Primary metal industries	0.73	0.84	0.83	0.75	0.67	0.63	0.65	0.67	0.72	0.65	0.63	0.61	0.54	0.51	0.45
Fabricated metal products	1.32	1.32	1.25	1.20	1.12	1.10	1.11	1.18	1.18	1.19	1.17	1.16	1.15	1.12	1.00
Nondurable goods	7.84	8.10	7.92	7.82	7.82	7.72	7.51	7.50	7.56	7.27	7.07	6.84	6.77	6.45	6.05
Chemicals and allied products	1.77	1.87	1.88	1.90	1.90	1.89	1.85	1.97	2.04	1.97	1.98	1.88	1.80	1.72	1.62
Petroleum and coal products	0.47	0.63	0.54	0.55	0.48	0.45	0.47	0.42	0.39	0.39	0.38	0.38	0.33	0.39	0.40
Transportation and public utilities	8.99	8.79	8.54	8.46	8.66	8.52	8.63	8.67	8.68	8.53	8.28	8.34	8.30	8.24	8.13
Transportation	3.35	3.31	3.14	3.06	3.11	3.06	3.10	3.16	3.15	3.12	3.15	3.29	3.26	3.19	3.04
Transportation by air	0.72	0.84	0.80	0.78	0.79	0.80	0.85	0.89	0.91	0.91	0.94	0.98	0.97	0.94	0.80
Communications	2.65	2.60	2.50	2.55	2.60	2.59	2.69	2.70	2.73	2.75	2.65	2.72	2.77	2.84	2.89
Electric, gas, and sanitary services	2.99	2.88	2.90	2.85	2.95	2.87	2.84	2.80	2.80	2.67	2.48	2.33	2.28	2.20	2.20
Wholesale trade	6.51	6.78	6.65	6.48	6.61	6.56	6.51	6.79	6.77	6.78	6.81	6.92	6.96	7.09	6.75
Retail trade	9.16	9.04	8.98	8.75	8.75	8.73	8.70	8.80	8.74	8.79	8.90	9.00	8.97	9.03	9.24
Finance, insurance, and real estate	17.50	17.50	17.39	17.41	17.91	18.06	18.15	17.79	18.21	18.39	18.87	19.46	19.40	20.12	20.60
Real estate	11.21	11.48	11.49	11.47	11.51	11.48	11.32	11.22	11.25	11.16	11.06	11.18	11.33	11.44	11.62
Services	16.66	17.38	17.78	18.46	18.77	19.30	19.39	19.35	19.76	20.02	20.33	20.84	21.32	21.54	22.08
Hotels and other lodging places	0.78	0.80	0.80	0.80	0.81	0.80	0.80	0.80	0.83	0.85	0.85	0.84	0.86	0.89	0.88
Government	13.94	13.83	13.73	13.90	14.32	14.15	13.92	13.58	13.37	13.06	12.80	12.56	12.41	12.39	12.71
Tourism Complex (based on BEA 2001 calculation of Direct Sales)															3.55
Tourism Complex (based on BEA 2001 calculation of Direct plus Indirect sales)															6.69

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.



Table 1-3 US national employment at a glance – steel/steel fabricating, petrochemical complex versus tourism complex in perspective.

Industry Title	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	01/87%
<i>Full-Time and Part-Time Employees by industry (1987 SIC basis) in thousands, 1987–2001</i>																
Gross domestic product	110 809	113 971	116 714	118 209	116 707	117 198	119 265	122 235	125 158	127 494	130 640	133 968	136 861	139 787	139 448	25.8%
Agriculture, forestry, and fishing	1794	1891	1856	1885	1886	1847	1887	1942	2010	2048	2130	2188	2294	2319	2341	30.5%
Mining	720	722	697	715	694	639	614	606	587	582	601	594	539	541	568	–21.1%
Construction	5175	5314	5382	5340	4876	4704	4855	5197	5385	5671	5965	6296	6704	7007	7038	36.0%
Manufacturing	19 112	19 475	19 517	19 206	18 535	18 179	18 175	18 425	18 594	18 579	18 772	18 923	18 673	18 567	17 702	–7.4%
Primary metal industries	741	771	775	756	724	694	680	696	707	708	710	715	698	700	646	–12.8%
Fabricated metal products	1407	1434	1444	1424	1358	1333	1345	1396	1444	1453	1485	1517	1529	1544	1470	4.5%
Nondurable goods	7906	8022	8061	8032	7900	7851	7888	7920	7871	7741	7713	7653	7495	7388	7070	–10.6%
Chemicals and allied products	1009	1047	1058	1071	1066	1062	1057	1037	1027	1021	1020	1021	1023	1024	1005	–0.4%
Petroleum and coal products	159	156	153	155	156	154	149	145	142	138	135	133	130	125	123	–22.6%
Transportation and public utilities	5415	5556	5665	5820	5787	5752	5867	6054	6172	6293	6466	6679	6896	7111	7118	31.4%
Transportation	3208	3344	3463	3555	3534	3530	3651	3828	3956	4063	4175	4341	4480	4589	4558	42.1%
Transportation by air	605	847	900	967	959	958	986	1025	1068	1119	1140	1199	1245	1297	1286	112.6%
Communications	1285	1283	1266	1315	1296	1269	1269	1293	1309	1348	1420	1477	1553	1665	1700	32.3%
Electric, gas, and sanitary services	922	929	936	950	957	953	947	933	907	882	871	861	863	857	860	–6.7%
Wholesale trade	5976	6128	6360	6294	6138	6131	6056	6235	6476	6560	6750	6918	6992	7104	6832	14.3%
Retail trade	19 057	19 662	20 164	20 214	19 903	20 025	20 433	21 160	21 868	22 256	22 636	22 991	23 542	24 049	24 147	26.7%
Finance, insurance, and real estate	6705	6796	6840	6870	6834	6769	6873	7021	6929	7053	7257	7533	7705	7743	7856	17.2%
Real estate	1308	1345	1357	1359	1357	1341	1372	1422	1410	1442	1481	1532	1567	1581	1615	23.5%
Services	26 305	27 521	28 949	30 086	30 252	31 313	32 652	33 684	35 172	36 517	38 010	39 584	40 975	42 337	42 412	61.2%
Hotels and other lodging places	1535	1613	1685	1730	1678	1661	1680	1713	1757	1794	1833	1869	1935	1981	1942	26.5%
Government	20 550	20 906	21 284	21 779	21 802	21 839	21 853	21 911	21 965	21 935	22 053	22 262	22 541	23 009	23 434	14.0%
Tourism Complex (based on BEA 1997 estimate of 4302–5263 and taking the higher figure in 1997)																5263

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.

Table 1-4 US national employment at a glance – steel/steel fabricating, petrochemical complex versus tourism complex in perspective (percentages).

Industry Title	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<i>Full-Time and Part-Time Employees by industry (1987 SIC basis) in thousands, 1987–2001</i>															
Gross domestic product	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Agriculture, forestry, and fishing	1.62	1.66	1.59	1.59	1.62	1.58	1.58	1.59	1.61	1.61	1.63	1.63	1.68	1.66	1.68
Mining	0.65	0.63	0.60	0.60	0.59	0.55	0.51	0.50	0.47	0.46	0.46	0.44	0.39	0.39	0.41
Construction	4.67	4.66	4.61	4.52	4.18	4.01	4.07	4.25	4.30	4.45	4.57	4.70	4.90	5.01	5.05
Manufacturing	17.25	17.09	16.72	16.25	15.88	15.51	15.24	15.07	14.86	14.57	14.37	14.13	13.64	13.28	12.69
Primary metal industries	0.67	0.68	0.66	0.64	0.62	0.59	0.57	0.57	0.56	0.56	0.54	0.53	0.51	0.50	0.46
Fabricated metal products	1.27	1.26	1.24	1.20	1.16	1.14	1.13	1.14	1.15	1.14	1.14	1.13	1.12	1.10	1.05
Nondurable goods	7.13	7.04	6.91	6.79	6.77	6.70	6.61	6.48	6.29	6.07	5.90	5.71	5.48	5.29	5.07
Chemicals and allied products	0.91	0.92	0.91	0.91	0.91	0.91	0.89	0.85	0.82	0.80	0.78	0.76	0.75	0.73	0.72
Petroleum and coal products	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.10	0.10	0.09	0.09	0.09
Transportation and public utilities	4.89	4.87	4.85	4.92	4.96	4.91	4.92	4.95	4.93	4.94	4.95	4.99	5.04	5.09	5.10
Transportation	2.90	2.93	2.97	3.01	3.03	3.01	3.06	3.13	3.16	3.19	3.20	3.24	3.27	3.28	3.27
Transportation by air	0.55	0.74	0.77	0.82	0.82	0.82	0.83	0.84	0.85	0.88	0.87	0.89	0.91	0.93	0.92
Communications	1.16	1.13	1.08	1.11	1.11	1.08	1.06	1.06	1.05	1.06	1.09	1.10	1.13	1.19	1.22
Electric, gas, and sanitary services	0.83	0.82	0.80	0.80	0.82	0.81	0.79	0.76	0.72	0.69	0.67	0.64	0.63	0.61	0.62
Wholesale trade	5.39	5.38	5.45	5.32	5.26	5.23	5.08	5.10	5.17	5.15	5.17	5.16	5.11	5.08	4.90
Retail trade	17.20	17.25	17.28	17.10	17.05	17.09	17.13	17.31	17.47	17.46	17.33	17.16	17.20	17.20	17.32
Finance, insurance, and real estate	6.05	5.96	5.86	5.81	5.86	5.78	5.76	5.74	5.54	5.53	5.55	5.62	5.63	5.54	5.63
Real estate	1.18	1.18	1.16	1.15	1.16	1.14	1.15	1.16	1.13	1.13	1.13	1.14	1.14	1.13	1.16
Services	23.74	24.15	24.80	25.45	25.92	26.72	27.38	27.56	28.10	28.64	29.10	29.55	29.94	30.29	30.41
Hotels and other lodging places	1.39	1.42	1.44	1.46	1.44	1.42	1.41	1.40	1.40	1.41	1.40	1.40	1.41	1.42	1.39
Government	18.55	18.34	18.24	18.42	18.68	18.63	18.32	17.93	17.55	17.20	16.88	16.62	16.47	16.46	16.80
Tourism Complex (based on BEA 1997 estimate of 4,302–5,263 and taking the higher figure in 1997)															3.8

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.





Table 1-5 Summary of relative shares of selected industrial complexes in the US gross domestic product, 1987 and 2001.

Industry group	1987	2001
Steel complex	2.05%	1.45%
Petrochemical complex	2.24%	2.02%
Hotel and airlines	1.50%	1.68%
Tourism complex (direct sales)	–	3.55%

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.

Table 1-6 Summary of relative shares of selected industrial complexes in US employment, 1987 and 2001.

Industry group	1987	2001
Steel complex	1.94%	1.51%
Petrochemical complex	1.05%	0.81%
Hotel and airlines	1.94%	2.31%
Tourism complex (direct sales)	–	3.80%

Source: Calculated by author using data from the Bureau of Economic Analysis, US Commerce Department.

In terms of share of the GDP, the tourism industry seems to have equaled the steel and petrochemical complex combined, and by surpassing the latter in terms of employment share, it has consolidated its position as one of the leading groups of industrial sectors of the US economy.

1.1.2 Composition of the US tourism industry, by sector

Although the potential of the tourism industry has often been invoked, many people remain somewhat skeptical about it. John Latham, a specialist in tourism statistics, characterizes tourism data as ‘being estimates, subject to several errors and produced with differing levels of accuracy. Sources or estimates of errors are seldom provided in tourism statistics’ reports. Tourism statistics are fraught with problems of definition, partly because tourism is a composite industry, made up of several other industries, which render its measurement more complex.’

Having stated the above, we will now consider some intriguing data gathered by the BEA, regarding the dependence of industries associated with tourism on tourism itself (Table 1-7).



Table 1-7 Total sales and tourism-related sales of tourism industries fourth-quarter 2001 at an annual rate.

Tourism industry	Total sales (\$ billion)	Tourism related sales (\$ billion)	Tourism dependence %
Hotels and lodging places	130	104	80.0
Eating and drinking places	356	61	17.0
Railroads and related services	52	2	3.0
Local and bus passenger transit	12	3	23.0
Taxicabs	11	5	46.0
Air transportation	111	84	76.0
Water transportation	50	9	17.0
Automotive rental and leasing	37	21	58.0
Travel agency services	20	4	21.0
Amusement and recreation services	80	16	20.0
Membership sports and recreation clubs	20	6	32.0
Motion pictures and other entertainment	44	8	18.0
Professional sports clubs and promoters	21	2	9.0
Gasoline service stations	39	3	7.0
Retail excluding restaurants and gas stations	1030	31	3.0
All tourism industries	2012	357	17.8

Source: Bureau of Economic Analysis (tourism dependence % column added by author).

Based on these data, not only can researchers evaluate the magnitude of the tourism industry as those engaged in, or studying any tourism-related industry, such as hotel or restaurant businesses, can understand the bigger picture of the degree of dependence of their respective industry on the tourism complex.

We would like to emphasize at this point that hotels and lodging places form the core of the tourism industry, and that it is thus natural for this sector to take leadership in representing the tourism industry, which covers many other industrial sectors of the economy. This fact is not necessarily recognized by the hotels and lodgings sector itself.

1.1.3 Relative position of the tourism industry in developing nations

In order to expand the discussion to the global economy, we would like to put forward some logical arguments regarding the relative position of the tourism complex as a leading industry, since we do not have access to comprehensive data of the global economy at this moment.

The World Travel & Tourism Council (WTTC), a Brussels-based organization of chief executive officers of major companies representing all sectors of the global tourism business, funded a study produced by the Wharton Economic Forecasting Association. This study put the total gross output for travel and tourism in 1993 at close to \$3.2 trillion, which is about 6% of the world's gross national product (GNP). According to the study, tourism grows

**Table 1-8** International tourism receipts as percentage of gross domestic product in 2000 for least developed countries.

Name among LDC	# Tourists arrival in 1998	Tourism receipts (\$ million)	GNP/capita in 1998	Tourism Receipts to GDP (%)	Population (million)
Maldives	315 000	303	1110	82.29	0.3
Samoa	68 000	38	1070	21.66	0.2
Vanuatu	44 000	52	1260	21.60	0.2
Comoros	23 000	16	370	8.11	0.5
Tanzania	285 000	570	210	7.03	32.0
PDR Lao	60 000	80	320	6.34	5.0
Cambodia	220 000	166	260	5.78	12.0
Etirea	315 000	34	210	5.00	4.0

Notes: GDP, gross domestic product; GNP, gross national product; LDC, least developed country.

Source: Calculated by author based on World Tourism Organization, 2002, Annex 2.

almost twice as fast as the world's GNP and a total of 127 million people work in the industry worldwide.

Based on the data about the impact of tourism on national economies in least developed countries (LDC) compiled by the World Tourism Organization (WTO), the Maldives have the highest dependence rate of the national economy on the tourism industry, which stands at over 80% of their GDP. In Vanuatu and Samoa it stands at around 21%. Among the LDC, we selected eight countries whose tourism receipts represent more than 5% of their GDP, as presented in Table 1-8.

In other words, regarding these island nations, where other means of production are scarce, we can reasonably assume that tourism is the only viable industrial complex. On a global scale, there appear to be nations and regional economies whose dependence on tourism is significantly higher than that of the US. This is particularly true for some developing nations, in which tourism is the foremost means of earning foreign currency. We will now consider two cases, in order to learn more about the effects of the tourism industry on the regional economy.

1.1.3.1 Bali, Indonesia

Indonesia has a population of 231 million people, with a GDP of \$687 billion, or approximately \$3000 per capita. The labor force numbers 99 million people. The GDP is composed of industry (41%), agriculture (17%), and services (42%), while the distribution of the labor force is of 16% for the industry, 45% for agriculture, and 39% for services.

The national economy has been facing severe economic problems since the Asian financial crisis of 1997, with a GDP real growth at 3.3% and unemployment rate at 8%, for the year 2001.

The tourism sector in Indonesia has fared relatively better, with 5.1 million incoming visitors annually, approximately one-third of whom (1.7 million tourists) visit Bali. Foreign

**Table 1-9** Structure of the Bali versus Indonesian economy.

Region	Bali region			Indonesia as a whole		
Indicators	Emp %	R-GDP %	Growth %	Emp %	R-GDP %	Growth %
Agriculture	32.2	20.6	0.5	44.9	16	5.4
Mining	0.5	0.7	-1.6	0.9	8.7	5.5
Manufacture	14.5	9.6	-3.5	12.6	20.9	-11.1
Utilities	0.1	1.3	30.9	0.1	1	23
Construction	7.9	4.2	-9.6	4.4	4.6	-33.7
Trade	24.2	33.2	1.1	18.3	15.4	-6.8
(Wholesale and retail)	20.2	12.1	-12.2	17.3	12.7	-7.4
(Hotels)	2.9	12.9	9.1	0.2	0.5	-6.1
(Restaurants)	1.1	8.1	7.1	0.7	2.2	2.7
Transport	5.1	11.3	-2.8	5.6	5.2	4.6
Financial services	1.2	6	0.6	0.6	5.4	-17.22
Public administration	14.3	13.2	-0.9	12.6	7.1	-2.4
Total	1.7 million	\$1.8 billion	-0.5	87.2 million	\$687 billion	-6.4

Notes: Emp, employment; GDP, gross domestic product.

Source: World Bank 2002 Data based on National Economic Survey 2002 and BPS Regional Accounts of Indonesia.

tourists contributed \$5.3 billion to Indonesia's balance of payments, or about 9.2% of total exports. The World Bank estimates that tourism accounts for about 50% of Bali's economic output. According to Bali's Minister for Culture and Tourism, its economy employed 65% of the total labor force, i.e. 1.1 million out of the 1.7 million labor force in Bali, where the population stands at 3.0 million. In 2000, the hotel and restaurant sector alone produced a 21% share of the real GDP, and employed a higher share of Bali's labor force. The tourism industry is one of the major export earnings for the whole of Indonesia, and it is the most important industry in Bali's economy. Bali's poverty rate was only 4% in 2002, compared to 15.9% in Indonesia as a whole. This indicates that it was possible for Bali's small, open regional economy to successfully develop a tourism-dependent economy. In Table 1-9, the relative proportion of employment and contribution to the GDP, both in Bali's regional economy and in that of Indonesia as a whole, are shown.

It appears from Table 1-9 that the relative importance of tourism-related sectors, such as hotels, restaurants, and transport, based on contributions to the regional GDP, differ greatly between Bali and Indonesia as a whole. Moreover, a comparison of employment ratios and GDP contribution within the Bali regional economy reveals the relative efficiency and wage levels in each sector. For example, the hotel sector has only 2.9% of the employment rate, but generates 12.9% of the regional GDP, indicating that people working in this sector probably earn higher salaries than those employed in other sectors. This confirms the empirical observation, according



Table 1-10 Principal sources of foreign exchange earnings of Egypt.

	FY93/94		FY94/95		FY95/96		FY96/97		FY97/98	
	Earnings (\$ million)	%	Earnings (\$ million)	%	Earnings (\$ million)	%	Earnings (\$ million)	%	Earnings (\$ million)	%
Tourism receipts	1779	17.6	2298	18.0	3009	25.6	3646	28.0	2941	24.4
Workers remittance	3489	34.4	3455	27.1	2991	25.5	3354	25.8	3660	30.4
Suez Canal dues	1990	19.6	2058	16.1	1885	16.0	1848	14.2	1777	14.8
Petroleum exports	1362	13.4	2175	17.0	2226	19.0	2577	19.8	1728	14.4
Agriculture	275	2.7	616	4.8	321	2.7	271	2.1	244	2.0
Manufacturing	1233	12.2	2166	17.0	1314	11.2	1304	10.0	1685	14.0
Total	10 128	100	12 768	100	11 746	100	13 000	100	12 035	100

Note: FY, fiscal year.

Source: Tohamy and Swinscoe, 2000.

to which jobs in the hospitality sector in developing nations are preferred positions for the educated elite. As was shown in Tables 1-2 and 1-4, this is not the case in the US, where the hotel- and tourism-affiliated sectors are perceived as offering lower paying jobs. The gap in the perception of the relative status of tourism-affiliated positions may be explained by comparative statistics between developed nations and developing countries, though a detailed study of the topic is not the focus of this book.

1.1.3.2 Egypt

Tohamy and Swinscoe (2000) compiled a working paper on the impact of the tourism sector on Egypt’s national economy. The paper showed the relative importance of the tourism sector for Egypt, in terms of its ability to earn foreign currency. Table 1-10 demonstrates the position of the tourism sector in the national economy.

One-quarter of the foreign currency income is generated by the tourism sector, which shares the top position with remittance revenues from Egyptian workers working in the Gulf region, in the Middle East.

The Tohamy and Swinscoe (2000) paper quotes a visitor expenditure survey made by the Egyptian Ministry of Tourism in 1996, which we present as Table 1-11.

This shows detailed spending patterns of average tourists, according to nationality group. What is interesting to note is the difference of ratios of expenditure between hotels and other types of venues, given the origin of tourists. The average is 31% (within hotels) versus 69% (other than hotels). It is less clear to outsiders that Cairo is a popular summer resort for people from the Arabian Gulf region, such as Saudi Arabia, Kuwait, and United Arab Emirates. Since they tend to stay in Cairo longer, their spending patterns are somewhat different. In Egypt, the average expenditure per visitor in 1996 was \$122 per day, according to the same

**Table 1-11** Distribution of tourists' expenditure by nationality (% of total expenditure).

Spending category/ nationality group	Arab	European	US	African	Asian	Others	Total
Expenditure within hotels	19.7	47.4	48.1	44.8	44.6	51.3	31.0
Expenditure outside of hotels							
Entertainment and cultural expenditure	22.0	14.8	13.7	14.3	11.9	13.8	18.8
Shopping	20.0	15.8	16.7	15.7	15.8	13.2	18.3
Food and drink outside of hotels	16.0	4.7	4.1	5.3	4.8	1.6	11.3
Domestic transportation	7.8	10.1	9.6	9.9	10.8	10.5	8.7
Accommodation outside of hotels	7.0	1.1	1.1	1.9	2.2	0.3	4.6
Museums, tourist attractions, etc.	2.0	6.0	6.5	6.5	6.5	8.8	3.7
Medical expenditure	3.1	0	0	0	0.1	0	1.9
Studying	2.3	0.2	0.3	1.7	3.2	0.5	1.6
Other	0.1	0	0	0	0.1	0.0	0.1
Total expenditure outside of hotels	80.3	52.7	52.0	55.3	55.4	48.7	69.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The Economic Impact of Tourism in Egypt, Tohamy and Swinscoe, The Egyptian Center for Economic Studies, Table 6, p. 7, working paper #40, June 2000 quoting Visitor Expenditures Survey, Ministry of Tourism, Egypt.

Source: Tohamy and Swinscoe, 2000, Table 6, p. 7.

report. Using the 1991–1992 I-O table, they derived several multiplier calculations. Their summary table for the impact analysis of the Egyptian tourism revenue is quoted as Table 1-12. What we can learn from the Egyptian case is that the tourism sector tends to be underestimated, unless all the transactions and activities other than hotels are looked at, by way of the I-O/social accounting matrix (SAM) framework. Although hotels represent one of the leading sectors of the tourism industrial complex, this underscores the need take into consideration tourists' expenditures recorded at other venues and sites.

1.2 Difficulty in measuring tourism as an industry

Since the basic structures of the major industries were established a few decades before the importance of tourism in national economies became the focus of attention, tourism could not be incorporated into the national account structure. As we have seen in Table 1-1, tourism as an industry cannot be reduced to a single sector. Rather, tourism should be regarded

**Table 1-12** Summary of economic impacts of foreign visitor spending in Egypt, 1996.

Economic measure	Direct	Multiplier	Total
Output/sales (\$ million)	2860	2.64	7563
as a % of GDP at market prices	4.1	2.64	10.7
Total labor income (\$ million)	529	2.18	1154
Employment	978 156	2.21	2 160 531
as a % of total employment	5.7	2.21	12.6
Tax revenue (Egyptian £ million)	2851	2.64	7538
as a % of total taxation	7.2	2.64	19.1
Total visitor spending (\$ million)			3012
Capture rate (%)			95.0
Implicit effective spending multiplier			2.51

Note: GDP, gross domestic product.

Source: The Economic Impact of Tourism in Egypt, Tohamy and Swinscoe The Egyptian Center for Economic Studies, Table 9, p. 16, working paper #40, June 2000Source: Tohamy and Swinscoe, 2000.

as being made up of many different industrial sectors, which also cater to demands unrelated to tourism. For example, let us consider at the taxi industry. Taxis can be used both by tourists and by nontourists, including local residents, business people, etc. While the taxis in Orlando or Waikiki Beach may be predominantly used by tourists, taxis in New York City or Shanghai are often also used by nontourists. We should consider the tourism industry as an industrial complex, or as a group of industrial sectors which are associated with tourists, at various degrees.

This requires taxi companies to attribute part of its business to tourists and part of it to others. In addition, some of the tourism-related products are intangible, unlike other industrial sectors, in which the output is easily measured by volume or by currency value. Thus, which sectors cater to tourists, and what percentage of their total sales should be attributed to tourists, so that we can compose all these fractions into larger pieces without disturbing the current industrial structures?

This is the reason for development of global wisdom to measure tourism with a new framework of satellite accounts. In other words, we will not challenge the status quo of the existing industrial frameworks but rather work with the existing structure, and around the existing major industrial sectors, by using supplementary accounts.

1.3 Unique characteristics of the economic impact of the tourism industry

The tourism industry has unique characteristics in terms of its economic impact. We present several arguments in this section.



1.3.1 Economic impact paramount to export of goods

A flow of incoming tourists has an economic impact similar to the export of goods. When China exports toys to the US, monetary flow occurs from the US to China in exchange for the delivery of goods; the goods and the money are moving in opposite directions. How about the monetary flow in the case of American tourists visiting China? When the tourists move from the US to China, the money moves along the same way, as if China were exporting something to the US. Tourists will not take back any manufactured goods from China, only experience, stories, and, perhaps, some souvenirs.

In other words, we can say that in terms of the international flow of funds, the tourism industry presents a unique aspect of economic effect that is paramount to exporting services (labor) from developing nations to developed nations.

1.3.2 The tourism industry's dependence on specific locations

Another aspect that is ignored when comparing tourism to the exporting of goods, is its unique link to specific locations. For example, a good manufacturing global firm can compare Louisiana (US), Poland, China, and Malaysia for setting up a competitive manufacturing facility, in terms of production costs. In that sense, a global manufacturing firm (e.g. Toyota or Panasonic) does not have specific location constraints. But the tourism industry, depending on the product they offer, is highly location-based: a local economy cannot look for cheaper locations for particular services. In other words, some locations cannot be substituted, simply because there is no substitute.

A tourist must visit China to see the Great Wall, Egypt to see pyramids, Israel to visit Jerusalem, New York City to visit the Statue of Liberty, the Red Sea to experience ultimate diving, and France to see Paris, irrespective of the relative costs of services. This, however, depends on the character and uniqueness of a specific location, as an underdeveloped white sand beach, for example, may be considered as an interchangeable commodity by tourists, i.e. consumers.

1.3.3 De-facto export of labor with little frictions, in line with the free-trade principle

If one considers at trade (e.g. between the US and less-developed nations), it is evident that some industries in importing nations, such as the steel and textile industries, have strong domestic lobbyists, who tend to interfere with the principles of free, normal trade patterns. Free-trade arrangements are perceived by lobbyists as a threat to the domestic industry and domestic constituencies in the US, due to the price competitiveness of the imported products, whose components involve the quasi-transfer of cheaper labor from developing nations to developed nations. However, in the tourism industry, there are no lobbyists with a protectionism agenda, which is more in line with free-trade principles of the tourism industry.

Nations or domestic lobbyists cannot interfere with the free movement of tourists. One good example is a current case in Japan. While 13.2 million Japanese traveled abroad in 2003, only 5.2 million foreign tourists visited Japan that year. Although it is a well-known fact that



Table 1-13 US International travel receipts and payments by countries, 1999.

Names of country	US exports (US citizen travel abroad) (\$ million)			US imports (foreigners come to US) (\$ million)			
	Travel receipts	Passenger fare receipts	Total	Travel payments	Passenger fare payments	Total	Total balance
UK	8398	2535	10 933	5457	3818	9275	1658
Canada	6670	1540	8210	6135	712	6847	1363
Mexico	4112	952	5064	6074	960	7034	-1970
Japan	9711	3585	13 296	2845	858	3703	9593
All EU	22 369	6700	29 069	18 325	9577	27 902	1167
All Latin America	19 799	5455	25 254	16 403	3039	19 442	5812
All Africa	1317	42	1359	1201	490	1691	-332
All Middle East	2686	398	3084	1748	475	2223	861
All countries	74 881	19 776	94 657	59 351	21 405	80 756	13 901

Notes: Japan contributes both the highest travel receipts and fare receipts among all nations to the US Economy, representing 14% of total receipts by the US economy in 1999. In terms of balance, due to the huge imbalance, Japan alone is accountable for 69% of the whole Travel surplus (\$9.5 billion out of total surplus of \$13.9 billion) of the US in 1999.

Source: Calculated by author based on US Department of Commerce, Tourism Industries/International Trade Administration, Bureau of Economic Analysis, October 2000.

the Japanese domestic tourism industry needs to generate more income in order to recover from a decade-long recession, there has been no attempt to curb the Japanese outbound tourists and divert them towards spending on domestic tourism. No pressure was put on Japanese consumers, on the part of the domestic tourism industry, regarding their choice of destination. Similarly, no government or pressure group in the US tries to exert protectionist-like pressure over US consumers to visit domestic destinations (and buy local products) in lieu of foreign destinations (and buy foreign products), despite the significant impact of tourism-related spending on the economy. For example, a substantial tourism trade surplus on the US economy was recorded in 1999, as shown in Table 1-13.

One of the unique features of the tourism industry lies in its ability to conduct international transactions in line with the principles of free trade, without any interference of domestic pressure groups, in clear contrast with the trade of traditional goods. Some nations may try to export manufactured competitive goods (cheap labor) to developed nations, whose domestic lobbyists exert political pressure to prevent these products from entering the market, for the sake of protecting domestic labor (higher costs).

1.3.4 Unique aspects of tourism sector's distribution of considerations

Even if a nation is lucky enough to have considerable exportable natural resources (such as oil, gas, diamonds, precious metals, agricultural products, etc.), there is a problem of growing



or sustained income disparity among its citizens. The export of natural resources is often conducted by the government or by large corporations, and compensation for exports are remitted to those enterprises, and often kept at off-shore escrow accounts to protect debt services for syndicated lenders. As a rule, the owner of a debt (banks, lenders) first receives the required debt service (principal and interest portion paid to lenders), and the remaining profit goes back to the owner of the capital (government or large corporations). Thus only a small amount of money comes down to the lower and larger segment of the social structure, except for a limited number of wage earners employed by the companies.

The tourism complex, once again, is unique in the sense that numerous payments in exchange for services are paid directly to the lower, larger segment of the social structure. It thereby appears to have a greater ability to mitigate income disparities, in comparison with a goods/commodity export-driven economy. The effect of the direct flow of income towards the population at large becomes clearer when compared with a capital exporting industry. Imagine a tourist staying at a hotel in Sanaa, Yemen, who visits a nearby crafts market, or hires a taxi for daily excursions. These monetary flows penetrate directly into the local economy, not as a wages, but more like a return on their limited capital for their small-to-medium enterprises. In terms of tax revenue, tourism expenditures offer various opportunities for the local government to levy a consumer tax, thereby leaving the expenditure within the local economy.

In terms of tourism transactions, a return on the capital can flow towards more recipients than goods' exporting industries. Compare the two monetary flows of return on capital. Capital for the traditional goods-exporting industry tends to accumulate in the hands of investors due to the capital intensive nature of the industry, leaving larger numbers of local people as wage-earners. As the tourism industry has fewer barriers of entry for capital requirements, people have more opportunities to receive a return on equity as small business units. Street souvenir vendors and tour guides have much lower barriers of entry than developers of petrochemical projects.

1.3.5 The tourism industry as an export sector for poverty alleviation

Some LDCs might lack the basic infrastructure and supporting industries to build competitive exporting industries, while cheap labor is abundant there are no means to export it. Some smaller developing nations are unable to build low-technology, labor-intensive manufacturing sectors for export. For these nations, which are not lucky enough to have considerable exportable natural resources (such as oil, gas, diamonds, precious metals, agricultural products, etc.), the tourism industry may be the only export industry through which they can earn foreign currency.

The WTO issued a report in 2002, in which the great potential of tourism as one of the few development opportunities for poorer countries is presented. Table 1-14 shows some data from the recent trend in global tourism development. The overall growth of international tourist arrivals in the last decade is encouraging, and developing nations are benefiting from it.

**Table 1-14** International tourist arrivals (in thousands).

Country groups	International tourist arrivals (thousands)			
	1990	2000	Increase	% increase
OECD	338 200	471 164	132 964	39.3
EU	204 961	283 604	78 643	38.4
Other countries	3465	6652	3187	92.0
Developing	150 563	292 660	142 097	94.4
LDCs	2921	5106	2185	74.8
Other developing countries	13 755	25 562	11 807	85.8

Notes: EU, European Union; OECD, Organisation for Economic Co-operation and Development; LCD, least developed country.

Source: World Tourism Organization, 2002, table 2, p. 26.

Table 1-15 Average value per international arrival of tourism expenditure (\$).

Country groups	Mean value per international arrival of tourism expenditure			
	1990	2000	Increase	% increase
OECD	595	701	107	18.0
EU	585	631	4	7.8
Other countries	394	359	-35	-8.9
Developing	396	475	7	19.8
LDCs	350	508	158	45.3
Other developing countries	803	667	-136	-17.0

Notes: EU, European Union; OECD, Organisation for Economic Co-operation and Development; LCD, least developed country.

Source: World Tourism Organization, 2002, table 4, p. 27.

The data on the average expenditure per tourist shows the favorable increase for LDCs, between 1990 and 2000 (see Table 1-15).

As shown in Table 1-8, in relation to some countries' GNP per capita, a \$500 expenditure per tourist per visit often exceeds the host nation's annual wealth creation per person, demonstrating the substantial impact that international tourists can make on the host nation. For poorer nations, devoid of the basic industrial infrastructures such as roads, electricity, capital, and human skills, to produce and export quality goods at competitive prices, the tourism industry appears to be the best viable option to generate foreign revenues.

Additional data are presented in Table 1-16, showing the relative importance of tourism within the international service trade. For the Organisation for Economic Co-operation and Development (OECD) and EU countries, tourism represented around 28% of trade in services



Table 1-16 Travel as share of total trade in services and as share of total goods and services, 2000.

Country groups	Travel as share of total services (%)	Travel as share of total goods and services
OECD	28.1	5.9
EU	28.6	6.3
Developing countries	43.3	6.5
LDCs	70.6	15.3
Other developing countries	29	4.9

Notes: EU, European Union; OECD, Organisation for Economic Co-operation and Development; LCD, least developed country. Source: World Tourism Organization, 2002, table 5, p. 28.

in 2000, significantly less than the 43% recorded for developing countries and the 70% recorded for LDCs.

A student from an LDC attending graduate school in a developed nation, will probably find tourism-related subjects underplayed, due to relative difference in the importance of the tourism industry to the national economy. For OECD and EU countries, tourism receipts for 2000 amounted to around 6.0% of total share in goods and services. In developing countries, it averaged 6.5% and in LDCs, the figure was even higher at 15.3%. Thus, it is evident that the relative importance of tourism as a viable industry is higher in developing nations, particularly in LDCs. This may explain the perception gap between developed nations, which may be prone to underestimate the significance of tourism complex and developing nations, where the tourism complex is considered an elite industry, with greater growth potential.

There is a growing awareness among international and national development and policy makers that it cannot be assumed that the benefits of the economic growth will trickle down automatically to the poor. A significant drop in poverty can only be achieved if the benefits of growth are redistributed to the poor or if the poor themselves can be brought to join the economic activity, either through employment or through entrepreneurial success.

The WTO advocates pro-poor tourism (PPT) – tourism that generates net benefits for the poor. The WTO claim that for those in regular tourism employment, wages can often reach \$1000–4000 per worker per year, which is enough to bring the core group of earners and their families above the poverty line. The WTO report claims that casual and small-business earnings per person are generally lower than earnings from regular employment, though case studies demonstrate a very high variability (from \$6–10 to over \$1000 per person per year) and that far more people work on a casual basis (4–10 times the number of steady employees). These workers would otherwise be unemployed because there are few other viable economic activities in the areas studied. While the report shows a clear direction for using the tourism industry as a tool for alleviating poverty, the WTO report underscores the fact that we need to create and quantify the claimed benefits of the tourism industry through quantitative modeling, in order to show how these benefits can help mitigate poverty.



1.4 Problems for chapter 1

Q1-1 Using online resources, find out the GDP by industry and by employment of a country of your residence. If the data you are looking for are not available on the internet, use the US data by visiting the Bureau of Economic Analysis website (<http://www.bea.gov/industry/index.htm#annual>) (GDP by industry).

- 1 Find out how large the hotel (=accommodation) industry's contribution is to GDP.
- 2 Find out how large the employment shares of the hotel (=accommodation) industry are to total employment.

Q1-2 Explain briefly why we cannot find the 'tourism' industry in GDP tables.

Q1-3 Visit the Bureau of Economic Analysis website to reach 'regional' then 'gross domestic product by state and metropolitan area' page (<http://www.bea.gov/regional/index.htm#gsp>).

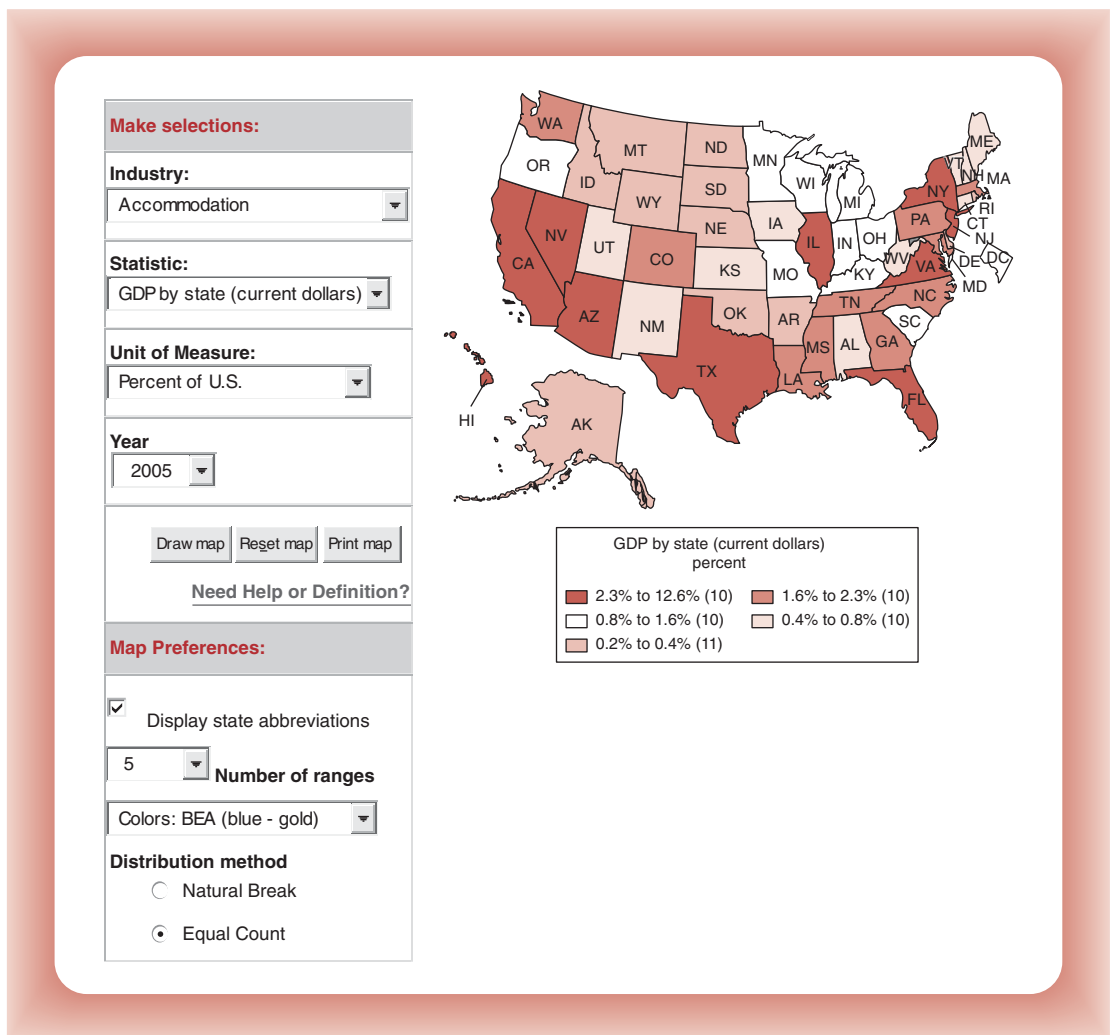


Figure 1-1

Source: U.S. Bureau of Economic Analysis, data released on 6/7/2007.



Go to the 'Interactive Maps' page and find out how the hotel (= accommodations) industry in each state contributes to the GDP visually. Make selections as shown below (industry = accommodation, statistic = GDP by state, unit of measurement = percent of US, year = any year but not the latest, and click to 'Display State abbreviations') then click 'draw map' (see Figure 1.1).

What can you say about the contribution to GDP of each hotel sector in each state? (If you prefer numbers, you should be able to see them below the map by scrolling down.)

1.5 References and further reading

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Chapter **2**

Introduction to Quantitative Methods for Tourism Industry Analysis





In chapter 1, the concept of, and the challenges in, studying tourism as an industry are introduced. In this chapter, in order to put the I-O/SAM modeling and TSA in perspective, brief overviews of academic research, followed by discussion on qualitative and quantitative methods will be presented. The emphasis lies in the relative overview of important and popular quantitative methods, namely, regression-based modeling and time-series modeling.

2.1 Overview of academic research for hospitality and tourism

Academic research starts from formulation of research problems. In the business environment, this initial step will be the identification of the problem. Pizam (1987) presented a planning framework which remains valid and relevant. The planning framework proposed is comprehensive to include a variety of research processes. They consist of:

- formulation of research problem,
- review of related research,
- clarification of concepts/identification of variables/statement of hypothesis,
- selection of research design,
- selection of data collection techniques,
- selection of subjects (not applicable for secondary data collection),
- planning of data coding,
- planning of data analysis.

In the following sections, an overview is presented of what should happen after the last step of Pizam's framework is achieved and we have some data (either primary or secondary). The emphasis is on the quantitative methods that help the research of tourism advance as a subject of social science, and how the I-O/SAM and TSAs would fit in the overall picture.

2.2 Overview of analytical research

Many workers in the hospitality industry have to use figures in the workplace. They may be sales results of a restaurant, number of attendees to a theme park, or simply, banking information. At the managerial level, data that you encounter may be multiple years of financial statements, average daily rates of your hotel compared with a group of comparable hotels in the same city, sales records of a hotel together with other economic data such as total number of visitors to your region, or macroeconomic data such as change in annual growth rate of GDP. In a typical managerial accounting course, series of ratio analyses are utilized to draw useful managerial information by comparing multiples of operational statements.

In the research field of tourism and hospitality, scholarly or scientific investigation or inquiry that would go beyond analysis of simple numbers would be considered as research. Research in hospitality and tourism is to build on what we think we know and improve what

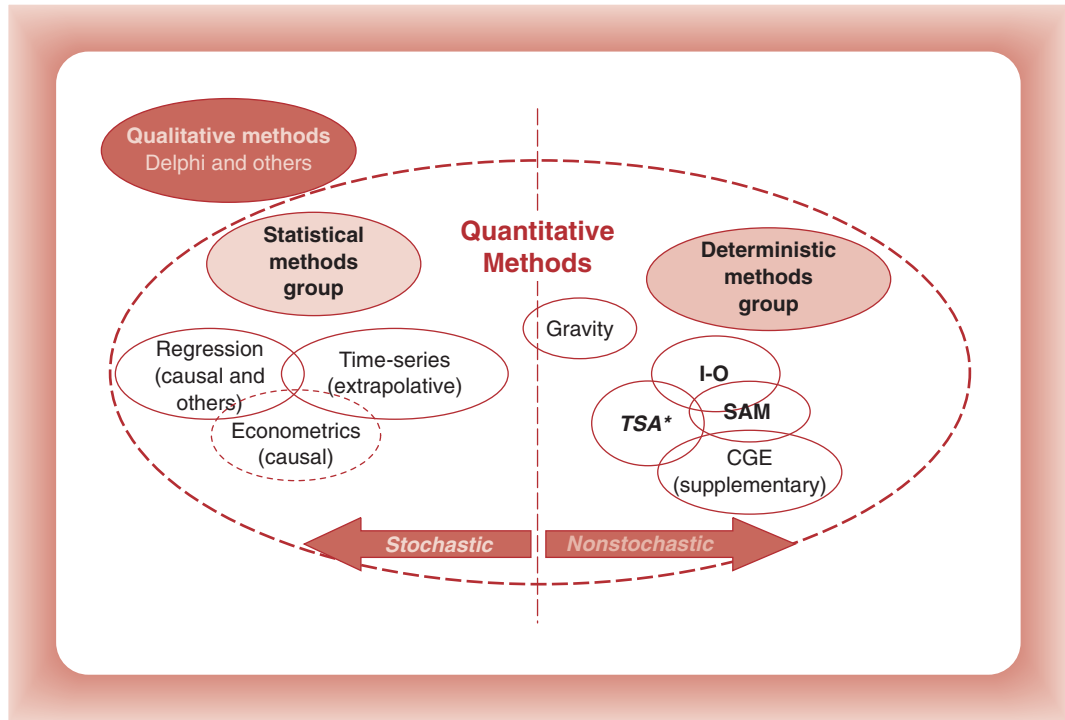


Figure 2-1 Overview of analytical research methods for hospitality and tourism.

Notes: CGE, computable general equilibrium; I-O, input-output; SAM, social accounting matrix; TSA, tourism satellite account; TSA is not exactly the method rather an applied technique top capture tourism as an industry.

we can do with problems in the hospitality and tourism management field, and hopefully with those in the broader society. Qualitative or normative assertions are not as easily verified or refuted as quantitative results, which tend to carry not only broader external validity but also higher objectivity. In acknowledgment of the existence of outcry, or candid admission that tourism and hospitality management field appear to enjoy less than fair share of due respect and recognition among broader scientific society, further advancement of the scientific component is what might be crucial for tourism to be considered as a scientific subject by broader audience in the society. Figure 2-1 presents an overview of analytical research methods in perspective.

As for scientific approaches for tourism analysis, statistical or stochastic methodologies are highly prevalent, and they are indeed very important tools for scientific research. It is important to note that I-O/SAM modeling would not be classified into this statistical group of methodology even though I-O/SAM methods are highly quantitative.

We briefly discuss each model and put them in perspective in relative to others.

2.3 Qualitative method

The qualitative method does not deal with numbers, or not as much as quantitative counterparts do, if any. Not all the objects that we observe can be quantified, even though quantitative



methods have a relative advantage in external validity. When we invite a former executive of a large hotel as a guest speaker from the industry, they are quite informative, inspirational, and intriguing. Students have to be inspired, so this has a great effect on motivation for learning. However, we do not know whether the way the speaker thought were the path for his/her success is applicable to other hotels in the same city, other hotels in other cities, or for a business unit in other business sectors. We do not know if the person's opinion can be applied to the broader hotel industry as the basis of argument is derived from one person's experience. The opinions can be expressed in a normative manner, which is the opinion of the authority. When the authority/expert advocates the same solutions for the same problems it will not cause any issues. When multiple experts have different solutions it becomes challenging to verify which one is relatively more appropriate over the others. Occasionally, the seniority (age, rank, affiliation) of the person becomes the source of relative authenticity of the opinion, away from the contents of arguments.

In the meantime, we cannot be too complacent to recognize the accumulated contributions made through thousands of years of history of humans that have been predominantly qualitative.

Wang (2007) used the concise and effective comparison of the qualitative and quantitative methods in a table format. Table 2-1 shows a relative comparison of characteristics of

Table 2-1 Research paradigm: quantitative and qualitative methods.

	Quantitative approach	Qualitative approach
Philosophical Assumptions ontology epistemology axiology	Positivism; determinism; reductionism;	Constructivism; understanding; social and historical construction; multiple meaning
Strategies of inquiry	Empirical observation and measurement; Theory verification	Participatory knowledge claims; grounded theory; phenomenology; ethnography; case study; Narrative research
Nature of problem	Previously studied; body of literature exists; known variables; existing theories	Exploratory research; variables unknown; context important; may lack theory base
Methods employed	Closed-ended questions; predetermined approaches; numeric data	Open-ended questions; emerging approaches; text, audio, visual data
Research practices	Test/verify theories; identify variables; related variables; uses unbiased approaches; employ statistical procedures	Collects participant meaning; brings personal values; Studies context/ setting of participants; Interpret data

Source: Course material in HFT6586 Research Method by Dr. Raymond Wang, Rosen College of Hospitality Management, University of Central Florida.



each approach (The context and nuances with which Wang's table is presented here may not necessarily reflect those of Wang but those of this author.)

Qualitative methods can be very useful to clear the thinking processes. After all, good research questions will not be generated by statistical software but by researchers with clear vision and insights on observed data and trends. Good quantitative research often originates from solid qualitative thoughts. It would be a little more challenging to put the results of qualitative research in the context of broader social science fields than those of quantitative approach.

2.4 Quantitative methods

While a qualitative approach is still widely used, it must be emphasized that a quantitative approach is important in advancing tourism and hospitality research as another solid social scientific subject in today's social science field.

In the US, which is one of the most advanced nations in terms of quantitative knowledge generation in hospitality and tourism, many students dislike learning quantitative methods as much as they dislike finance or accounting courses because of overwhelming amount of dry numbers. However, without an ability to understand financial statements, it is difficult to serve at senior management positions in business.

In the current US hospitality and tourism academic fields, it is almost impossible for students studying for a doctor in philosophy degree (PhD) to obtain tenure-track positions unless they can demonstrate solid knowledge on, and mastery of, quantitative methods. It is understandable that hospitality and tourism students procrastinate to learn to use numbers until, or unless, they appreciate that mastery of quantitative skills is important whether they work for the profit-oriented industry or research-oriented noncommercial environment. After all, as some honest students claim that they are in the hospitality and tourism field because they do not like numbers.

In the following sections, there will be only brief overviews of statistical and nonstochastic (deterministic) models. Excellent textbooks covering the precise subjects of statistical models are already available so the subject will not be covered in great detail. For nonstochastic (deterministic) models, detailed introductory explanations will be expanded in the following chapters.

2.4.1 Statistical models

A model is a simple representation of the complex interactions of variables in the real world. If you believe that beverage expenditures at your restaurant (something you are interested in knowing: represented by Y as a dependent variable, which means that this variable changes depending on another factor) depends on the total number expenditure on food (another factor that may affect the Y represented as X as an independent variable), then you can investigate the customer's expenditure patterns on food and beverages at your restaurant using equation (1.1).

$$Y = \alpha + \beta X + \varepsilon \quad (1.1)$$



where Y = dependent variable, i.e. the beverage expenditure per person; α = intercept value of Y when X is zero, i.e. how much does a customer consume for beverages when they do not eat anything; β coefficient for the slope of the model; X = independent variable, i.e. the food expenditure per person; and ε = error term that captures the difference when Y_i deviates from an expected value predicted by $\alpha + \beta X_i$.

Suppose the analysis of data of 3000 customers revealed that $Y = \$4.00 + 0.3X$.

Then if per customer consumption of food item in total (X) was \$20, you can say the customer's expenditure on beverages would be $\$4.00 + \$6.00 = \$10.00$. However, in a social science setting where you have to observe reality, one person who spent \$20 on food may spend \$20 on beverages ($\$20 - (\$4.00 + 0.3 \times \$20.00) = \10 deviation from the predicted results by the model), whereas another person who spent \$50 on food may spend nothing on beverages ($\$0 - (\$4.00 + 0.3 \times \$50.00) = -\19 deviation from the predicted result by the model). It is important to note that after analyzing data from 3000 customers, the model $Y = \$4.00 + 0.3X$ was suggested from the result of calculations to express the association between Y_i and X_i (where i is any observation from observation number 1 to 2999) better than any other parameters, which was fit to the data in a way that the expected errors to be zero. The model allows those deviations, and the model may overestimate or underestimate, but overall, such errors would be expected to be zero as the errors occur both above and below zero in real data. When there is a large sample size, such as 3000 observations, amid occasional observed value with large deviations from the expected value, you start to see the observed values tend to regress back to the mean (expected value).

In general, statistical models have common features of stochastic (random) character. You cannot predict exactly how much the next customer would spend on beverages, though you can make a reasonable guess (expected value) about it from food expenditure. This randomness may be attributed to either the true randomness of customers' expenditure on beverages or a lack of inclusion of certain other important factors (variables) that were not incorporated in the model.

It depends on your judgment on model building whether you, as a researcher, could think any other factors that may affect the relationship between food and beverage expenditures; which may include, but are not limited to:

- outside temperature,
- time of eating (e.g. breakfast, lunch, or dinner),
- number of parties,
- age group of the customer (above legal age for alcoholic beverages or not),
- gender,
- perceived friendliness of the server,
- spiciness of food items,
- price elasticity,
- ambience of the restaurant,
- layout of the restaurant,



- particular seating that customer was assigned,
- existence and results of special social events such as sports (New York Yankees versus Boston Red Sox game in New York City or Boston; Six Nation Rugby game in England, France, Ireland, Italy, Scotland, and Wales; Cricket World Cup match in Caribbean Islands; Asian Cup soccer game in Iraq etc.),
- religious events (Easter holidays, Eid-ul Fitr, Hanukkah, New Year in Chinese calendar, etc.),
- national holidays (Independence day, Liberation day, Constitution day, etc.).

If you do not include them in the model, those effects are captured in the error term.

Unlike deterministic models, statistical models incorporate certain variance of data to be captured as an error term. In other words, a model would take into consideration associations between independent variables and a dependent variable, and thus it may indicate some relationship between values of a dependent variable given certain values of independent variables. So, while the overall model would show $Y = \$4.00 + 0.3X$, it may be expressed as $Y_i = \$4.00 + 0.3X_i + \varepsilon$. These models come with some explicit assumptions and tacit reservations.

It may seem that the error term, ε , appears to be useless because it is expected to be zero anyway, however, it cannot be disregarded. When ε is put in perspective with the coefficient (slope) to have the relative comparison of the estimated coefficient and the standard error of the coefficient, useful information can be obtained, for example, how certain the model is to insist on the existence of slope at all. Namely, you can verify whether increase in food expenditure would yield an increase in expected expenditure on beverages with 95% or 99% likelihood or even higher, subject to a series of assumptions in the model.

2.4.2 Statistical analysis

In order to do a statistical analysis the basic features of the data are needed (whether using primary data collected from results of questionnaires or secondary data obtained from another researcher). This includes number of data, types of variables (how many possible answers, e.g. if it is gender there should be two choices for one answer), overall mean, and standard deviation. This initial process is termed descriptive statistics. While results of descriptive statistics may suffice for many practitioner audiences, more rigorous data analysis is needed to draw certain inferences, such as hypothesis testing and correlation analysis.

If you work for restaurant environment, you may regard descriptive statistics as a process of checking the quality and quantity of all the ingredients before you start cooking, to be followed by processes of cooking, which are the inferential statistics. Knowing the conditions of ingredients would surely help you make a better meal. What would happen to the cooked dishes if the ingredients are of an inferior quality? Hopefully, before you start to jump on intensive cooking processes, you take time to taste the carrots, lettuces, and tomatoes to ensure that they meet the required level of basic quality, or look closely and smell very carefully the quality of meat and fish. Such practice would save precious cooking time before you start the processes. You can abort the cooking process before you cook subpar meals, which



would require you to throw away the ingredients you currently have to be replaced with better ingredients. When the meats in your inventory are of an inferior quality for steaks though are still edible and safe, an experienced chef can still cook them as ingredients for Chili sauce as long as the chef has basic set of skills and knowledge to generate satisfactory results. Descriptive statistics may show you whether it is advisable for you to throw away, salvage them and cook with spices, or cook a series of dishes by capitalizing on the superior quality of the fresh ingredients, as long as you have basic set of skills and knowledge as a researcher.

Researchers who collect primary data are able to design the research and identify sampling issues before they start data collection. Thus by creating a controlled environment for experiments, a researcher can make statistical analysis of the samples to verify their hypotheses. In contrast, researchers who deal with observed data in the society or secondary data may not be able to create a controlled environment and the lack of a controlled environment will pose extra challenges as will be mentioned later.

2.4.2.1 Hypothesis testing

Hypothesis testing is the technique in which you present two hypotheses, namely one hypothesis that stands for the idea that you would like to challenge or verify (null hypothesis), and another hypothesis that stands for an alternative idea or possible new finding that you are eager to explore. Data analysis will show quantitatively whether there would be enough evidence to refute the null hypothesis or not.

For example, the null hypothesis in our simple case can be that 'there is no association between a customer's expenditure amount for food and the same customer's expenditure amount for beverages' (i.e. the null hypothesis; 'Ho' – the hypothesis that you as a researcher would like to challenge with statistical evidence), and the alternative hypothesis can be that 'there is an association between a customer's expenditure amount for food and the same customer's expenditure amount for beverages' (i.e. the alternative hypothesis; 'Ha' – the hypothesis that you as a researcher would like to prove certain existence of associations between the variables of your interest by negating the null hypothesis with statistical evidence).

The following provides some other examples of combinations of null and alternative hypotheses. These are not necessarily derived from existing research but are used as examples of how you can think about hypotheses testing.

- A null hypothesis can be that 'there is no association between degree of employee satisfaction and the financial performance of the employer', and an alternative hypothesis can be that 'there is an association between the degree of employee satisfaction and the financial performance of the employer';
- A null hypothesis can be that 'there is no association between whether the mortgage borrower is classified as subprime borrower (or not) and the likelihood of the borrower filing bankruptcy', and an alternative hypothesis can be that 'there is an association between whether the mortgage borrower is classified as subprime borrower (or not) and the likelihood of the borrower filing bankruptcy';



- A null hypothesis can be that ‘there is no association between increase in marketing expenditures of the regional marketing office (often known as Convention and Visitors Bureau: CVB) and the change in numbers of inbound visitors to the region’, and an alternative hypothesis can be that ‘there is an association between increase in marketing expenditures of the regional marketing office (CVB) and the change in numbers of inbound visitors to the region’ (this is a return on investment (ROI) in marketing issue).

Imagine only two variables of X and Y . If you believe that as X increases Y should increase, then you are assuming the existence of positive slope (slope increases towards 2 o’clock direction). If X represents the disposable income in households and Y represents tourism-related expenditures per year and you assume a positive slope, then your null hypothesis would be ‘ H_0 = there is no association (slope = 0) between amount of disposable income in household and amount of tourism-related expenditures’ and your alternative hypothesis would be ‘ H_a = there is an association (slope $\neq 0$) between amount of disposable income in household and amount of tourism-related expenditures’. If your parameter estimation error is relatively small, such as less than 5%, in relation to the value of the estimated coefficient in parameter (which means you are investigating whether there would be a substantial possibility that the slope will become zero), you can say ‘we have enough statistical evidence to refute the null hypothesis that there is NO association between amount of disposable income in household and amount of tourism-related expenditures.’

2.4.3 Regression models

Regression is a statistical tool to verify whether any relationships exist between variables of interests. It can be between sales at restaurants and the numbers of visitors to the region, or likelihood of a mortgage loan borrower’s default and the usage of adjustable rate mortgages. There are many variations of regression modeling, starting from simple linear regression where there are only one set of dependent variables (the data you are interested in) and one set of independent variables. If you think that the height of children below the age of 18 years can be explained by the age of that student, $Y = \alpha + \beta X + \varepsilon$, where Y = height and X = age. If there are more than two independent variables, they would be incorporated as a multivariate regression model. Typically, you want to find whether there is a slope, positive or negative, in the relationship between the independent variable(s) and the dependent variable, and you will examine the data whether the slope is kept away from being flat (i.e. no slope) over 95% of the cases. That is measured by comparing the estimated coefficients with the standard error of the coefficient.

Techniques used in regression models by statisticians are similar with those used in econometric models. One of the differences would appear to exist in the mindset of researchers. Econometricians tend to discourage any attempts to measure relationships without referring to relevant theories such as those in macro- and microeconomics, labor economics, public finance economics, monetary theories, international trade theories, etc. While processes of verification



with existing theories are also important in noneconometrics environment, negative perceptions towards 'measurement without theory' may not be as punishing as in econometrics.

One example would be a technique called data-mining. The term data-mining itself may bring about negative connotations to some econometricians and economists due to the implied lack of prior verification with existing theories, but in commercial, business, and financial environments, statisticians are making best use of increasing powers of personal computers to identify trivial, nonapparent, hidden patterns of information from certain combinations of model specifications from huge amounts of real data. The huge dataset often exist in proprietary, commercial environments, such as consumers' consumption patterns collected by credit card companies, retail banks, online vendors, or hotel chains. Because the datasets are huge in sample size and numbers of variables (often 200 and more), computers are programmed to use large numbers of models in an attempt to find any significant increases in dependent variables. If a cosmetic company plans to introduce a new cosmetic product targeting at middle age, self-conscious women, identifying the target segments would probably help the likelihood of the product penetrating into the segment. In addition, if a company can extract certain hidden patterns by identifying combinations of key variables, the company would be able to generate narrower focused target segments where the response rate to the pilot campaign is expected to be significantly higher (e.g. variables such as age group, annual income level, type of occupation, type of car they drive, hotels they stay at, magazines they subscribe to, travel destinations they choose, number and age of children, zip code of residence (indicating the area they live, which may have spatial autocorrelations with other data), etc.). There are no theories behind the certain combination that maximizes the likelihood of a purchase of a promoted product and, as long as the combination maximizes the likelihood of purchase, everything else can be secondary value. This can be a very different attitude from many econometricians.

2.4.4 Econometrics model

Econometrics is a statistical application to deal with economic data in society from an economics point of view. Economic data are often called secondary data, as econometricians do not collect data by designing experiments but most likely use the data of the society that were collected and compiled by others. Econometrics is similar to regression and statistical models in structure, but the data they deal with are far from the controlled environment with which statisticians are more familiar. In that regard, econometricians tend to face more problems with violations of various assumptions used in the statistical environment and thus become more familiar with how to deal with them.

2.4.5 Time-series model

Techniques employed in the time-series model are similar to other statistical methods, but there is a difference. The time-series model does not depend on other variables at the same timeframe, but it does depend on the past behavior of variables, including the past data of the variable itself. We will start from a simple model.



If you are concerned with your performance in a coming examination, you may consider how you have been doing in the examinations up to now, and if the results of your last examination were just as good as those of your previous examinations, then you hope you should do well with the coming examination (as you seem to know how to study and prepare for examination). This is very different from other models in which you thought your performance in the coming examination depends on how many hours you slept, how many classes you skipped, the temperatures of the examination day, and how happy you are with your friend. In time-series modeling, the relative relevance of your examination result last week may be higher than your examination result 2 months ago when it comes to predicting your performance in tomorrow's examination. The time-series model can be referred to as the extrapolative method, in contrast with other methods such as regression or econometrics models, which can be considered as causal methods. The time-series technique is very important in financial fields and in tourism-related forecasting.

While time-series data deal with the collection of observations on the same entity across time, another contrasting concept is the cross-section data, in which observed data are collected from different entities at the same time period.

2.4.6 Forecasting

Forecasting is the group of techniques used to predict certain values of your interest in the future. While there are some nonquantitative methods, such as the Delphi method, many rigorous forecasts use a combination of the quantitative methods that are mentioned in this chapter. Demand forecasting is critical for hospitality company managers, in terms of capital budgeting and taking proactive steps to curve out the fluctuations of market demands and not to miss opportunities to maximize their profit margins when appropriate.

Forecasting, particularly tourism-demand forecasting, even requires some qualitative techniques and rigorous utilization of all the quantitative methods particularly with the high level of regression and econometrics applications, it is the field which is led and expanded by small numbers of economics/econometrics-trained tourism researchers. Their textbook is specific to tourism-demand forecasting and is comprehensive and rigorous, covering the stochastic side of the quantitative methods.

Frechtling (2001) has published a thorough guide of forecasting tools that can be used for tourism-demand forecasting, and the book provides ample examples and actual data to work with. The book is good at suggesting appropriate strategies for a researcher who plans to conduct tourism-demand forecasting. It offers actual monthly data on hotel/motel room demand in Washington DC metropolitan area. The book chapters clearly show how the author categorizes the forecasting into sets of different methods as follows:

- 1 Introduction
- 2 Alternative forecasting methods and evaluation
- 3 The tourism forecasting process



- 4 Basic extrapolative models and decompositions
- 5 Intermediate extrapolative methods
- 6 An advanced extrapolative method
- 7 Causal methods: regression analysis
- 8 Causal methods: structural econometric models
- 9 Qualitative forecasting methods
- 10 Conclusions

Chapter 3, for example, is rather short chapter but shows clear steps that researchers of forecasting should take that would offer highly useful directions.

Song and Witt (2000) is one of a few books that specializes in tourism demand modeling and forecasting to guide you up to advanced levels of topics such as co-integration, error correction model, and vector auto-regression modeling. While some section may be too advanced for hospitality and tourism students unless they have taken introductory courses in multiple regression or fundamental statistics as claimed in their Preface, those who did would learn from intermediate to advanced levels of forecasting models such as co-integration, vector auto-regression, Kalman filter, and panel data analysis.

Vanhove (2005) wrote a comprehensive book dealing with tourism economics, and it has a chapter with useful case studies of regression analysis application to the tourism data. The book covers comprehensive contents of tourism research from economists' viewpoint, including forecasting, thus it is a useful handbook for graduate students. For those who teach tourism economics, this is perhaps one of the most appropriate textbooks.

Smith's (1995) *Tourism Analysis Handbook* covers broad issues of tourism research with an introduction to various concepts and methods that can be applied. It contains important geographical aspects for tourism research such as framework of applied geographical economics that are not necessarily captured in other books.

2.5 Nonstochastic (deterministic) model

2.5.1 Gravity model

Newton's law of gravity states that the force between two masses is directly related to their size and inversely related to the distance between them. This can be applied to special interactions between two cities. If you have a city A, and city B, you can predict that the volume of interactions (e.g. amount of trade, expenditure for shopping, number of tourists) would be the functions of population in each city and the distance between two cities.

Conceptually, the amount of interactions between city A and city B are equal to equation (1.2).

$$\frac{\text{population}_A \times \text{population}_B}{\text{distance}_{AB}^2} \quad (1.2)$$



This can be used to predict the amount of trade, commercial activities, immigration, number of tourists, etc. between two cities given the population of both and the distance between them. This model can be used as a deterministic model or a part of stochastic model.

2.5.2 Input-output/social accounting matrix

I-O/SAM and their groups of siblings, are not stochastic but deterministic models by default, despite the fact that they are mathematically intensive in the process of calculations. The computable general equilibrium (CGE) model incorporates market clearing concept (i.e. prices move according to supply and demand) by manipulating with prices into the I-O/SAM framework, but I-O/SAM remains at the heart of CGE modeling, which is deterministic by structure. Since these modeling techniques do not include stochastic elements, they do not offer the useful methods available in the statistical models, including but not limited to, hypothesis testing, confidence intervals, and forecasting of the dependent variable.

Among students who are familiar with quantitative methods, almost all are familiar with statistical models and the structures, but not all are familiar with nonstochastic model groups of quantitative analysis, such as I-O/SAM. The I-O/SAM model, particularly the I-O model is sometimes stereotyped as an outdated deterministic modeling technique by those who are familiar with statistical modeling but have little training on the I-O/SAM model. This is unfortunate for two factors. First, in the field of regional science, it has been quietly evolving and new techniques and applications are developed but few hospitality and tourism students consider the field beyond hospitality and tourism, making their perception on I-O remain outdated for a couple of decades old version. Second, increasing interests in TSAs from a small but growing number of economists do not seem to translate into the linearly growing interests of hospitality and tourism students. The most likely reason for this is that knowledge of I-O/SAM as a prerequisite to learn TSA creates a hurdle for students to learn about TSA.

2.5.3 Current curriculum

It is rare to find a course offering of I-O/SAM in hospitality and tourism programs, where courses of statistics, research methods, or regressions are usually offered. Economics or Applied Economics departments in the same university that has tourism or hospitality programs may or may not offer courses in I-O/SAM or CGE. It appears to be common that Economics departments allocate more resources into stochastic modeling application or the more prestigious pure theory building, and it would be other departments such as City and Regional Planning and International Development which offer courses on I-O/SAM as a planning and development tool. TSA, as we will discuss in detail later, is based on the framework of I-O/SAM, and thus without a working knowledge of I-O/SAM, it is difficult not only for hospitality and tourism students to learn, but also for the hospitality and tourism faculty to teach the content.

Notable exceptions as an intriguing model for tourism education can be found in Japan where some universities such as Wakayama University and Yamaguchi University developed



tourism programs within the existing Economics department. At these universities they can teach both statistical and deterministic groups of quantitative methods within the department. This is a rare business model for tourism education but makes good sense to advance tourism as scientific subjects.

TSA's are based on I-O/SAM structure, which appear to pose a mysterious hurdle to students, even though somewhat familiar jargons such as multiplier, direct effect, indirect effect, shock, commodity and industry etc. have been recognized, used, and sometimes abused. The structure and calculation processes will be demystified in chapter 3 and 4 before we discuss TSA in chapter 5.

2.6 Chapter 2 problems

Q2-1 Table 2.2 is based on the freely downloadable data from BEA, US Commerce Department. It shows annual data of international travel exports and international travel imports of the US from 1970 to 2006 shown in \$ millions.

- 1 In MS-Excel, calculate the net travel accounts (i.e. travel exports + travel imports)
- 2 After completion of the net travel accounts column, try to create a chart using MS-Excel (click the chart icon or use insert → chart). What can you say by looking at the plotted data in the chart?
- 3 Do you think any of the combinations of four columns are correlated? (In MS-Excel, you can check correlation by insert → function → correlation, which will show you how to use = correl (array 1, array 2).)
- 4 If you have statistical software, you may go beyond the above.

Q2-2 You will find data collected from students before and after the semester of taking finance course. Students were asked their self-evaluation of finance knowledge and their perception of importance of finance both at the beginning and the end of the course measured between 5 and 1. The third column shows whether the questionnaires were asked before the course (0) or after the course (1).

- 1 Is the correlation between the self-evaluation of financial knowledge and the perceived importance of finance stay the same before and after the course?
- 2 If you have statistical software, you may go beyond the above.

Q2-3 You will find data collected from participants to a certain function held in Orlando, US in 2007 about their two-way flight costs from their home to Orlando. A total of 142 responses were collected.

- 1 What would you say about the sample data of \$30 000? Will you consider this as an outlier and throw away?
- 2 How about a person who paid \$6000?

**Table 2-2** Annual data of international travel exports and imports of the US, 1970–2006.

US	Travel exports	Travel imports	Net travel accounts
1970	2331	–3980	
1971	2534	–4373	
1972	2817	–5042	
1973	3412	–5526	
1974	4032	–5980	
1975	4697	–6417	
1976	5742	–6856	
1977	6150	–7451	
1978	7183	–8475	
1979	8441	–9413	
1980	10 588	–10 397	
1981	12 913	–11 479	
1982	12 393	–12 394	
1983	10 947	–13 149	
1984	17 177	–22 913	
1985	17 762	–24 558	
1986	20 385	–25 913	
1987	23 563	–29 310	
1988	29 434	–32 114	
1989	36 205	–33 416	
1990	43 007	–37 349	
1991	48 385	–35 322	
1992	54 742	–38 552	
1993	57 875	–40 713	
1994	58 417	–43 782	
1995	63 395	–44 916	
1996	69 809	–48 078	
1997	73 426	–52 051	
1998	71 325	–56 483	
1999	74 801	–58 963	
2000	82 400	–64 705	
2001	71 893	–60 200	
2002	66 605	–58 715	
2003	64 359	–57 447	
2004	74 546	–65 750	
2005	81 799	–68 970	
2006	85 694	–72 029	

Source: US International Accounts Data, Bureau of Economic Analysis, US Commerce Department.



2.7 References and further reading

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Chapter **3**

Input-Output Model and its Application





3.1 Brief history

It was Dr. Wassily Leontief (1951) who succeeded in materializing the concept of ‘Tableau Economique’ presented by the French Economist Francois Quesnay, in 1758. Dr. Leontief published the US I-O table of 1919 and 1929, in 1936, followed by a series of publications, resulting in the 1973 award of the Nobel Prize in Economics ‘for the development of the I-O method and for its application to important economic problems’ (http://nobelprize.org/nobel_prizes/economics/laureates/1973/index.html).

Dr. Walter Isard started to focus on regional economic impact analysis in the 1940s and initiated a new academic field entitled ‘regional science’, which is roughly explained as ‘applied geographical economics’. The Regional Science Association International (RSAI; <http://www.regionalscience.org>) was founded by Dr. Isard in 1954, and many researchers have expanded the depth and width of applied research using quantitative methods to address issues of regional economic analyses. Scholars in this field have contributed considerably towards the development and application of I-O models, in order to help solve problems in the world. RSAI has strong overseas chapters, which work towards the proliferation of the quantitative regional modeling, in many parts of the world.

I-O modeling, however, has failed to maintain the interest of academic theorists. (Duchin, 1998). While the popularity of stochastic modeling rose, including multivariate regression, econometrics, or time-series analyses, I-O modeling did not capture main-stream momentum due to the perception of researchers regarding the lack of stochastic elements. The I-O structure, however, still remains the core of sophisticated modeling such as SAM or CGE modeling, and its understanding is a de-facto prerequisite to other modeling, including the TSA framework, which is based on the I-O structure.

3.2 Conceptual introduction to simple input-output modeling

A model is built to represent larger systems, and is therefore often built to scale. Let us assume that you want to learn about your nation. To make the story simple, let us assume that your nation consists of three industrial sectors only, namely agriculture, manufacturing, and services sectors.

3.2.1 Intermediate goods and final consumption

In our example, you want to purchase orange juice in a plastic bottle to quench your thirst. Here is the first important question. What does the orange juice bottle consist of? Is it a manufactured product or an agricultural product? While the plastic bottle is the manufactured product, namely a product made by the manufacturing sector, one important ingredient came from the agricultural sector, the oranges. The manufacturing sector purchased the output – namely, the oranges – from the agricultural sector, not to be consumed, but to be used as intermediate goods for producing the final product – the orange juice in the plastic bottles. If the manufacturer is the food-processing company, they must have bought the empty bottles from another manufacturing sector, thus the manufacturing sector is selling plastic bottles to the other firms within the same manufacturing sector. When a sector purchases required input



from other sectors, in order to produce their own goods, the former are called intermediate goods and this type of transaction is called an interindustry transaction. This is in clear contrast with the purchase of the orange juice bottle for your own consumption. Your purchase, unless you try to purchase a bulk to sell to your friends for profit, is deemed as final consumption, and your purchase is considered as final demand.

3.2.2 Relationship among intermediate transactions, final demands, and total output

Imagine now that you are a farmer who grows oranges, and that you sell your oranges (i.e. output) to only two kind of purchasers. First of all, you sell some oranges (i.e. output) to the manufacturing sector, who make orange juice. They purchase your oranges (i.e. output) as intermediate goods in the interindustry transactions (agricultural output sold to the manufacturing sector). As for the remaining oranges, you decide to take them to the farmer's market, where people can directly purchase them for their own consumption, to satisfy their final demand.

To put these sentences in a simple equation, we can say that:

$$\begin{aligned} \text{Intermediate goods} + \text{final demand} &= \text{total output} && (3.1) \\ \text{i.e. (oranges sold to other industries)} + \text{(oranges sold for final demand)} & && \\ &= \text{(all the oranges produced)} && \end{aligned}$$

Since this is one of the key concepts, let us consider some examples. Imagine you own the Bridgestone-Firestone tire factory. Some sales go to Ford Motors as intermediate goods – so that Ford Motor can sell their new cars with tires – and some sales go directly to consumers who want to purchase tires for their car, i.e. as a final demand.



Figure 3-1 Tomatoes for final consumption or intermediate purchases from the farmers' market at Bestow, FL, US.

Source: Photograph taken by author, 2006. (Plate 1)



Now imagine you are a farmer who grows tomatoes. If Chris, a restaurant owner, wants to purchase fresh tomatoes for his restaurant, the purchase is considered as a purchase of intermediate goods, since Chris will not be consuming these tomatoes but will be using them as a necessary ingredient in preparing his final products – tomato salads, tomato pizzas, spaghetti with tomato sauce, etc. When you sell your tomatoes to Deborah who purchases the same tomatoes for her own enjoyment, this transaction fulfils her final demand, because she is purchasing tomatoes to satisfy her own final demand to consume fresh, tasty tomatoes.

What about hard-disk manufacturers? They sell some hard-disks to Hewlett Packard so that it can create a personal computer for consumers, while they can also sell a hard-disk directly to consumer, so that they can upgrade the current 20GB disk to, for example, 500GB.

Does this apply to a hotel environment? If you are the general manager of a 400-room hotel with full occupancy on a given night, all the 400 rooms are sold. Does this mean that all 400 rooms are sold to fulfill the final demand? It is indeed possible that all rooms are sold to fulfill final demands of at least 400 people, but there could also be some rooms that are sold as intermediate goods. If a travel agency purchases a block of rooms for the purpose of selling them as a part of package tour to individuals, the rooms sold to the travel agency are sales of intermediate goods, while the final demand would be satisfied as people purchase an all-inclusive package tour, which includes a hotel room, from the travel agent.

Now that we know the total output consists of intermediate goods and final demand, we can consider them in a table format in the next section.

3.3 Structure of input-output transaction table

The I-O table is displayed in a two-dimensional matrix format, with rows and columns. Rows show the output for each sector, and columns show the input for each sector.

Table 3-1 is a simplified basic structure of the I-O framework. Table 3-2 is the same framework with numbers filled. While both the MS-Excel sheet and the explanation of the whole tables in this chapter appear on the attached CD-R, I will explain the agricultural sector's numbers both in the row (first row from top to bottom) and in the column (first column from left to right), to show you how to read the numbers in Table 3-2.

Table 3-1 Input-output transaction table.

	AG	MNF	Serv	FD	Total Output
Agriculture					
Manufacturing					
Services					
Value Added					
Total Input					

Notes: AG, agricultural sector; FD, final demand; MNF, manufacturing sector; Serv, service sector.



3.3.1 Row interpretation in transaction table

As you can see, the agricultural sector’s row in Table 3-2 runs as follows:

$$[1 \quad 2 \quad 1 \quad 6 \quad 10]$$

This means that in the course of that year, there was one agricultural sector’s sale within the same sector, two sales to the manufacturing sector, one sales to the service sector, and six sales to final demand, which amounts to a total output of 10. To put the numbers in equation 3.1,

$$(1 + 2 + 1) + 6 = 10$$

$$\text{Intermediate goods} + \text{final demand} = \text{total output}$$

Intermediate goods are sold to the industrial sector as necessary ingredients, or as input for this sector. By looking at the row of the agricultural sector, you can see the destination of this sector’s output. In this case, a total of four agricultural goods provided the industrial sectors with intermediate goods and the total of six went to final demands. In this table, the total amount of transactions is recorded with the actual currency unit, such as millions of US dollars, so the table is called a transaction table. Each industrial sector may have a different method to record their sales volumes, such as numbers of bushels, cars, barrels, or numbers of visitors, attendees, but in the transaction table, it is more convenient to use common monetary values that reflect the exchange of goods and money. Thus, we use common units such as million of US dollars or millions of Euros.

3.3.2 Column interpretation in transaction table

We see that the agricultural sector’s column in Table 3-2 has

$$\begin{bmatrix} 1 \\ 1 \\ 2 \\ 6 \\ 10 \end{bmatrix}$$

This can be interpreted as follows: one internal purchase of the agricultural sector, one purchase from the manufacturing sector, two purchases from the service sector, and six purchases from value added sector, thus making the total agricultural sector’s purchases of 10. Value added consists of labor, capital, and imports etc., which we will examine later. This column shows something

Table 3-2 Completed input-output transactions table.

	AG	MNF	Serv	FD	Total Output
Agriculture	1	2	1	6	10
Manufacturing	1	3	2	4	10
Services	2	2	4	12	20
Value Added	6	3	13		
Total Input	10	10	20		

Notes: AG, agricultural sector; FD, final demand; MNF, manufacturing sector; Serv, service sector.



very useful in order to understand the structure of each industrial sector, because the numbers that you see in the column depict all the required input, with the bottom number showing the total input for the sector, in the course of 1 year. For hospitality students, there is an easier way to understand what the column means: it can be regarded as a list of all the required ingredients for a recipe. For the agricultural sector, it required one ingredient (goods and/or services) from the same sector, one ingredient (goods and/or services) from the manufacturing sector, two ingredients (goods and/or services) from the service sector, and six from value added, which refers to other required ingredients such as labor, capital, and imported goods. This amounts to 10 required ingredients within 1 year, in order to produce the total output of 10 agricultural goods.

Evidently, the total output amount equals the total input amount. In this case, the total output of 10, shown in the far right column, equals the total input of 10, shown in the bottom row. In order to produce a total output of 10, the agricultural sector required a total input of 10 (total output = total input) which consists of a total of four intermediate goods from the industrial sectors and six from value added.

This table is called a transaction table as it records all the transactions that occurred in the course of 1 year. The transaction table is the first table from which the series of I-O tables are to be created in sequences.

3.4 Steps from transaction table to Leontief inverse matrix

Although it is my intention to avoid using mathematical notations, a review of some basic mathematics involving matrix notations and algebra will make calculations easier at a later stage. The mathematics component has been reduced to a minimum, albeit essential for hospitality and tourism students, who may even find some of it enjoyable. There follow the inserts of these reviews.

3.4.1 Minimum required knowledge for series of matrix operations for input-output modeling

At a glance, matrix notations may look somewhat threatening. However, a minimum level of knowledge is required to conduct series of matrix operations. Imagine visiting a dentist because of a toothache. The dentist first has to anesthetize (numb) the area, causing a slight pain; this way, continuous and prolonged pain during and after the treatment is avoided. Please take time to read the following sections to review your basic algebra. In order to simplify the calculation, we have used 2×2 matrices.

3.4.1.1 Matrix addition

Let us assume that there are two matrices whose numbers of rows and columns are the same. In our case, we have two matrices of B and C, both of which are square matrices of 2×2 . You can add or subtract the matrices when the numbers of rows and columns are identical.

$$B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, C = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$$



Then, $B + C$ simply amount to adding the corresponding elements together.

$$B + C = \begin{bmatrix} a + e & b + f \\ c + g & d + h \end{bmatrix}$$

3.4.1.2 Matrix subtraction

What about $B - C$? Similarly to the addition, corresponding elements of C are subtracted from the elements of B .

$$B - C = \begin{bmatrix} a - e & b - f \\ c - g & d - h \end{bmatrix}$$

So far, matrix operations only look scary.

3.4.1.3 Matrix multiplication

This operation is not as easy as matrix addition and subtraction. As a basic rule, one can only multiply a matrix when the number of columns of the matrix to be multiplied is the same as the number of rows in the multiplying matrix. The result of the multiplication yields a matrix whose number of rows equals the number of rows of the multiplied matrix, and whose number of columns equals the number of columns of the multiplying matrix. Here are a few examples.

If B is a 3×3 square matrix, which of the following matrix can be used with it?

$$D = [h \ i \ j], E = \begin{bmatrix} k \\ l \\ m \end{bmatrix}, F = \begin{bmatrix} n & o \\ p & q \end{bmatrix}, G = \begin{bmatrix} r & s & t \\ u & v & w \\ x & y & z \end{bmatrix}?$$

The answer can be obtained when you identify the numbers of rows and columns of each matrix. $D = (1 \times 3)$, $E = (3 \times 1)$, $F = (2 \times 2)$ and $G = (3 \times 3)$.

In other words:

B and D would be $(3 \times 3) \times (1 \times 3) \rightarrow$ Unsuitable

B and E would be $(3 \times 3) \times (3 \times 1) \rightarrow$ Suitable (conformable)

B and F would be $(3 \times 3) \times (2 \times 2) \rightarrow$ Unsuitable

B and G would be $(3 \times 3) \times (3 \times 3) \rightarrow$ Suitable (conformable)

And the result would be:

B and E would be $(3 \times 3) \times (3 \times 1) \rightarrow$ a matrix of (3×1)

B and G would be $(3 \times 3) \times (3 \times 3) \rightarrow$ a matrix of (3×3)

If you understand that the outcome of $(n \times n) \times (n \times 1)$ would yield a matrix of $(n \times 1)$, you will be able to proceed.

Let us go back to 2×2 matrices, in order to learn the minimum required level of the matrix operations of multiplication.

$$B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad C = \begin{bmatrix} e & f \\ g & h \end{bmatrix}$$



How do we calculate $B \times C$? Unfortunately, it is not as straightforward as in the case of addition or subtraction.

$$B \times C = \begin{bmatrix} a \times e + b \times g & a \times f + b \times h \\ c \times e + d \times g & c \times f + d \times h \end{bmatrix} \quad (2 \times 2 \text{ square matrix})$$

I would recommend that you pick up a pencil and follow the sequence of calculations, so that you may detect some pattern in the sequences. How about the following multiplication of B (2×2 square matrix) by D (2×1 column vector), where

$$B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad D = \begin{bmatrix} e \\ f \end{bmatrix} .$$

$$B \times D = \begin{bmatrix} a \times e + b \times f \\ c \times e + d \times f \end{bmatrix} \quad (2 \times 1 \text{ column vector})$$

In the I-O modeling, you can get through the basic level by remembering how to calculate the multiplication matrix of [$n \times n$ square matrix] by [$n \times 1$ column vector], which yields [$n \times 1$ column vector]. The reason for this will appear later on in this chapter.

3.4.1.4 Inverse of a matrix

What is an inverse? Which inverse do we have to know in order to understand I-O modeling? The multiplicative inverse of \times is a certain number which yields 1 when multiplied by x . The inverse of 2 is $1/2$, as $2 \times 1/2 = 1$.

Now, we have to review some algebra on exponentiation. How much is 2^2 ? How much is 2^3 ?

$$2^2 = 2 \times 2 = 4$$

$$2^3 = 2 \times 2 \times 2 = 8$$

What about 2^{-1} ? 2^{-1} can be rewritten as:

$$\frac{1}{2^1} = \frac{1}{2} = 0.5$$

If 2 is multiplied by its inverse 0.5, then $2 \times 0.5 = 1$

In the same manner, in a matrix notation, we can say that a square matrix A multiplied by its inverse $1/A$ or A^{-1} should yield an identity matrix, which is the equivalent of 1 in matrix operations.

The actual calculation of an inverse matrix looks worse than the multiplication.

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \text{ then, } A^{-1} = \frac{1}{a \times d - b \times c} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

As you can see, a square matrix is not invertible if $ad - bc = 0$. In other words, when $(a \times d)$ minus $(b \times c)$ equals zero, you cannot calculate the inverse. So, you may want to make sure that $ad - bc \neq 0$ before proceeding with other calculations.



Let us have a consider one example. If we assume that:

$$A = \begin{bmatrix} 1 & 4 \\ 1 & 3 \end{bmatrix}, \text{ what is A-inverse?}$$

$$A^{-1} = \frac{1}{a \times d - b \times c} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} = \frac{1}{1 \times 3 - 4 \times 1} \begin{bmatrix} 3 & -4 \\ -1 & 1 \end{bmatrix} = \frac{1}{3 - 4} \begin{bmatrix} 3 & -4 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} -3 & 4 \\ 1 & -1 \end{bmatrix}$$

$ad - bc = -1$. In other words, it is possible to calculate the inverse of the A-matrix.

By definition, $A \times A$ -inverse should yield an identified matrix (I-matrix), which works like 1 in normal algebra, similar to the case where $2 \times 1/2 = 1$ (if a number is multiplied by its multiplicative inverse, the result will be 1). I-matrix is the matrix whose elements are all zeros, except those along the diagonal line from top left to bottom right. Let us verify this by multiplying A by A-inverse while you still recall how to multiply matrices.

$$A \times A^{-1} = \begin{bmatrix} 1 & 4 \\ 1 & 3 \end{bmatrix} \times \begin{bmatrix} -3 & 4 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} 1 \times -3 + 4 \times 1 & 1 \times 4 + 4 \times -1 \\ 1 \times -3 + 3 \times 1 & 1 \times 4 + 3 \times -1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

3.4.2 Processes in matrix format

Based on what we have learned so far, let us put down the process in simple matrix notations.

We use X to represent the total output, where X consists of intermediate goods (AX: where $0 < A < 1$), and final demand (Y). The equation (3.1) can be expressed as:

$$AX + Y = X \tag{3.2}$$

(Intermediate goods + final demands = total output)

AX is the portion of total output that is traded within the industrial sector as intermediate goods; thus A is greater than 0 but smaller than 1. It is important that you still remember what we discussed doing equation 3.1 conceptually, in order to proceed.

When we move the AX to the right side of the equation, the sign before AX changes from plus to minus.

$$Y = X - AX \tag{3.3}$$

(Final demands = total output – intermediate goods)

Since we have a common X on the right side of the equation, we pull X out to make it as follows. As you saw earlier, you may consider the I-matrix as 1 in normal algebra.

$$Y = (I - A)X \tag{3.4}$$

(Final demand = leftover portion of the total output used for the intermediate goods)

We divide both sides of the equation by (I - A), since the equation will hold as long as both sides are divided by the same factor.

$$\frac{Y}{(I - A)} = \frac{(I - A)X}{(I - A)} \tag{3.5}$$



Erase $(I - A)$ from both numerator and denominator of the fraction on the right side of the equation.

$$\frac{Y}{(I - A)} = X \quad (3.6)$$

(Final demand divided by the portion representing leftover used for intermediate goods = total output)

We recall a rule in algebra regarding inverse notations:, $1/a = a^{-1}$ and apply it to equation 3.6.

$$(I - A)^{-1} Y = X \quad (3.7)$$

(If an inverse of the portion representing leftover used for intermediate goods is multiplied by final demand, it would equal total output.)

We will add two final details to this equation. First of all, we will simply add Δ , which can be read as $\Delta = \text{change in}$, so that we can make this equation more relevant to I-O-based economic impact analysis. Second, the $(I - A^{-1})$ part can be read as the Leontief inverse matrix, so that:

$$(I - A^{-1}) \Delta Y = \Delta X \quad (3.8)$$

(Leontief inverse matrix multiplied by a change in final demand yields a change in total output)

These are the steps that we would take to reach the famous Leontief inverse matrix and subsequent impact analyses.

For students who found the mathematical notations too dry, here are more conceptual explanations of what these equations imply for hospitality and tourism students. Recall that the A is $(0 < A < 1)$ and that I is like number 1. So the Leontief inverse part would be bigger than 1.

If ΔY is the growing amount of tourism expenditures in your region, then due to inter-industrial transactions expressed as a Leontief inverse matrix, the total output of each industrial sector would increase more than the increase in tourist expenditures. For example, if tourists book hotel rooms, more linen, shampoos, soaps, water, and electricity must be purchased by the hotel. This is not where tourist expenditures end. Tourists use transport services, which means that more gas, oil, and tires will be used, together with hot dogs, ketchup, mustard, chopped onions, napkins, chips, and diet-sodas. They consume more orange juice, which means that more oranges and new empty bottles are required to meet the increased level of final demand for various output generated by tourist expenditures.

3.4.3 Matrix operations for input-output modeling

Now that we have covered the conceptual and mathematical parts of the I-O modeling, we can resume the matrix presentations of the tables. From the transaction table, we will move

**Table 3-3** Transactions table with interindustry columns only.

	AG	MNF	Serv
Agriculture	1	2	1
Manufacturing	1	3	2
Services	2	2	4
Value added	6	3	13
Total input	10	10	20

Notes: AG, agriculture; MNF, manufacturing; Serv, services.

step-by-step towards the Leontief inverse matrix, which will enable you to calculate series of multipliers.

3.4.3.1 Important concept of endogenous versus exogenous

First of all, we should learn some concepts related to being inside the model (endogenous) and being outside the model (exogenous). In I-O modeling, we will retain the interindustry transactions parts as endogenous, and will leave the final demand and total output columns aside, as exogenous from further processes, as shown in Table 3-3.

We now have interindustry columns only, having taken out the final demand and total output columns from Table 3-2. In the sample of Table 3-3, the matrix has five rows and three columns (i.e. a 5×3 matrix). In other words, we have an interindustry square matrix (which means that the numbers of rows and columns are the same, such as a matrix of 3×3), the value added row (labor, capital, and others such as imports) and the total input rows which consist of the sums of each column.

3.4.3.1.1 Standardization

When you wish to compare the financial statements of two companies, you use the ratio analysis by standardization, so that despite the difference in absolute size, two companies can be compared in relative terms, for operating efficiency. The concept here is similar. You standardize the required input in the transaction table by putting it in relative terms along each column. The process is rather simple. You take each required input in each column to be divided by the column total (i.e. total input).

For example, let us take the agricultural sector's column, the first column from the left. The relative input from the agricultural sector within the same sector would be calculated as 1 divided by 10 = $1/10 = 0.1$; the relative input from the manufacturing sector to the agricultural sector would be calculated as 1 divided by 10 = $1/10 = 0.1$; and the relative input from the service sector to the agricultural sector would be calculated as 2 divided by 10 = $2/10 = 0.2$. The relative input from the value added (i.e. labor, capital, imports, and others) to the agricultural sector would be calculated as 6 divided by 10 = $6/10 = 0.6$. Now, repeat this process for the manufacturing and the service sector columns.

**Table 3-4** Standardized transactions matrix with interindustry columns only.

Standardized	AG	MNF	Serv
Agriculture	0.1	0.2	0.05
Manufacturing	0.1	0.3	0.1
Services	0.2	0.2	0.2
Value added	0.6	0.3	0.65
Total input	1	1	1

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

Table 3-5 A-matrix.

Standardized	AG	MNF	Serv
Agriculture	0.1	0.2	0.05
Manufacturing	0.1	0.3	0.1
Services	0.2	0.2	0.2

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

Once the calculations are complete, you can see all the transaction amounts converted into relative input for each sector's total input. What you see is each sector's relative input to the total input, in relative terms. You can also compare the structure of each industry in terms of relative input, in a way that for each dollar of total input, the agricultural sector requires a 10 cent input from the agricultural sector, a 20 cent input from the manufacturing sector, and a 20 cent input from the service sector. After the standardization, the table should resemble Table 3-4.

3.4.3.1.2 Creating an A-matrix

After the completion of the standardization process, you select the interindustry part of the matrix only, in order to get a square matrix (i.e. a matrix in which the number of rows equals the number of columns – in this case, 3×3). This square matrix is called an A-matrix. It was obtained by standardizing each transaction amount as required input, in terms of total input, and only leaving the part with elements of the interindustry square matrix. The A-matrix is the first of the series of calculations towards economic impact studies, as shown in Table 3-5.

3.4.3.1.3 Notation for matrix elements

Although we try to minimize the use of mathematical formulas some are necessary. As you saw in the explanation of standardization, indicating the intersection between the agricultural sector row and the manufacturing sector column, i.e. of first row and second column, is lengthy. We can use the small subscript to be suffixed at the bottom, to display the relevant location in the matrix in the order of rows and columns. Ideally, r and c as rc can be used but



Table 3-6 I-matrix table (3 × 3).

I-Matrix	AG	MNF	Serv
Agriculture	1	0	0
Manufacturing	0	1	0
Services	0	0	1

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

it is already common to use ij to represent relative locations in row and column. By using the notation, the processes of standardization can be expressed as:

$$a_{ij} = \frac{z_{ij}}{X_j} \tag{3.9}$$

This indicates that each standardized element in the A-matrix, a_{ij} , is calculated by having the corresponding elements in the transaction matrix, z_{ij} , divided by the column sum (i.e. total input) of the corresponding column X_j . z_{ij} represents each element in the transactions table, i.e. the actual amount of transactions recorded in the transaction table, as shown in table 3-2. For example, the cell where the service sector row intersects with the agricultural sector column in the transaction table, or the element at the third row, first column, can be expressed simply as z_{31} , which is 2, and the a_{31} can be calculated by taking the z_{31} (i.e. 2) divided by the sum of the first column, which is the total input of the agricultural sector X_1 (i.e. 10), which is 0.2. transaction tables are thus sometimes called Z-matrices.

3.4.3.1.4 Identity-matrix

The I-matrix is the square matrix which works like 1, as we know from algebra, such as $1 \times 2 = 2$, $0.5 \times 2 = 1$, $1 - 0.5 = 0.5$. Although the I-matrix works like 1, it looks different from 1, as it is a matrix. The I-matrix looks like a square matrix whose elements are all zeros, except for the diagonal elements from top left to bottom right, which have values of 1. It is a square matrix where $a_{ij} = 0$, except when $i = j$ then $a_{ij} = 1$. Table 3-6 shows a 3 × 3 I-matrix.

3.4.3.1.5 Subtracting an A-matrix from an I-matrix

Subtracting an A-matrix from an I-matrix results in a (I – A)-matrix. In our example, let us subtract the A-matrix shown in Table 3-5 from the I-matrix shown in Table 3-6. For example, looking at the first row, first column, the I-matrix has 1 and the A-matrix has 0.1. Thus, the first row, first column of the (I – A)-matrix will have $(1 - 0.1) = 0.9$. Complete the subtraction work for all the elements. The completed matrix should resemble the one shown in Table 3-7.

3.4.3.1.6 Calculating an inverse of the (I – A)-matrix (Leontief inverse matrix)

Since this part is quite dense, even for a relatively small matrix (3 × 3), you are recommended to refer to step 7 in the example shown in Figure 3-2, where you will learn how to calculate



Table 3-7 $(I - A)$ -matrix.

$(I - A)$	AG	MNF	Serv
Agriculture	0.9	-0.2	-0.1
Manufacturing	-0.1	0.7	-0.1
Services	-0.2	-0.2	0.8

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

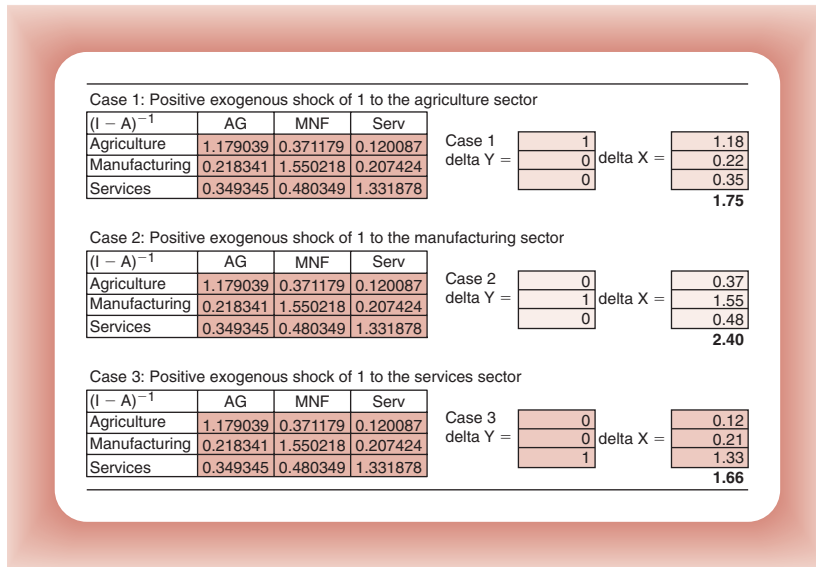


Figure 3-2 Output multipliers calculations (type I).

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

Table 3-8 Inverse of the $(I - A)$ -matrix (Leontief inverse matrix).

$(I - A)^{-1}$	AG	MNF	Serv
Agriculture	1.18	0.37	0.12
Manufacturing	0.22	1.55	0.21
Services	0.35	0.48	1.33

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

the inverse matrix in MS-Excel. What you will be calculating here is the famous Leontief inverse matrix, as shown in Table 3-8. For those who still wish to calculate the inverse matrix of 3×3 manually, or who did not suffer too much going through section 3.4.1, the process can be found in any matrix algebra textbook, linear algebra textbook, or through online resources such as Google, Yahoo, etc. There will also be one possible calculation process of 3×3 matrix inverse posted at the end of this chapter as an appendix.



3.4.3.1.7 Using the Leontief inverse matrix: simple output multiplier analyses

Let us put the Leontief inverse matrix into action. Recall the multiplication rule in matrix algebra that when you have a $(n \times n)$ square matrix it can only be multiplied by a suitable matrix, i.e. one whose number of rows equals n . Also recall equation 3.8, according to which a Leontief inverse matrix multiplied by a change in final demand yields a change in total output. We can put the combined knowledge into action, as follows:

$$(I - A)^{-1} \Delta Y = \Delta X \tag{3.10}$$

$$(3 \times 3) \times (3 \times 1) = (3 \times 1)$$

(Leontief inverse matrix \times change in final demand = change in total output)

By introducing the concept of incremental change, we can feed the model with the change in final demand to see how the economy responds with its total output. The change in final demand is also called a shock, initial shock, direct shock, direct effect, or direct impact.

Using the same industrial sectors in a row as in the Leontief inverse matrix, you have a (3×1) matrix. Since there is only one column, we can call this matrix a column-vector or, more specifically, a final demand column vector.

Let us conduct three cases in which we give a positive increase of 1 to each of the three industrial sectors, one by one. In this case, the final demand column vector (numbers will be shown as a column) would be as follows:

$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Case 1 = case 2 = case 3 =

In case 1, we assume that the final demand for the agricultural sector’s output is increased by 1 (if you prefer to put some meaning, e.g. \$1 million, assuming the I-O transaction table was shown in million dollar units). In case 2, we assume that the final demand for the manufacturing sector’s output is increased by 1, and in case 3, we assume that the final demand for the services sector’s output is increased by 1.

Following this process, you can calculate the Leontief inverse matrix, and the last calculation in which you multiply the Leontief inverse matrix $(I - A)^{-1}$ by a certain change in final demand ΔY , expressed in the column vector, will give you the change in total output ΔX .

We will learn how to interpret the results.

$$(I - A)^{-1} \Delta Y = \Delta X \tag{3.10}$$

$$(3 \times 3) \times (3 \times 1) = (3 \times 1)$$

(Leontief inverse matrix \times change in final demand = change in total output)

The correct calculations would show the result as if you had just extracted each column of the three sectors, one by one. There was a special reason for using the positive 1 as change in final



demand. Now, take the total output column vectors of each sector and sum up the numbers in the columns. The agricultural sector has 1.75, which means that a change in total output of the industrial sector will be of 1.75, if there is an increase in final demand for the agricultural sector for 1. You have an output multiplier of 1.75 for the agricultural sector. Repeat the same calculations for the manufacturing sector and the service sector, and you will have 2.40 and 1.66, respectively.

3.4.3.1.8 Utilization of MS-Excel

All the processes conducted in this section can be reconstructed by using a spreadsheet program, such as MS-Excel. Figure 3-3 shows the calculation results that were covered, in one sequence.

Two recommendations can be made in order to turn the above newly acquired knowledge into useful skills. First of all, practice basic sets of matrix operations in MS-Excel sheet called minimum knowledge of matrix operations for tourism industry analysis. The sheet is shown as Figure 3-3, but it is important that you work with these sheets on your computer. After completion of the first exercise, you imitate each step in the practice sheet shown as Figure 3-4, which you will find in the attached CD-R (or link to the publisher's designated website).

Remember, what you read here is like a recipe book, in that the sense that reading it will not turn you into a good chef. The spreadsheets have been prepared in a way that you can concentrate on the actual calculations of what you have read. If the results you obtain using the MS-Excel resemble what you see in Figure 3-4, you are on the right track.

In my course assignments, I have been using series of streaming video clips that I refer to as cyber-labs. It has generally been effective in helping the students learn how to understand the programming facility of MS-Excel, as the video clips focus on the specific components that appear troublesome to many students. However, file sizes require a high-speed internet connection.

3.5 Multiplier calculations in the input-output framework

Why should we learn about economic impact studies? More precisely, why should hospitality and tourism students learn the required calculation processes for tourism economic impact analysis?

These studies are of vital concern to various stakeholders in the field of tourism and hospitality. Results of tourism economic impact studies may be used to justify important causes such as the existence of a tourism office, a convention and visitors' bureau, a destination marketing organization, or publicly funded tourism organizations. These studies are also used to justify the allocation of tax dollars toward funding tourism-related infrastructure projects, and of certain funds towards tourism-related offices in local, regional, and national governments. The study may constitute an important document in support of a developer's application for



Minimum knowledge of matrix operations for tourism industry analysis

1. Matrix

		column		
		1	2	3
row	1	3	5	2
	2	1	5	8
	3	4	5	1

	1			
	1	5		
	2	8		
	3	7		
	4	6		
	5	4		
	6	1		
	7	1		

(Row by Column) Matrix

(\leftarrow often referred as "column vector")

	1	2	3
1	4	8	7

(\leftarrow often referred as "row vector")

When R and C are the same, the matrix is called "Square Matrix"
 Ex: 2×2 , 3×3 , 9×9 , $n \times n$...

2. Matrix addition

If two matrices A and B are of the same order, we can define a new matrix C as $A + B$. Matrix addition simply add corresponding elements in the two matrices A and B to obtain the elements of C.

Let's use 2×2 matrices as examples.

A =	<table border="1"><tr><td>3</td><td>1</td></tr><tr><td>5</td><td>-2</td></tr></table> (2×2)	3	1	5	-2	B =	<table border="1"><tr><td>4</td><td>2</td></tr><tr><td>-3</td><td>6</td></tr></table> (2×2)	4	2	-3	6	then, C =	<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> (2×2)					<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>				
3	1																					
5	-2																					
4	2																					
-3	6																					

3. Matrix subtraction

<table border="1"><tr><td>5</td><td>2</td></tr><tr><td>4</td><td>3</td></tr></table> (2×2)	5	2	4	3	<table border="1"><tr><td>-3</td><td>2</td></tr><tr><td>1</td><td>-1</td></tr></table> (2×2)	-3	2	1	-1	<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> (2×2)					<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>				
5	2																		
4	3																		
-3	2																		
1	-1																		

4. Matrix multiplication

A =	<table border="1"><tr><td>1</td><td>3</td></tr><tr><td>2</td><td>0</td></tr></table> (2×2)	1	3	2	0	B =	<table border="1"><tr><td>2</td><td>4</td></tr><tr><td>1</td><td>3</td></tr></table> (2×2)	2	4	1	3	<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> (2×2)				
1	3															
2	0															
2	4															
1	3															
				$(1 \times 2) + (3 \times 1)$ $(1 \times 4) + (3 \times 3)$ $(2 \times 2) + (0 \times 1)$ $(2 \times 4) + (0 \times 3)$												
				UseExcel <table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> (2×2)												

Figure 3-3 Minimum knowledge of matrix operations for tourism industry analysis (available in MS-Excel format).



- 1 Highlight the target matrix space
- 2 Type formula [=mmult()], and move the cursor within the ().
- 3 Click "array1" in the formula, highlight the first matrix, and type ",".
- 4 Then click "array2" in the formula, highlight the second matrix.
- 5 WAIT!, before hitting enter, HOLD DOWN "CTRL" & "SHIFT" KEYS TOGETHER, then hit the "ENTER" KEY.

Try with 3×3 square matrices!

Excel helps you greatly!

$$A = \begin{bmatrix} 4 & 2 & 0 \\ 2 & 1 & 0 \\ -2 & -1 & 1 \end{bmatrix}$$

(3×3)

$$B = \begin{bmatrix} 2 & 3 & 1 \\ 2 & -2 & -2 \\ -1 & 2 & 1 \end{bmatrix}$$

(3×3)

How about $A \times B$?
(follow the procedures above)

$$C = A \times B = \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix}$$

(3×3)

One Rule: Matrix A is conformable to another matrix B only when the number of columns of A is equal to the number of rows of B. Then the product AB has the same number of rows as A and the same number of columns as B.
How about this way?--> ($m \times n$) ($n \times p$) are conformable (you can multiply them) when $n = n$. Then the target matrix will be ($m \times p$)

Ex: (3×3), (3×1) matrices--> yes they are conformable, and the answer will be (3×1) (27×1) (1×3) matrices --> yes they are conformable, and the answer will be (27×3)

How about some examples?

$$A = \begin{bmatrix} 2 & 4 & 2 \\ 1 & 2 & 1 \\ 2 & 5 & 1 \end{bmatrix}$$

(3×3)

$$B = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$$

(3×1)

$C = AB = ?$
(3×3) (3×1) --> conformable, and the answer should be (3×1)

Again, let Excel help us.

$$\begin{bmatrix} \\ \\ \end{bmatrix}$$

Figure 3-3 (Continued)

a hotel/time-share development project in a local county, for a gaming license, for certain tax breaks with a local government, etc. It may be used to support a particular legislation in favor of tourism development, by showing how it could benefit the regional economy. It can be used to assess how much extra tax revenue will be generated by certain actions/inactions by regional government, so that the viability of municipality bonds issued for financing a tourism-related infrastructure development project may be put in perspective.



5. Basic algebra review

"2 powered by 2 = 4", "2 powered by 3 = 8". In Excel we write them as "2^2 = 4", "2^3 = 8"

You can actually let Excel calculate it by typing that way.

2^2
2^3



How about this? "2^-1" $2^{-1} = \frac{1}{2^1} = 0.5$

$$2^{-1} = \frac{1}{2^1} = \frac{1}{2} = 0.5$$

2 powered by minus 1 (-1) creates "inverse" of 2, which is 0.5.....

What is inverse? $2 \times 0.5 = 1$ So inverse of something makes the something back to 1.

What is the inverse of 10?

0.1 0.1 10 1

So $2 \times 0.5 = 1$, $10 \times 0.1 = 1$, $Y \times Y^{-1} = 1$ ("Y times Y-inverse equals one")

Does matrix has an equivalent of an Inverse and number ONE in normal algebra?

YES. Let's start from an equivalent of number 1.

It is called "Identity Matrix", which is often denoted by capital letter "I"

6. Identity matrix

I =

1	0	0
0	1	0
0	0	1

(3 × 3)

Identity matrix can be a square matrix of any size. (2 × 2), (3 × 3), (500 × 500) etc. It has zeros all over except upper-left to lower-right diagonal where you find 1s.

7. Inverse matrix

How about we create an inverse matrix by Excel, because calculation by hand can be overwhelming?

A =

1	2	3
1	3	3
1	2	4

(3 × 3)

This is a good old 3 × 3 matrix

A^-1 =

(3 × 3)

- 1 Highlight the target matrix space
- 2 Type formula [=minverse()], and move your cursor within the ().
- 3 Click "array" in the formula, highlight the base matrix
- 4 WAIT!, before hitting enter, HOLD DOWN "CTRL" & "SHIFT" KEYS TOGETHER, then hit the "ENTER" KEY.

Let's check if A-inverse matrix is truly the inverse of A-matrix by $A \times A^{-1}$ calculation. Just like 2×0.5 becomes 1, $A \times A^{-1}$ should give us an Identity matrix.

(3 × 3)

- 1 Highlight the target matrix space
- 2 Type formula [=mmult()] and move the cursor within the ().
- 3 Click "array1" in the formula, highlight the first matrix, and type ",".
- 4 Then click "array2" in the formula, highlight the second matrix.
- 5 WAIT!, before hitting enter, HOLD DOWN "CTRL" & "SHIFT" KEYS TOGETHER, then hit the "ENTER" KEY.

$$A \times A^{-1} = I$$

If you get a beautiful identity matrix just above here, the pain is over. This has been the rather tougher part of "Tourism Industry Analysis" course. Now, you are well-prepared to deal with advanced topics of tourism industry analysis, which will be built on this basic knowledge and Excel skills. Well-done. Thank you.

Figure 3-3 (Continued)

While the popularity of an economic impact study and the proliferation of its jargon seem to require no further marketing, there are fewer people who can actually calculate the necessary process of impact studies. It would benefit you to understand the process of calculations in order to become a better consumer. In the future, you may work for a tourism organization

Quick and Easy Introduction to 'Input-Output Model' for Tourism Industry Analysis

1

	AG	MNF	Serv	FD	Total output
Agriculture					
Manufacturing					
Services					
Value added					
Total input					

1. This is the basic structure of I-O. At upper-left, you have 3 × 3 inter-industry matrix.

2

	AG	MNF	Serv	FD	Total output
Agriculture	1	2	1	6	10
Manufacturing	1	3	2	4	10
Services	2	2	4	12	20
Value added	6	3	13		
Total input	10	10	20		

2. We fill in the data based on the macro-economic data. Often the statistics office of the regional/state/national government publish these data, even the I-O itself.

3

	AG	MNF	Serv
Agriculture	1	2	1
Manufacturing	1	3	2
Services	2	2	4
Value added	6	3	13
Total input	10	10	20

3. Here, we pick up the whole column under industry columns. Now you see 3 × 3 inter-industry matrix, and below it, Value-added (labor, capital & others) and the Total Input. At this stage, you may forget about Value Added. (We will study them when we move to SAM)

4

Standardized	AG	MNF	Serv
Agriculture	0.1	0.2	0.05
Manufacturing	0.1	0.3	0.1
Services	0.2	0.2	0.2
Value added	0.6	0.3	0.65
Total input	1	1	1

4. Here, look at the table above. You take each entry within the interindustry matrix and divide them by the column sum. Repeat for all cells in the inter-industry matrix. Then the calculation will look like this.

$$a_{ij} = Z_{ij} / X_j$$

5

Standardized	AG	MNF	Serv
Agriculture	0.1	0.2	0.05
Manufacturing	0.1	0.3	0.1
Services	0.2	0.2	0.2

= A-matrix

5. Take out the Inter-Industry matrix. This is called 'A-matrix'. You are now ready to start your magic step by step!

6

I-Matrix	AG	MNF	Serv
Agriculture	1	0	0
Manufacturing	0	1	0
Services	0	0	1

= I-Matrix

6. This matrix, with all zeros except along the upper-left-lower-right diagonal line with 1s, is called 'I-matrix' (sounds 'eye'-matrix). Do not worry, this matrix has the same role as 1 (one) in normal algebra.

7

(I-A)	AG	MNF	Serv
Agriculture	0.9	-0.2	-0.1
Manufacturing	-0.1	0.7	-0.1
Services	-0.2	-0.2	0.8

= (I-A)

7. Follow the formula and let's work on (I-A). Simply subtract A-matrix from our newly created I-matrix.

Figure 3-4 Input-output practice sheet (available in MS-Excel format).



Leontief Inverse!

$(I-A)^{-1}$	AG	MNF	Serv
8 Agriculture	1.18	0.37	0.12
Manufacturing	0.22	1.55	0.21
Services	0.35	0.48	1.33

$= (I-A)^{-1}$

8. This is the most challenging part. We will have a help from Excel.

(1) Highlight all the nine cells in the target matrix (where you want to write result of calculation, in our example, yellow ones)

(2) Type “=MINVERSE()” and put the cursor within the ().

(3) Then, choose the 3 × 3 original matrix as an array. (in our example, pink ones)

(4) Important to follow: While Hold down both Shift & Control Keys, hit the Enter key. This is the Inverse matrix! Now you see the fascinations for industry analysis.

$(I-A)^{-1}$	AG	MNF	Serv
9 Agriculture	1.18	0.37	0.12
Manufacturing	0.22	1.55	0.21
Services	0.35	0.48	1.33

Case 1

delta Y =	1
	0
	0

delta X =	1.18
	0.22
	0.35

Case 2

delta Y =	0
	1
	0

delta X =	1.75
	0.37
	1.55
	0.48

Case 3

delta Y =	0
	0
	1

delta X =	2.40
	0.12
	0.21
	1.33
	1.66

'So, what is this stuff? How can it be useful?'

**WASSILY
LEONTIEF
1973 Nobel
Laureate in
Economics**

'for the development of the input-output method and for its application to important economic problems.'

Figure 3-4 (Continued)

that outsources such studies to outside consultants; however, if you are familiar with the process, you are likely to ask the right questions on various assumptions hidden behind fancy reports, based on your knowledge of I-O modeling.

3.5.1 Multiplier calculations

Caution is required with the term multiplier as there are various types. Unless you calculate them yourself, or know precisely which multiplier is being discussed, a mere comparison of extracted multipliers across results of different impact studies carried out by different researchers may be misleading. In this section you will learn how to calculate several types of multipliers.

3.5.1.1 Type-I multiplier: direct impacts and indirect impacts

Changes in final demand drive the whole economic system. Changes in final demand, as you saw, can be caused by changes the consumer patterns of domestic residents, firms, or



governments, or by the export of goods and services. In the impact studies environment, the change in final demand can be called direct impact, direct shock, direct effect, or initial impact because this is the exogenous shock that stimulates the entire economic system. When the shock is caused by a change in the final demand, the economy responds to it by producing a new level of total output through interindustry transactions in the regional economy.

In our case, shown in section 3.4.3, we gave a positive change of 1 in the final demand for agricultural goods, and found the resulting change in total output to be a positive 1.75. The net additional increase was only of 0.75, if we defined the net increase as the difference between the initial change in final demand and the resulting change in total output. The simple concept of output multiplier is shown as the change in total output to the change in final demand.

$$\begin{aligned}\text{Output multiplier} &= \frac{\Delta X}{\Delta Y} = \text{change in total output} / \text{change in final demand} \\ &= (\text{direct impact} + \text{indirect impact}) / \text{direct impact}\end{aligned}$$

In our example, given the shock of +1 for the agricultural sector's final demand, the total output resulted in +1.75, thus the output multiplier for the agricultural sector, in this particular economy, is of 1.75. Direct impact was +1, and indirect impact was +0.75, so the output multiplier was $1.75/1 = 1.75$ for the agricultural sector. An additional impact of 0.75 was generated as the economy's response to the direct positive shock indirectly through the interdependency of the industrial sectors. This is why this additional response of the industrial sectors is called an indirect impact.

The combined effect of direct impacts and indirect impacts can be put in relative terms by standardizing the direct (i.e. initial) impact as 1 so that we can view the size of the resulting total output in perspective. How large the resulting impact would be in response to the initial impact, relatively, is the concept of the multiplier. In our case, a direct impact of 1 given to the agricultural sector generates an additional indirect impact of 0.75, so that the total impact becomes 1.75. Because the initial impact was 1, the size of the total impact was 1.75 fold larger than the direct (initial) impact.

The combined effect of direct impacts and indirect impacts can be called a type I multiplier, which reflects the impact caused by the interdependency within the industrial sectors only. You will soon understand why I say 'only'.

Since we looked at the impact on output, we may call the result a type I output multiplier, which gives more precise information on that we did. In type-I multiplier calculations, the I-O structure included only the industrial sectors as endogenous. Institutions, particularly households, are not included in the model – they remain exogenous. You may be puzzled by the sudden emergence of new terms, such as institutions and households; these are parts of the components we initially ignored, i.e. the final demand, in the I-O sample table.

You may have heard of other multiplier-associated words, such as induced impacts, induced shock, induced effect, etc. We will discuss induced impacts when we internalize the households into the model by turning them into an endogenous sector in the type II multipliers.



Table 3-9 A-matrix with households as an additional industrial sector.

Standardized	AG	MNF	Serv	HH (PCE)
Agriculture	0.1	0.2	0.05	0.01
Manufacturing	0.1	0.3	0.1	0.04
Services	0.2	0.2	0.2	0.07
Households	0.11	0.12	0.2	0

Notes: AG, agricultural sector; HH, household; MNF, manufacturing sector; PCE, personal consumption expenditures; Serv, service sector.

3.5.1.2 Type-II multipliers: addition of induced impacts by endogenizing households

In addition to the direct and indirect impact caused by interindustry transactions in the I-O framework, we can internalize the households sector as if it were an additional industrial sector, at the bottom of the rows and at the end of the columns of the I-O table. The households' row will then provide their goods and services (such as labor) into each industrial sector, in exchange for receipt of money (income), and the households' sector in the column will spend some part of its income to purchase output from the industrial sector, as necessary input to ensure its existence. This will generate additional monetary flow towards the interindustry table. While this still falls short of a complete inclusion of all economic transactions within a region or nation, including households in the I-O structure will yield extra impact, thanks to their additional purchasing activities. An example of the structure is shown in Table 3-9.

If you look at the rows, you see the households row at the bottom as if it were another industrial sector. If you look at the columns, you can see HH (PCE). PCE stands for personal consumption expenditures, which means that households will spend some portion of their received income to purchase other industrial sector's output. Because of the addition of another sector, the output multiplier would be higher.

Type-I multipliers are a group of multipliers that are based on the usage of the generic structure of the I-O model, without any other nonindustrial sector, while type-II multipliers are a group of multipliers that utilize the I-O, while including households as an additional quasi-industrial sector. Type I and type II distinguish the structure of the I-O being used to calculate several multipliers, as follows. Besides output multipliers, which can be calculated in a type I or type II environment (using the typical I-O or the I-O including households), there are other multipliers that can be calculated along type-I and type-II structures.

For the sake of simplicity, the following multipliers are explained in type-I structure, in which there are only endogenous industrial sectors.

3.5.1.3 Employment multipliers (type I)

Once you have the data for the number of workers employed in each industrial sector, together with the transaction table, you can calculate employment multipliers for each sector

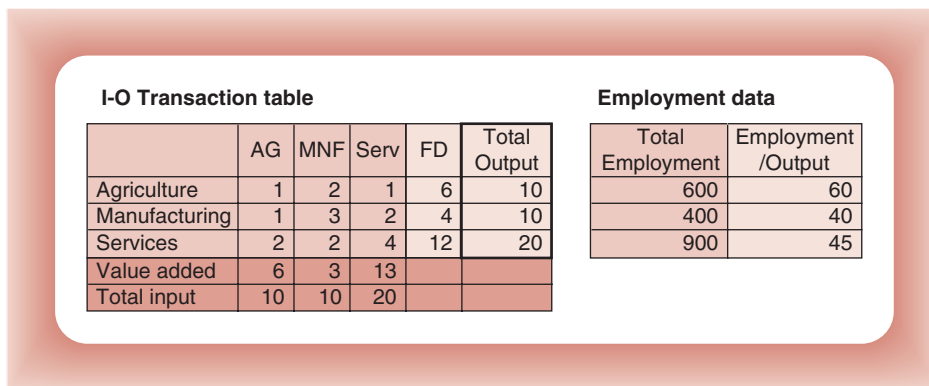


Figure 3-5 Input-output transaction table and employment data.

Notes: AG, agricultural sector; FD, final demand; MNF, manufacturing sector; Serv, service sector.

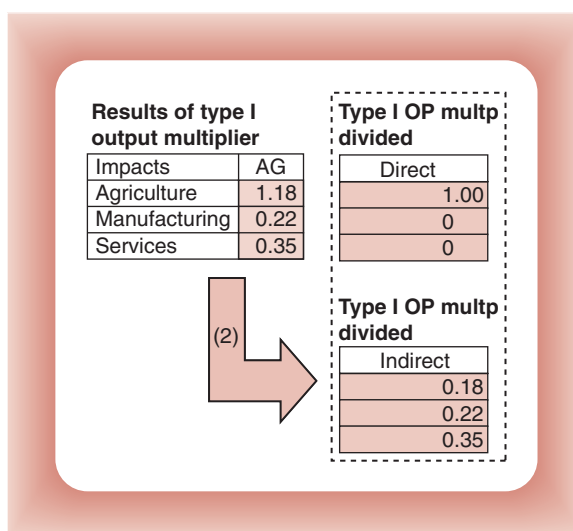


Figure 3-6 Decompose the type-I output multiplier into direct and indirect impacts.

Notes: AG, agricultural sector; multp, multiplier; OP, output.

(Figure 3-5). Given the employment-related data of the region/nation under study, you will be able to do the following:

- 1 Calculate employment per output, based on the data. In our example, let us say we use \$ million as a unit. You then find how many people are employed per \$1 million in output.
- 2 From the result of your output multiplier calculations, divide the multiplier into direct effects and indirect effects. If you gave the positive shock of 1 to the agricultural sector only, the direct impact will be 1 for the agricultural sector, and 0 for other sectors. You can then subtract the direct impact from the column vector extracted from the Leontief inverse matrix. The remaining numbers shown in the column vector represent the indirect impact, as shown in Figure 3-6.

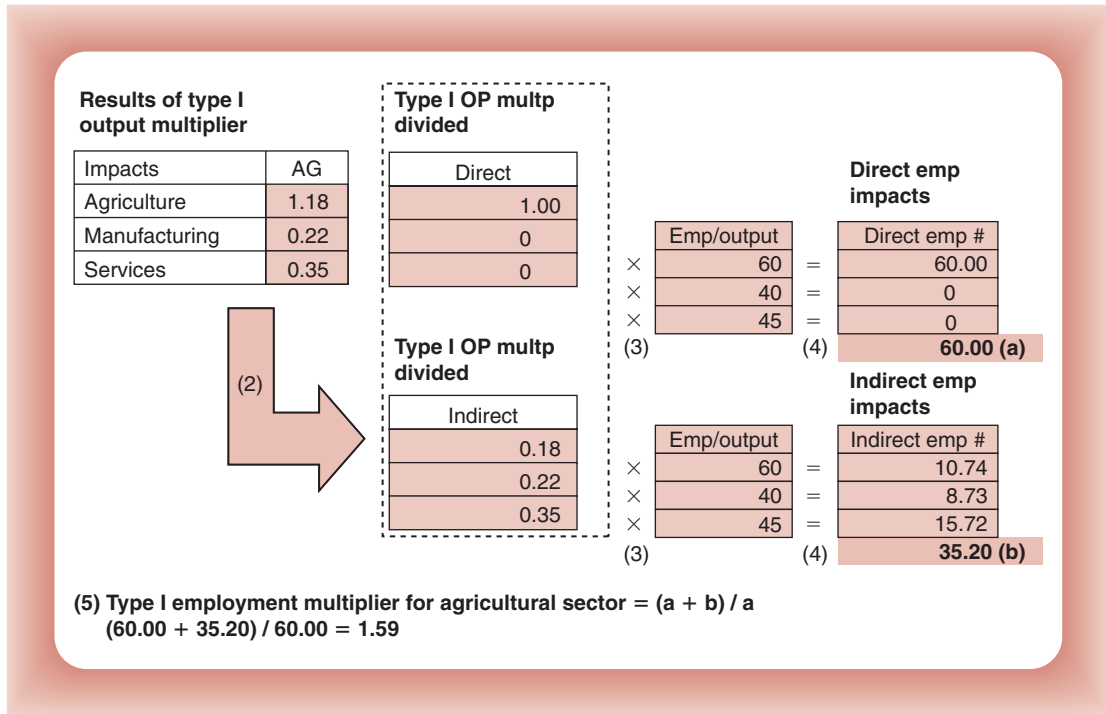


Figure 3-7 Type-I employment multiplier calculation processes for the agricultural sector.

Notes: AG, agricultural sector; emp, employment; Multp, multiplier; OP, output.

- 3 Multiply each industrial sector by the direct effects and indirect effects by the result of point (1).
- 4 Sum up the results of point (3) for employment direct effects and employment indirect effects respectively.
- 5 The results of point (4) will be calculated along the following equation:

$$(\text{Employment direct effects} + \text{employment indirect effects}) / \text{employment direct effects} = \text{type I employment multiplier}$$

The interpretation of this multiplier would be as follows. Given the increase in final demand for the agricultural sector, for \$1 million, which initially creates 60 new jobs in the agricultural sector in the area under study, the economy will generate a total of 95.2 new jobs owing to the interdependency of the industrial sectors. In response to an initial increase of 1 job, the economy will generate an additional 0.59 jobs, totaling the new jobs created to be 1.59 jobs. The calculations for the other two sectors are shown in Figure 3-8.

3.5.1.4 Income multiplier (type I)

Income multipliers can be calculated similarly to the way we calculated the employment multiplier. In terms of actual calculations, you can use most of the same worksheet format and follow the steps you took with the employment multiplier. Once you have the data for the total income for each industrial sector, together with the transaction table, you can calculate

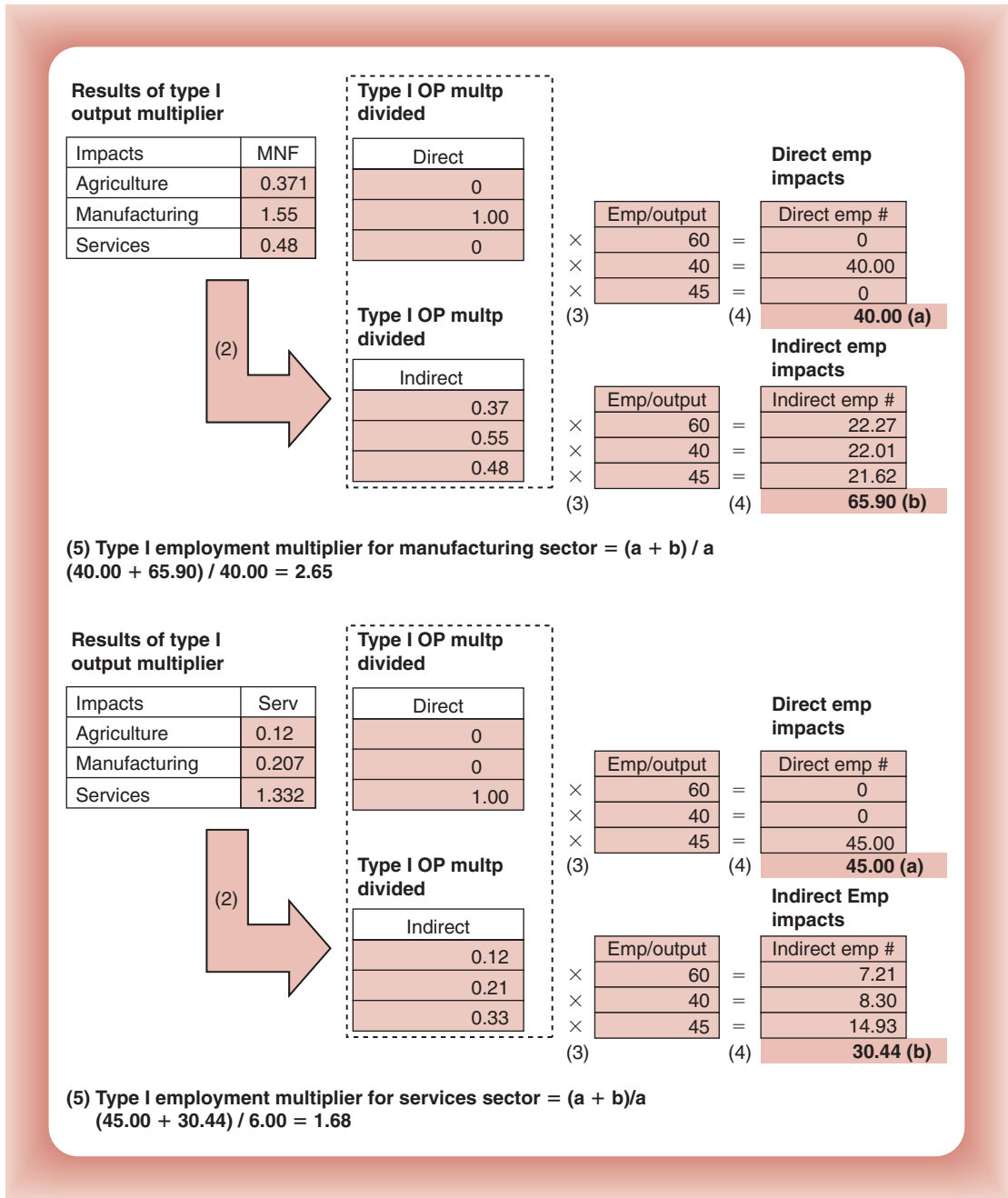


Figure 3-8 Type-I employment multiplier calculation processes for the manufacturing and service sector. Notes: emp, employment; MNF, manufacturing; Multp, multiplier; OP, output.

the income multipliers for each sector. Given the income-related data of the region/nation under study, you will be calculating the following:

- 1 Calculate the income per output from the separate data. In our example, let us say we use \$1 million as a unit. You then find how much total income is paid per \$1 million of output, as shown in Figure 3-9.

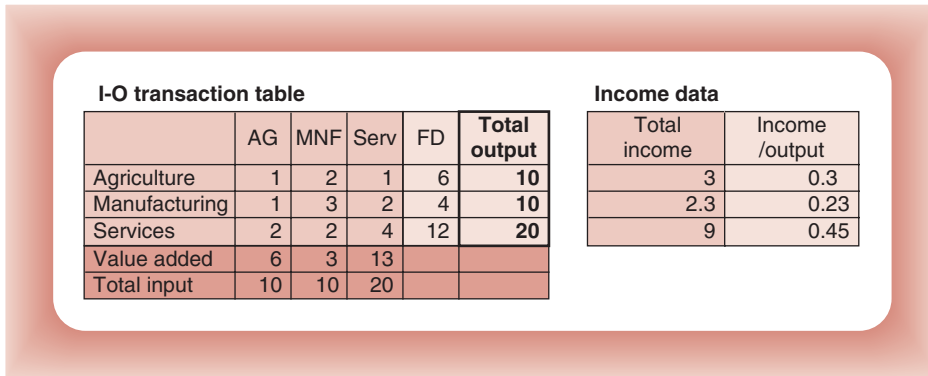


Figure 3-9 Input-output transaction table and income data.

Notes: AG, agricultural sector; FD, final demand; MNF, manufacturing sector; Serv, service sector.

- 2 From the result of your output multiplier calculations, divide the multiplier into direct effects and indirect effects. If you gave the positive shock of 1 to the agricultural sector, the direct impact will be 1 for the agricultural sector, and 0 for the other sectors. You can then subtract the direct impact from the column vector extracted from the Leontief inverse matrix. The remaining numbers shown in the column vector are the indirect impacts as shown in Figure 3-10, which actually is not different from the Figure 3-6.
- 3 Multiply each industrial sector by the direct effects and the indirect effects by the result of point (1).
- 4 Sum up the results of point (3) for income direct effects and income indirect effects respectively.
- 5 The results of point (4) will be calculated along the following equation:

$$\frac{(\text{Income direct effects} + \text{income indirect effects})}{\text{income direct effects}} = \text{type I income multiplier}$$

This multiplier could be interpreted as follows: given the \$1 million increase in final demand for the agricultural sector, which initially generates \$0.3 million in additional income for the agricultural sector, the economy will generate a total of \$0.56 million in additional income for the workers, owing to the interdependency of the industrial sectors. Thus, in response to an initial increase in \$1 income, the economy will generate additional \$0.87 income, totaling a new income of \$1.87. The calculations for the other two sectors are shown in Figure 3-12.

3.5.1.5 Other value added multipliers

Other value added multipliers can be calculated using the same processes, and are subject to the availability of other social and economic data for the nation or region under study. They may appear to be extremely useful in making important decisions, such as choosing suitable types of tourism-related policies.

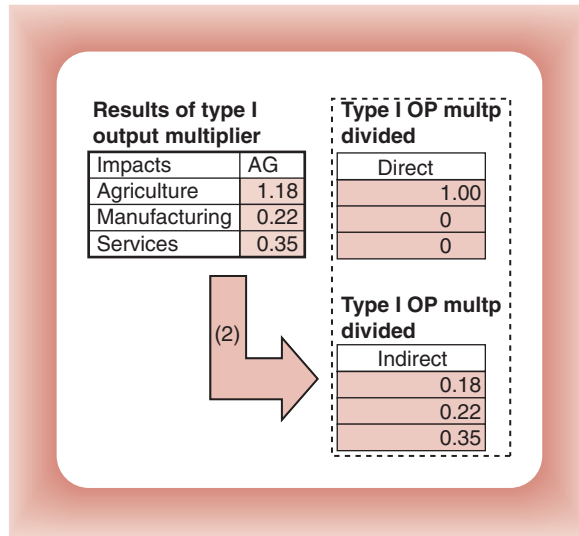


Figure 3-10 Decomposing type I into direct and indirect impact.
Notes: AG, agricultural sector; multp, multiplier; OP, output.

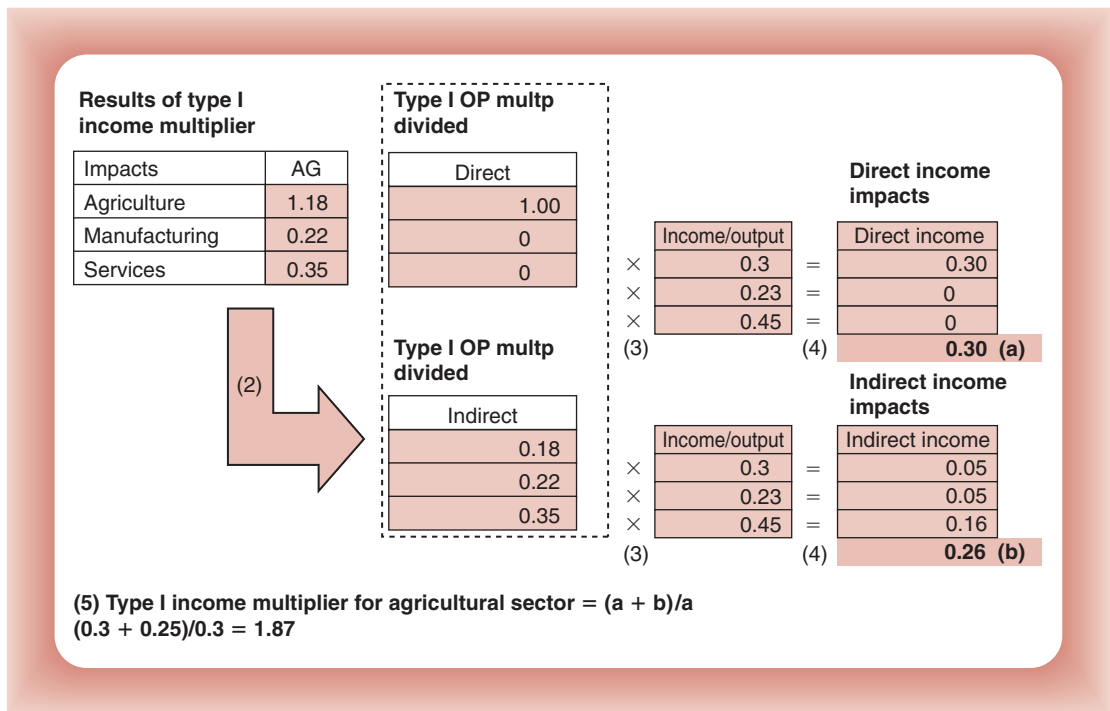


Figure 3-11 Type-I income multiplier calculation processes for the agricultural sector.
Notes: AG, agricultural sector; multp, multiplier; OP, output.

3.6 Structural limitations of input-output modeling

As it is the case with any other quantitative modeling, I-O modeling has its limitations due to its structural design. Knowing its limitations will keep your study within reasonable limits

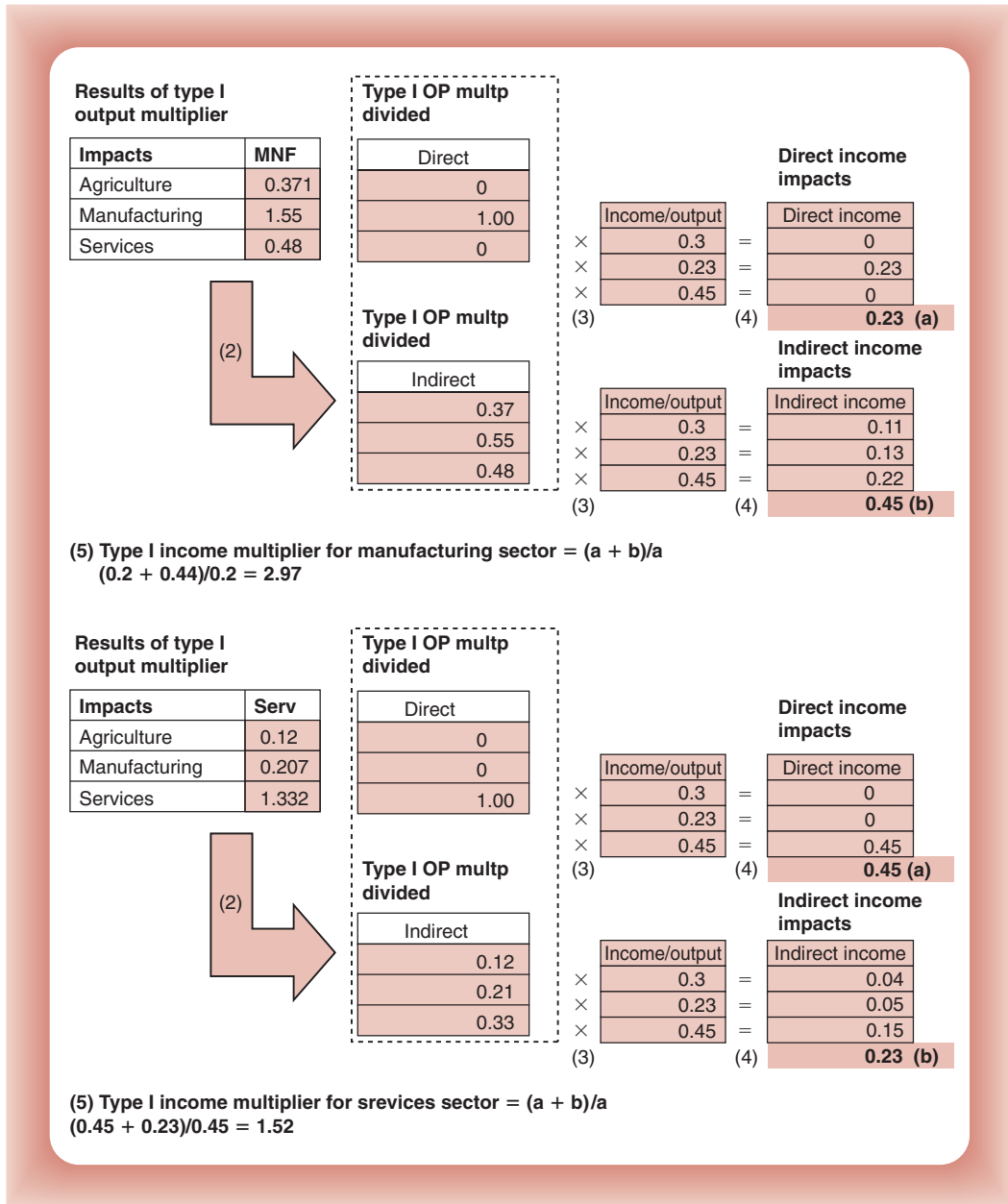


Figure 3-12 Type-I income multiplier calculation processes for the manufacturing and service sector. Notes: emp, employment; MNF, manufacturing; Multp, multiplier; OP, output.

and make you resilient to a series of possible criticism of its limitations, which will be described in the following sections.

3.6.1 No Assumption on supply constraints

I-O modeling assumes that the required input is always available without constraints in supply. You can, for example, conduct a study of what would happen to a local economy if the



number of customers to a popular tourist destination – an ice-cream factory – were to triple in the following year. The model calculates that the required input of sugar, milk, and electricity will increase dramatically, which would stimulate the local economy through industrial interdependency. The model will not ask you whether there will be enough machines in the factory or enough parking spaces and seats for the tourists in that situation, because it will not make any assumption about capacity constraints.

Factory production in the study region can increase by 50% but I-O modeling tacitly assumes the existence of excess capacity, parking spaces, truck deck for delivery, and electricity, so that there would be no supply constraints to meet the new level of final demands. You can calculate the economic impact of increased tourist expenditure in Ghana, for example, assuming that there would be enough electricity supplied for hotel operations to meet the growing demand for hotel rooms. When the declining water level in the river threatens the amount of electricity generated by the hydraulic power generation plants, such a shortage of critical input creates a problem of supply constraints for hotel operations. These constraints, however, are not assumed in generic I-O modeling.

3.6.2 Constant return to scale

The required input can be put in relative terms as ratios, as we did when transforming the transaction table into the standardized A-matrix table. That relationship is assumed to continue. If the input to the orange juice factory from the agricultural sector is 0.12, when the total output increases by \$100 million, there should be an additional purchase of \$12 million of agricultural product (oranges). If the increase in total output is of \$100, there should be an additional purchase of oranges of \$12. The relationship is assumed to remain linear.

For example, in a restaurant operation that is an independent outlet or part of a hotel, a certain amount of food is purchased as intermediate goods, and a certain amount of labor input is required to produce complete meals for the final demands from customers. The I-O is created based on the data collected at a certain point in time. One can also imagine the appearance of new businesses, such as half-cooked meals, or ready-made food ingredients. A manager now has the choice to purchase those ready-made ingredients, which will perhaps increase the proportion of the food cost, and possibly decrease the relative labor input, as the manager would not need as many prep-cooks. In the transactions table, there would be more purchase of manufactured goods in lieu of agricultural goods. Such changes are not included in the I-O framework, as you can understand by recalling the steps you took to create various matrices. It would not be an issue if only one or two firms in the industrial sector changed their purchasing behavior (input patterns). When there is a certain trend in the industrial sector to change the purchasing patterns as a whole, the need may arise to update the I-O data.

3.6.3 Fixed commodity input structure

The fixed commodity input structure is similar to constant returns to scale, but the ratio of inputs is assumed to remain the same as it was during the observed study period, irrespective of changes in price of some items. In the real world, if the price of furniture from China



becomes so attractive, a general manager of a hotel in the US may switch to purchases from China instead of those from a domestic manufacturing industry in West Virginia. If the price of beef increases for some reason, you may find fewer beef dishes at the restaurant. Increase in prices would not cause a huge technical problem for the I-O modelers if the change in prices of goods and services are equally distributed across all of society. That is often not the case, such as the surge of crude oil prices. In the I-O world, the exact mixture of intermediate goods will remain fixed despite short-term price fluctuations.

3.6.4 Homogeneous sector output

If the sector produces more than one commodity (this will be discussed later), the proportion of such multiple commodities productions will remain the same as in the study period. If an automobile manufacturing factory in the region (the industry) produces more than one model of cars (the commodities), and I-O table recorded industry by commodities, the relative portion of commodities (small cars, mid-size cars, large cars, huge trucks, gigantic sport utility vehicles) will not be assumed to change even when the gasoline prices increase later. As an example of the hospitality industry, let us consider a full-service hotel. They have a rooms department and food and beverage department as a core department to generate their products, clean rooms, and tasty meals. The proportion of those products is not assumed to change, which means that if the proportion was 70% and 30%, then when the total revenue at the hotel increased from \$100 million to \$150 million, the sales of the two departments are assumed to increase from \$70 million and \$30 million to \$105 million to \$45 million as the relative ratio of proportions are fixed.

In general, relatively small changes to the economy in question would pose less of a problem, and changes to relatively larger economic region would create fewer problems in the impact analysis using the I-O framework. Being aware of those structural limitations, mainly derived from linear-modeling techniques, you may as well present your arguments in perspective without misleading audiences and readers. It is evident that these are not the all limitations of your particular study, as there may be errors that are more specific and applicable to your research.

3.7 Applications of impact studies

In this section we will learn how the knowledge we gained in previous sections can be applied for the impact studies.

3.7.1 Steps for impact studies

Here is an overview of necessary steps for a simple impact study; while there can be many deviations and variation from a simple form.

3.7.1.1 Check availability of the I-O table – free sources

Creating the I-O table is a daunting task and it is usually a task for the large numbers of government officials as it requires various types of nationwide data collections. I will elaborate



about the process later. Thus, we start by discussing the steps required to find an existing table for your research.

If you are interested in conducting an impact study of tourism, you want to make sure the regional economic data are available for use. Many nations in the world provide national data free of charge, and often make those data available for free download on their websites. Available tables may include the interindustry transactions table, before standardization, or it may be in the Leontief inverse matrix format already.

As for the US, the BEA, US Commerce Department has a web page from which I-O data and valuable reports can be downloaded (<http://www.bea.gov/industry/index.htm>). Eurostat at the European Commission shows I-O tables of 60×60 for over 25 nations in Europe. Some nations even offer I-O tables at regional levels. A case in point is Japan, which has more than 40 prefecture level I-O tables and more than 10 municipality level I-O tables in addition to national and multiregional tables. I-O data are often available free by e-mail, telephone, or links on a web page. The Japanese national I-O table is downloadable from the website of the Director-General of Policy Planning at Ministry of Internal Affairs and Communications (<http://www.stat.go.jp/english/data/io/index.htm>).

You may wonder how many nations in the world have national I-O data. According to data produced by Pan Pacific Association of I-O Studies in 2004, there were 83 nations in the world that create National I-O tables.

The reason for governments to make I-O data available is that it is useful for them to have the table for planning and analyses purposes; in addition, they could benefit from various aspects of discussions on policy analyses with taxpayers, students, and scholars. Despite the fact that data collection and compilation for I-O tables requires massive labor inputs of many government workers, I-O data tend to be underutilized, taking into consideration of the huge benefits that can be extracted from it.

3.7.1.2 Check availability of other relevant data – free sources

Once the government of the nation/region that you wish to study is identified to have the I-O data, it is more than likely that they have other important data such as labor, employment, income etc., which you will need to calculate various multipliers as we learned in section 3.5.1. Creating the I-O table requires high levels of rigor and coordination among many different government offices, and existence of the I-O data implies that the government has certain levels of ability to collect important data. Once the data are collected, those governments tend to disseminate the details to taxpayers, students, and scholars free of charge. Recent advancements of the internet are without doubt helping governments to disseminate data.

3.7.1.3 Check availability of input-output tables – proprietary sources

Detailed I-O tables may be obtained from commercial and noncommercial proprietary organizations. In the US, two of the well-known vendors are RIMS and IMPLAN, which are also known as the software and data packages for impact modeling. As for IMPLAN, the data availability goes down to the county level, covering over 3000 counties in all states



(<http://www.implan.com/index.html>). Not all people are aware that the Minnesota IMPLAN Group (MIG) IMPLAN as a company sells not only the IMPLAN software but also IMPLAN data, which are updated annually at the county level. IMPLAN data already incorporates relevant data on employment, income, and taxes. (The US consists of 50 states and a federal district (the District of Columbia); most states have counties, with the exception of Louisiana, which has parishes (that are equivalent to counties). Some states have independent cities such as Baltimore in MD and St. Louis in MO. All together, there are approximately 3140 counties and comparable substate level regions in the US.)

3.7.1.4 Compose an appropriate final demand column vector

As long as you take A-matrix and subsequent Leontief inverse matrix as matrices with fixed coefficients, they are fixed. You do not tamper with them along the processes of calculations. In that regard, defining an appropriate final demand column vector is where discretion enters into impact studies. This is the step in your impact studies that deserves extra attention because the accuracy of representing the initial shock would be precisely reflected in the responding shocks as indirect impacts. You have to identify an appropriate column vector as collection of tourism-related initial shocks allocated to different industrial sectors. While the I-O table data would most likely be secondary data, identifying a final demand column vector for tourism as an industry faces the same challenge which motivated European economists to start the TSA concepts as we see in later sections.

There are several mistakes that students tend to make. One of the common mistakes associated with tourism impact analysis would be to put one single number in one sector that you believe is associated with tourism and leave all the other sectors with zero initial shocks (e.g. if you assume that additional tourists will come to the region and subsequently the final demand for tourism products increase of \$100 million per year); some students tend to put all \$100 million into one single sector, such as a hotel sector. While the hotel sector is certainly one of the relevant sectors associated with tourists, not all the expenditures of tourists are at within this sector (e.g. tourists may purchase souvenirs at local gift shop, dine at local restaurants, participate in organized tours, and use local transportation).

Whenever possible or feasible, it would be advisable to consider prime data gathering of tourists' expenditures which will require you to design and collect enough sample data to represent the population. If there are secondary data specific for the region and specific to the type of tourists, they may be used to construct the final demand column vector to reflect the visitors' expenditures. When there is no other specific data, you may use national data or something comparable to your study region. In this case ensure that you state explicitly how you created the final demand column vector as there may be substantial regional deviation from the national average data, as shown in chapter 1. It is the final demand column vector that drives the change in total output and basically the whole impact studies that you conduct. You may occasionally find some reports that do not disclose how the final demand column vector was composed. You will have little clue on how they did it, thus it is challenging to verify the study.



3.7.1.5 Several cautions in composing final demand column vector

There are several additional cases where you have to be cautious about composing final demand column vector.

3.7.1.5.1 Defining the direct shock

When you try to estimate possible impacts of a new hotel, or a new amusement park, there would be two types of final demand column vectors due to the nature of the shocks. The first shock occurs from construction activities, and that is nonrecurring as it happens once during a project. After opening of the hotel or the amusement park, the second shock occurs from visitors' expenditures. This shock from operations is recurring, which means it happens every year once the operation starts. Thus, when you estimate an impact of a new project, you conduct two impact studies, one based on the final demand column vector representing the construction phase (the total impact from the construction), and the other based on the final demand column vector of visitors' expenditures (total impact from the operation).

3.7.1.5.2 Location of the direct shock

It is desirable for you to measure the visitors' expenditures as a result of collection of primary data by way of surveys, questionnaires, etc. In case you wish to calculate regional impacts of a county or state, be very careful about the exact location of the occurrence of expenditures as tourists may spend outside of the study region. For example, if you are estimating the impact of the Japanese tourists' expenditure in the state of Nevada, their expenditures made in the state of California should not be counted as a part of final demand column vector in the study of Nevada. If European tourists purchased the Caribbean cruise ship tour organized by a travel agency in New York City, not all the amount that the tourists paid to the New York City travel agency would not be counted as a final demand column vector for the tourism economic impact analysis for Jamaica. Whatever the cruise ship company pays the Jamaican company for their short stay and the souvenirs that tourists purchased directly from Jamaican vendors would only constitute the final demand column vector for Jamaican economy.

3.7.1.5.3 Duration mismatch

As you see, the I-O data are based on annual flows in the economy, so the default setting for the duration is 1 year, which is the common duration for the income statements of firms. Certain events that you want to capture may not match its duration, such as week-long festival, 3-day convention, etc. Whatever the shock you give will be the aggregate shock for the duration of the event, but the calculation results are presented based on the annual flow of data. This poses an interesting question. If duration of the event in question is shorter than 1 year by far, the default method of presenting the corresponding total output clearly poses a challenge. Because the result is shown on an annual basis, actual instant shock during the event may be more intense and the effect may diminish quickly after the completion of the event. If you think about the soccer World Cup or the Olympics, that would give you an idea.



3.7.1.5.4 Visitors' definition and compliance

As we will learn in detail in Chapter 5, compliance with a definition of visitors will prevent certain portions of expenditures by local residents (i.e. nonvisitors) from being included in the initial shock.

For example, estimating an impact of a local popular concert in a metropolitan area will result in overestimation of total impacts if you include all the expenditures during the event, because a substantial portion of expenditures include those by local residents. In addition, this would occur with the development of large leisure-infrastructure projects such as museums, arenas, or sports facilities in the urban setting, as much, if not all, of the expected expenditure would be made by local residents. An example of estimating the economic impacts of huge tourism-related facilities in or near the urban center would be Tokyo Disneyland, which opened in 1983 and attracted 10 million visitors in the first year and 21 million visitors in 2001. Because Tokyo Disneyland is located at the Tokyo Bay, it is only 10 miles to the central part of Tokyo. But according to various definitions of who can be considered as visitors, more than half of the guests who go to Tokyo Disneyland would not be considered as visitors (i.e. leisure travelers and nonleisure travelers who travel enough long distance). So the majority of expenditures would be considered to be made by the nonvisitors or locals who spend money as part of daily lives in usual environment. This is a thriving environment, but an impact study of tourists (i.e. visitors) would be smaller because of exclusion of those expenditures by nonvisitors (i.e. local residents).

When dealing with tourism-impact-related studies, defining the tourists or visitors to the study region is important to ensure accurate estimates of their expenditures and their subsequent impacts. This is another reason why hospitality and tourism students and scholars have to learn about TSA, which have been predominantly led by professional economists.

3.7.1.5.5 Producers' price base as default setting

I-O data are recorded at the producers' price, while tourism expenditures data may be recorded by purchasers' prices. This will be discussed later.

3.7.2 An Impact study sample

We will conduct a simple impact analysis using, not with a 3×3 matrix, but a 15×15 matrix with aggregated national data of the US. Here you are recommended to use MS-Excel.

Table 3-10 is the aggregated US I-O table for 1999. As the largest economy in the world by GDP size, there are many numbers in the transaction matrix. If this calculation is performed manually, the difference between $3 \times 3 = 9$ elements matrix and $15 \times 15 = 225$ elements matrix can be overwhelming. However, once the process is computerized, methods used to calculate a series of matrix operations for 3×3 are easily applicable to deal with 15×15 matrix.

The next two steps are to create an A-matrix by standardizing each element along the column sum at the bottom. After completion of the standardization, you leave only the inter-industry components of the 15×15 matrix (Table 3-11).

Table 3-10 Aggregated US input-output table, 1999.

USA Inter-Industry Transaction Matrix (C×1)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	(US\$ million)	
IOCode	Name	Agriculture, forestry, fishing, and hunting	Mining	Utilities	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing	Information	Finance, insurance, real estate, rental, and leasing	Professional and business services	Educational services, health care, and social assistance	entertainment, recreation, accommodation, and food services	Other services, except government	Government	Total Final Uses (GDP)	Total Commodity Output
1	Agriculture, forestry, fishing, and hunting	55 800	1	23	912	138 434	1993	258	8	11	1510	5950	603	9154	304	1551	35 794	252 306
2	Mining	386	22 476	60 507	5686	139 358	17	10	2519	1	1451	106	10	28	8	9497	-61 579	180 481
3	Utilities	5958	2574	359	3078	48 427	5412	12 364	3311	4819	28 519	14 330	11 433	15 736	5937	48 192	176 990	387 440
4	Construction	895	33	5446	1014	8118	2040	4017	1452	3443	28 388	8256	9357	6248	3735	44 271	868 763	995 474
5	Manufacturing	46 582	17 781	13 808	207 916	1 257 656	40 653	57 564	60 001	69 820	80 111	78 627	114 361	99 728	57 606	194 326	1 400 908	3 797 446
6	Wholesale trade	10 432	2658	2249	23 094	221 251	23 002	7539	11 768	12 030	9909	13 264	16 767	19 517	8583	29 898	447 463	859 423
7	Retail trade	165	287	98	47 482	10 269	1780	2840	1578	541	11 085	5979	2244	2116	6726	156	907 831	1 001 177
8	Transportation and warehousing	7590	4705	24 518	15 712	117 205	13 613	17 547	71 823	9147	27 436	22 354	14 208	8812	5287	35 469	189 589	585 017
9	Information	1178	467	750	8761	38 819	13 147	15 495	9036	193 016	27 802	68 779	33 419	15 520	12 538	58 631	357 572	854 932
10	Finance, insurance, real estate, rental, and leasing	14 229	17 657	8448	29 222	100 451	37 975	69 142	30 251	59 948	570 465	111 938	115 665	57 455	39 889	75 169	1 877 909	3 215 812
11	Professional and business services	4767	14 160	10 680	77 411	310 604	83 443	122 422	50 723	119 131	239 495	279 027	127 013	48 998	43 689	197 095	384 383	2 113 039
12	Educational services, health care, and social assistance	9	107	633	105	2 605	700	517	510	2519	955	2129	11 565	600	842	31 559	1 401 975	1 457 327
13	Arts, entertainment, recreation, accommodation, and food services	395	840	1221	2018	18 959	4737	5866	4049	15 270	22 726	28 512	21 189	20 529	4172	20 478	577 658	748 618
14	Other services, except government	3259	287	917	10 189	44 013	7095	7806	8554	13 854	22 132	22 201	11 078	7695	6172	28 486	383 720	577 457
15	Government	113	28	398	1167	3232	3247	4473	1172	4594	9147	13 182	14 200	3218	3746	9607	1 646 870	1 718 393
Total Value Added		98 616	105 593	201 644	464 853	1 351 630	622 864	765 804	294 878	483 972	2 125 736	1 220 153	793 132	371 515	253 712	1 326 717	10 480 820	-
Total Industry Output		250 491	190 550	331 777	899 129	3 852 724	869 537	1 094 575	567 444	1 000 982	3 223 070	1 901 251	1 296 479	687 227	454 007	2 128 664	-	18 747 908

Source: Calculated by author based on data from BEA, US Department of Commerce.

Table 3-11 A-matrix of the US data.

Standardized Matrix = A Matrix		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IOCode	Name	Agriculture	Mining	Utilities	Construction	Manufacturing	Wholesale	Retail trade	Transportation	Information	Finance, insurance	Professional	Educational	Arts, entertainment	Other services	Government
1	Agriculture, forestry, fishing, and hunting	0.22276	0.00001	0.00007	0.00101	0.03593	0.00229	0.00024	0.00001	0.00001	0.00047	0.00313	0.00047	0.01332	0.00067	0.00073
2	Mining	0.00154	0.11795	0.18237	0.00632	0.03617	0.00002	0.00001	0.00444	0.00000	0.00045	0.00006	0.00001	0.00004	0.00002	0.00446
3	Utilities	0.02379	0.01351	0.00108	0.00342	0.01257	0.00622	0.01130	0.00583	0.00481	0.00885	0.00754	0.00882	0.02290	0.01308	0.02264
4	Construction	0.00357	0.00017	0.01641	0.00113	0.00211	0.00235	0.00367	0.00256	0.00344	0.00881	0.00434	0.00722	0.00909	0.00823	0.02080
5	Manufacturing	0.18596	0.09331	0.04162	0.23124	0.32643	0.04675	0.05259	0.10574	0.06975	0.02486	0.04136	0.08821	0.14512	0.12688	0.09129
6	Wholesale trade	0.04165	0.01395	0.00678	0.02568	0.05743	0.02645	0.00689	0.02074	0.01202	0.00307	0.00698	0.01293	0.02840	0.01890	0.01405
7	Retail trade	0.00066	0.00151	0.00030	0.05281	0.00267	0.00205	0.00259	0.00278	0.00054	0.00344	0.00314	0.00173	0.00308	0.01481	0.00007
8	Transportation and warehousing	0.03030	0.02469	0.07390	0.01747	0.03042	0.01566	0.01603	0.12657	0.00914	0.00851	0.01176	0.01096	0.01282	0.01165	0.01666
9	Information	0.00470	0.00245	0.00226	0.00974	0.01008	0.01512	0.01416	0.01592	0.19283	0.00863	0.03618	0.02578	0.02258	0.02762	0.02754
10	Finance, insurance, real estate, rental, and leasing	0.05680	0.09266	0.02546	0.03250	0.02607	0.04367	0.06317	0.05331	0.05989	0.17699	0.05888	0.08921	0.08360	0.08786	0.03531
11	Professional and business services	0.01903	0.07431	0.03219	0.08610	0.08062	0.09596	0.11184	0.08939	0.11901	0.07431	0.14676	0.09797	0.07130	0.09623	0.09259
12	Educational services, health care, and social assistance	0.00004	0.00056	0.00191	0.00012	0.00068	0.00081	0.00047	0.00090	0.00252	0.00030	0.00112	0.00892	0.00087	0.00185	0.01483
13	Arts, entertainment, recreation, accommodation, and food services	0.00158	0.00441	0.00368	0.00224	0.00492	0.00545	0.00536	0.00714	0.01526	0.00705	0.01500	0.01634	0.02987	0.00919	0.00962
14	Other services, except government	0.01301	0.00151	0.00276	0.01133	0.01142	0.00816	0.00713	0.01507	0.01384	0.00687	0.01168	0.00854	0.01120	0.01359	0.01338
15	Government	0.00045	0.00015	0.00120	0.00130	0.00084	0.00373	0.00409	0.00207	0.00459	0.00284	0.00693	0.01095	0.00468	0.00825	0.00451

Source: Calculated by author based on data from BEA, US Department of Commerce.



Once you have created the A-matrix the next step is to create the I-matrix of the identical size in rows and columns as shown in Table 3-12.

Then subtract the A-matrix from the I-matrix. The result will be shown in the matrix with the same size in rows and columns as shown in Table 3-13.

Now, you have to create an inverse of the $(I - A)$ -matrix as shown in Table 3-14 to create $(I - A)^{-1}$.

By adding the column sum, you may calculate type-I output multipliers for each industrial sector. But here, we should proceed to conduct an impact studies.

Recall the basis for an impact study is equation 3-10. The only difference now is that we are dealing with larger matrix of 15×15 .

$$\begin{aligned} (I - A)^{-1} \Delta Y &= \Delta X \\ (15 \times 15) \times (15 \times 1) &= (15 \times 1) \\ (\text{Leontief inverse matrix}) \times (\text{change in final demand} \\ &\text{shown as column vector}) = (\text{change in total output} \\ &\text{shown as column vector}) \end{aligned}$$

If you want to study the increase in final demand for construction sector in the US, say of \$100 million, you will create a final demand column vector such as in Table 3-15.

Once the change in final demand is expressed as a column vector, you can calculate the multiplication of matrices using MS-Excel so that the results will be shown in the column vector format. In the example used here, ΔX has been positioned next to the ΔY , as shown in Table 3-16.

3.7.3 Interpretation of the results

After the multiplication of the Leontief inverse matrix by the final demand column vector, you will have the total output column vector. This shows change in total outputs in each sector in response to the initial shock, the change in final demand column vector. Given the initial shock of \$100 million increases for the final demand for the construction sector, the manufacturing sector receives the larger increase in their intermediate goods than any other sectors, with the \$39.36 million increase in total output. Construction activities surely require materials, such as steel, concrete, copper wiring, lifts, air-conditioners, security systems, carpets, etc. Professional and business services sector receives the second largest stimulation through the indirect shock, indicating that the construction sector requires substantial services from this sector. Why is that? We have to think about how the construction sector functions as it requires architects, structural engineers, attorneys, and accountants when they build a multistory high-rise complex. In this way, you can see that the total output in response to the direct (initial) shock of \$100 million will be \$193 million after adding up the numbers in the total output column vector.

For the sake of comparative policy analyses, you can calculate more than two different events to the same I-O with the same total amount of the final demand column vector to compare the patterns of two total outputs. In Table 3-17, two direct shocks (policy 1 and 2), both for \$100 million and resulting changes in total output are shown next to each other. While the

Table 3-12 I-matrix.

Name (I-Matrix)		Agriculture	Mining	Utilities	Construction	Manufacturing	Wholesale	Retail trade	Transportation	Information	Finance, insurance	Professional	Educational	Arts, entertainment	Other services	Government
1	Agriculture, forestry, fishing, and hunting	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Mining	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Utilities	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
4	Construction	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5	Manufacturing	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
6	Wholesale trade	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7	Retail trade	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
8	Transportation and warehousing	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
9	Information	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
10	Finance, insurance, real estate, rental, and leasing	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11	Professional and business services	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
12	Educational services, health care, and social assistance	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
13	Arts, entertainment, recreation, accommodation, and food services	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
14	Other services, except government	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1



Table 3-13 (I – A)-matrix.

Name: (I – A) Matrix		Agriculture	Mining	Utilities	Construction	Manufacturing	Wholesale	Retail trade	Transportation	Information	Finance, insurance	Professional	Educational	Arts, entertainment	Other services	Government
1	Agriculture, forestry, fishing, and hunting	0.77724	-0.00001	-0.00007	-0.00101	-0.03593	-0.00229	-0.00024	-0.00001	-0.00001	-0.00047	-0.00313	-0.00047	-0.01332	-0.00067	-0.00073
2	Mining	-0.00154	0.88205	-0.18237	-0.00632	-0.03617	-0.00002	-0.00001	-0.00444	0.00000	-0.00045	-0.00006	-0.00001	-0.00004	-0.00002	-0.00446
3	Utilities	-0.02379	-0.01351	0.99892	-0.00342	-0.01257	-0.00622	-0.01130	-0.00583	-0.00481	-0.00885	-0.00754	-0.00882	-0.02290	-0.01308	-0.02264
4	Construction	-0.00357	-0.00017	-0.01641	0.99887	-0.00211	-0.00235	-0.00367	-0.00256	-0.00344	-0.00881	-0.00434	-0.00722	-0.00909	-0.00823	-0.02080
5	Manufacturing	-0.18596	-0.09331	-0.04162	-0.23124	0.67357	-0.04675	-0.05259	-0.10574	-0.06975	-0.02486	-0.04136	-0.08821	-0.14512	-0.12688	-0.09129
6	Wholesale trade	-0.04165	-0.01395	-0.00678	-0.02568	-0.05743	0.97355	-0.00689	-0.02074	-0.01202	-0.00307	-0.00698	-0.01293	-0.02840	-0.01890	-0.01405
7	Retail trade	-0.00066	-0.00151	-0.00030	-0.05281	-0.00267	-0.00205	0.99741	-0.00278	-0.00054	-0.00344	-0.00314	-0.00173	-0.00308	-0.01481	-0.00007
8	Transportation and warehousing	-0.03030	-0.02469	-0.07390	-0.01747	-0.03042	-0.01566	-0.01603	0.87343	-0.00914	-0.00851	-0.01176	-0.01096	-0.01282	-0.01165	-0.01666
9	Information	-0.00470	-0.00245	-0.00226	-0.00974	-0.01008	-0.01512	-0.01416	-0.01592	0.80717	-0.00863	-0.03618	-0.02578	-0.02258	-0.02762	-0.02754
10	Finance, insurance, real estate, rental, and leasing	-0.05680	-0.09266	-0.02546	-0.03250	-0.02607	-0.04367	-0.06317	-0.05331	-0.05989	0.82301	-0.05888	-0.08921	-0.08360	-0.08786	-0.03531
11	Professional and business services	-0.01903	-0.07431	-0.03219	-0.08610	-0.08062	-0.09596	-0.11184	-0.08939	-0.11901	-0.07431	0.85324	-0.09797	-0.07130	-0.09623	-0.09259
12	Educational services, health care, and social assistance	-0.00004	-0.00056	-0.00191	-0.00012	-0.00068	-0.00081	-0.00047	-0.00090	-0.00252	-0.00030	-0.00112	0.99108	-0.00087	-0.00185	-0.01483
13	Arts, entertainment, recreation, accommodation, and food services	-0.00158	-0.00441	-0.00368	-0.00224	-0.00492	-0.00545	-0.00536	-0.00714	0.01526	-0.00705	-0.01500	-0.01634	0.97013	-0.00919	-0.00962
14	Other services, except government	-0.01301	-0.00151	-0.00276	-0.01133	-0.01142	-0.00816	-0.00713	-0.01507	-0.01384	-0.00687	-0.01168	-0.00854	-0.01120	0.98641	-0.01338
15	Government	-0.00045	-0.00015	-0.00120	-0.00130	-0.00084	-0.00373	-0.00409	-0.00207	-0.00459	-0.00284	-0.00693	-0.01095	-0.00468	-0.00825	0.99549

Table 3.14 $(I - A)^{-1}$ -matrix.

Name: $(I - A)^{-1}$ [Inverse of $(I - A)$ matrix]		Agriculture	Mining	Utilities	Const ruction	Manufacturing	Wholesale	Retail trade	Transportation	Information	Finance, insurance	Professional	Educational	Arts, entertainment	Other services	Government
1	Agriculture, forestry, fishing, and hunting	1.306451	0.009988	0.006893	0.020632	0.073747	0.008633	0.006513	0.011385	0.009584	0.004903	0.01036	0.010102	0.031369	0.013151	0.010698
2	Mining	0.027875	1.146573	0.214653	0.026418	0.07029	0.006714	0.008287	0.01786	0.010127	0.006736	0.007533	0.010935	0.018359	0.014581	0.019189
3	Utilities	0.040348	0.021697	1.008521	0.013281	0.02675	0.010737	0.0162	0.013598	0.012896	0.013974	0.013374	0.015734	0.031915	0.02104	0.029096
4	Construction	0.008667	0.003498	0.018619	1.004666	0.006684	0.00469	0.006394	0.006082	0.007774	0.012335	0.007569	0.01087	0.013278	0.012149	0.024026
5	Manufacturing	0.408434	0.194697	0.132227	0.393636	1.564453	0.102606	0.112917	0.220797	0.17387	0.072906	0.107062	0.17778	0.274746	0.239088	0.186892
6	Wholesale trade	0.0847	0.031862	0.022431	0.055032	0.101402	1.036801	0.017587	0.041773	0.030551	0.011227	0.01863	0.028869	0.05201	0.038956	0.030925
7	Retail trade	0.004064	0.003812	0.003033	0.055742	0.006471	0.003719	1.004493	0.005609	0.003285	0.005832	0.005375	0.004309	0.006188	0.017793	0.003228
8	Transportation and warehousing	0.069052	0.04608	0.099601	0.042419	0.067914	0.027191	0.028633	1.160002	0.026722	0.019055	0.024747	0.026576	0.034702	0.030623	0.034298
9	Information	0.023587	0.016584	0.013681	0.030041	0.034849	0.029776	0.029592	0.036977	1.255492	0.021674	0.059549	0.046482	0.04392	0.050171	0.048103
10	Finance, insurance, real estate, rental, and leasing	0.130576	0.155637	0.078708	0.085119	0.094842	0.077583	0.102396	0.107554	0.124565	1.235151	0.104509	0.141409	0.141854	0.144281	0.078359
11	Professional and business services	0.108678	0.146653	0.0957	0.175106	0.194394	0.145314	0.165579	0.169959	0.2177	0.126976	1.212217	0.166184	0.149525	0.173787	0.158838
12	Educational services, health care, and social assistance	0.000878	0.001208	0.002498	0.000946	0.001765	0.001345	0.00105	0.001724	0.003866	0.000785	0.001893	1.00981	0.001722	0.002739	0.015696
13	Arts, entertainment, recreation, accommodation, and food services	0.008798	0.010625	0.008821	0.009509	0.014145	0.010142	0.010523	0.014381	0.02579	0.012183	0.021714	0.023058	1.037379	0.01631	0.015888
14	Other services, except government	0.026677	0.008448	0.008752	0.021215	0.024955	0.013296	0.01267	0.024478	0.024466	0.012143	0.018389	0.01585	0.020135	1.021987	0.020573
15	Government	0.002988	0.002274	0.002785	0.004026	0.004029	0.005614	0.006124	0.004755	0.008388	0.004875	0.009556	0.013495	0.00731	0.010964	1.006935

**Table 3-15** Final demand column vector.

	Change in FD delta Y
1 Agriculture, forestry, fishing, and hunting	0
2 Mining	0
3 Utilities	0
4 Construction	100.00
5 Manufacturing	0
6 Wholesale trade	0
7 Retail trade	0
8 Transportation of warehousing	0
9 Information	0
10 Finance, insurance, real estate, rental, and leasing	0
11 Professional and business services	0
12 Educational services, health care, and social assistance	0
13 Arts, entertainment, recreation, accommodation, and food services	0
14 Other services, except government	0
15 Government	0

sizes of the total output appear to be similar, the distribution of indirect shock looks different over the two total outputs.

In Table 3-17, the same amounts of direct (initial) shocks are given to two different industrial sectors. Policy 1 is to assume an increase in final demand for the construction sector for \$100 million, and policy 2 is to assume increase in final demand for the information sector for \$100 million. Do you see different patterns of distributions of indirect impacts over two policies? If you are the manufacturing sector, which one do you prefer to see assuming you would be happier with higher numbers? How about the case that you are working in the professional and business services sector? What you see is the magnitude of interdependencies among the different industrial sectors. No industrial sectors exist in isolation, even though some people may only be interested in learning the particular industry of their concern. I-O modeling can show you such intricate interdependencies among industrial sectors.

3.7.4 Impact studies literature

There are many studies forecasting the positive impacts of certain events. We will cite a few of the many examples using the I-O model as a tool to forecast positive economic impacts. Isard and Kuenne (1953) used the I-O model in their study of the impact of steel industry developments on the greater New York-Philadelphia industrial region in 1953. In this paper, the I-O framework was introduced to anticipate the impact of the location of a basic industry upon the various economic activities of a region. Part of the paper's historical significance was that, at the time, prior studies assumed a one-to-one employment effect between steel-related employment figures and employment figures in supporting sectors. Isard and Kuenne

**Table 3-16** Change in total output in response to the change in final demand.

		Chg in FD delta Y	Result Tot OPT delta X
1	Agriculture, forestry, fishing, and hunting	0	2.06
2	Mining	0	2.64
3	Utilities	0	1.33
4	Construction	100.00	100.47
5	Manufacturing	0	39.36
6	Wholesale trade	0	5.50
7	Retail trade	0	5.57
8	Transportation and warehousing	0	4.24
9	Information	0	3.00
10	Finance, insurance, real estate, rental, and leasing	0	8.51
11	Professional and business services	0	17.51
12	Educational services, health care, and social assistance	0	0.09
13	Arts, entertainment, recreation, accommodation, and food services	0	0.95
14	Other services, except government	0	2.12
15	Government	0	0.40
		100.00	193.78

demonstrated with the I-O model that the employment multiplier effect of the steel industry is well over a one-to-one ratio in relation to the regional economy.

The I-O/SAM model is versatile and can accommodate various types of impact analyses. Ahlert (2001) applied an I-O model to a contemporary topic to discuss how the soccer World Cup in 2006 in Germany would affect the economy, considering different financing arrangements for extending the public sports infrastructure, calculated at the national accounts level, to show the positive influences on income and employment. Another example of a contemporary study on economic impact using the I-O/SAM model is a working paper estimating the effect of increasing childcare on a local economy (Shockley and Ebeling, 2002). Shockley and Ebeling used the I-O model to simulate how much a local economy will benefit by increasing the capacity for childcare, assuming that working mothers with children in childcare would not be able to hold jobs without the formal care. The I-O framework is also used to estimate regional economic impacts for converting corn to ethanol (English et al., 2002). Ethanol has been added to gasoline in some US states for some time, but this paper focuses on the economic impact on corn farmers if local government decides to invest in an ethanol production facility that purchases corn from farmers.

Hughes (1994) tried to draw researchers' attention to a common mistake in using an I-O-based model. He was concerned with abuse and over-quotation of multipliers from one study to another. He said that employment multipliers are the least reliable of all multipliers,



Table 3-17 Comparative display of two different shocks.

		Policy 1 Chg in FD delta Y	Policy 1 Result Tot OPT delta X	Policy 2 Chg in FD delta Y	Policy 2 result Tot OPT delta X
1	Agriculture, forestry, fishing, and hunting	0	2.06	0	0.96
2	Mining	0	2.64	0	1.01
3	Utilities	0	1.33	0	1.29
4	Construction	100.00	100.47	0	0.78
5	Manufacturing	0	39.36	0	17.39
6	Wholesale trade	0	5.50	0	3.06
7	Retail trade	0	5.57	0	0.33
8	Transportation and warehousing	0	4.24	0	2.67
9	Information	0	3.00	100.00	125.55
10	Finance, insurance, real estate, rental, and leasing	0	8.51	0	12.46
11	Professional and business services	0	17.51	0	21.77
12	Educational services, health care, and social assistance	0	0.09	0	0.39
13	Arts, entertainment, recreation, accommodation, and food services	0	0.95	0	2.58
14	Other services, except government	0	2.12	0	2.45
15	Government	0	0.40	0	0.84
		100.00	193.78	100.00	193.51

because of the assumption that increased employment will result from an increase in a linear form, and the assumption of the existence of unemployed, mobile, and substitutable resources. Hughes pointed out that increased output might be met through increased utilization of existing capacity (including labor) or a less-than-proportionate increase in employment. He concluded that all that is required for better analysis is consistency in use, a greater understanding of the concepts, and better data collection plus modification of assumptions.

Nakajima (1994) used the I-O model to analyze the international impact of the Japanese construction industry. He discussed international I-O analysis as a useful analytical tool that can capture direct and indirect effects among industries in Japan and other countries. He aggregated the number of sectors into 28 industries and compiled four sets of bilateral international I-O models to examine the Leontief inverse matrices, output multipliers, value-added multipliers, income multipliers, and operating-surplus multipliers. Hayashi (1991) used the conceptual and mathematical framework of the I-O-based model to demonstrate



how his proposed semi- I-O framework captures the direct, indirect, and induced effects of a large-scale infrastructure project on a regional economy.

3.7.4.1 Impact analysis for the tourism industry

Turning now to studies of economic impacts on the tourism industry, a paper by Fletcher (1989) is among the most quoted. Fletcher's aim was to demonstrate the usefulness of I-O analysis in studying the economic impact of tourism. The paper's conclusion states that I-O analysis is the most comprehensive method available for studying the economic impact of tourism, and that no other technique can offer the same flexibility and level of detail. He presents a theoretical introduction to the I-O model, and quotes actual tourism multipliers for many nations. Fletcher et al. (1981) quotes their previous research on the multiplier effect of the tourism industry on the economy of Gibraltar, saying that tourism generated the greatest marginal increase in both income and employment, even though final demand in Gibraltar was dominated by UK Ministry of Defense expenditures. Archer (1982) wrote a pioneering paper on the use of I-O models for tourism industry analysis in the early 1980s. He talked about analyzing different policy choices to compare each for its implications on income, wages, and employment, which would be valuable to policymakers and planners in the tourism industry.

Heng and Low (1990) utilized the I-O model to conduct a detailed analysis of the economic impact of tourism development on the economy of Singapore. They compared multipliers for the manufacturing industry, the export industry, and the tourism industry and concluded that tourism created three times more jobs per million dollars compared with total exports, and two times more as compared with manufacturing exports. The paper also pointed out that the tourism sector's larger labor requirement may imply greater importation of low-skilled workers for the hotel, wholesale, and retail trade sectors and that automation and mechanization may be quite limited in a personalized, labor-intensive industry like tourism.

Briassoulis (1991) focused on methodological issues at greater length and took a more critical view of the prevalent usage of the I-O model for tourism industry analysis. Briassoulis's criticism of the I-O-based framework for tourism included the following points:

- the linear and additive I-O relationships assumed among economic sectors leave out interaction effects;
- the constancy of the technical coefficients assumption has been shown to be unrealistic, even in the short term, because of capacity and supply constraints;
- the assumption of constant coefficients may not be accurate, as the early stages of tourism development of an area are characterized by dynamic, short-term changes, affecting unstable technical coefficients;
- the broader possibility of substitution effects has for the most part not been dealt with;
- considerable interaction between the study region and the rest of the world (RoW) make the general equilibrium assumption implausible; and
- because of the vulnerability of the tourist industry to exogenous influences (economic, political, or social changes), it is also implausible to assume that the study region is in an equilibrium state.



Briassoulis also mentioned that the economic impacts that are assessed by I-O analysis represent only part of the total economic value of tourism's impacts. He suggested that, even if the application of I-O analysis is considered valid in a given situation, it should be remembered that it does not provide a complete account of the economic impacts of tourism. Caution over the economic impact studies of tourism-related events was raised in other papers, in terms of misuse and misinterpretation (Crompton, 1995; Tyrrell and Johnston, 2001). Crompton identified that most economic impact studies are commissioned to legitimize political position and pointed out 10 mischievous procedures; including local residents; inappropriate aggregation' including of time-switchers and casuals; abuse of multipliers; ignoring costs borne by the local community; ignoring opportunity costs; ignoring displacement costs; expanding the project scope; exaggerating visitation numbers; and inclusion of consumer surplus (Crompton, 2006).

Fleisher and Freeman (1997) concluded that researchers using a single-region I-O model should take the downward bias into consideration otherwise they will not obtain an accurate estimate of the full economic impact of tourism. It is intriguing that the finding is based on their simulation of tourism sector on Israeli economy. Regional impact modeling to estimate the multiplier effects of tourism expenditures in the Washington DC area were well-documented with details in the paper by Frechtling and Horvath (1999) showing that tourism multipliers are relatively high for earnings and employment, but low for output, compared with other industrial sectors.

As for the topic of estimating visitor expenditure, a paper by Frechtling (2006) is very comprehensive to cover previous research over 30 years, identifying three important contexts of occasion, venue, and timeframe. This paper displays excellent details on issues of measurement of expenditures at a specific tourism event.

3.7.5 Usage of impact studies computer software packages

You may use a software package that enables you to work impact modeling without matrix computations of your own. Such packages can be very powerful tools for impact studies, and available choices to fine tune some assumptions actually allow researchers to incorporate sophisticated parameters into the modeling.

To increase flexibility, regional economic data may be exported into database software such as MS-Access, which can re-export them to common spreadsheet programs such as MS-Excel or to matrix computations software such as Matlab. If this is the case, IMPLAN is a useful data source for your impact studies (for details see Olsen, 2004).

Some researchers share the concern that IMPLAN can be an off-the-shelf, impact package software and pose a danger of allowing novitiates to conduct easy impact studies. While the concerns have good validity, particularly true for students who do not know how multipliers are calculated, superiority and versatility of the packages together with availability of regional data can offer stimulating learning experiences in regional impact modeling with proper guidance of instructors. IMPLAN offers numerous options enabling experienced researchers to utilize the more sophisticated options to cater for specific situations within



their impact studies. As long as all the assumptions are explicitly displayed, including, but not limited to, a composition of final demand column vector, at least future researchers can verify what had been done in that particular impact study.

3.8 Varieties of additional concepts on input-output modeling

While we covered a minimum level of core components of I-O modeling, there are some other useful concepts and facts that you may need as you begin to study I-O modeling.

However, some elements of the following explanations may be irrelevant unless you plan a regional (narrower region than a national) impact analysis, and some elements may be too complicated for the rewards you may receive.

3.8.1 The closed input-output model and the open input-output model

As we learned earlier, the type-II multiplier, the extra impact that derives from household inclusion in the I-O structure is called induced impact, which emerges in addition to the indirect impact in response to the direct impact. This particular I-O model, which includes household as an extra sector, can be referred to as the closed I-O model with respect to households. Thus, we can call the I-O model that we have been considering without inclusion of the household the open I-O model with respect to households, or simply the open I-O model. With the open I-O model, there will be only a type I output multiplier, which consists of the sum of direct impact and indirect impact only. The concept of openness and closeness can be mistaken. One idea that you may try would be to think that the households are closed inside of the border (i.e. endogenous) in the closed I-O model. In Chinese characters used in Japanese, if you put the character for treasure inside a square border, the combined characters become nation (i.e. 玉 → 國). If you put the households within the I-O model, it becomes the closed I-O model, from which type-II multipliers, including the induced impacts can be calculated.

3.8.2 Backward and forward linkages

As noted previously, within the structure of the I-O table, industrial sectors depend on each other because they need inputs from other industrial sectors, including the same sectors. The dependence that we have learned thus far can be named backward linkages. Let us consider an example. A restaurant receives thousands of extra guests from outside of the study region because one of the celebrities casually wrote about it in her popular blog (internet diary). A surge of final demands for their products means that the restaurant has to sell their menu items as popular commodities. This requires the restaurant to purchase many more ingredients; i.e. tomatoes, vegetables, apples, and oranges from the agricultural sector; pasta, sauce, peppers, salt, butter, manufactured foods, napkins, silvers, beer, wines from the manufacturing sector; and linen supply services, advertising, business support services from the services sector. This surge in purchases stimulates other industrial sectors to boost their production output to meet the requirements of the restaurant.



An example of importance of backward linkage was found in the analysis of negative indirect shock to hospitality sectors in New York City at the time of 9/11 terrorism event (Hara, 2004). The hospitality sector did not receive the large direct negative shock of terrorism, but it ended up receiving a huge negative shock, because of the sudden disappearance of financial sector's purchase of hotel sectors' output (rooms, food, banquet, etc.) as intermediate goods in the New York City area following the event. When one sector's output is suddenly cut or suddenly surges, it affects other industrial sectors due to interdependence of industrial sectors. Thus, backward linkage refers to the sequence in which final demand for consumption stimulates one industrial sector's increase in output, leading to increases in outputs of supporting sectors. Clearly the sequence is demand-driven.

Forward linkage has the opposite concept. Let us assume that you are the only transportation company in the region, and you have taxis, buses, limousines, and trucks. You have some tourists who use your services to fulfill their final demands, but you have to serve industrial sectors' needs for transporting their intermediate goods and services. Because you cannot meet their needs all the time, other industrial sectors often have to wait for your outputs, i.e. deliveries via the transportation services. In this case, if you increase your outputs of transportation services, that may serve the other sector to secure enough inputs and lead to increase in their outputs. In that sense, you may be the stimulator of other industrial sectors, but in different aspects, you may impede the growth of other industrial sectors. We can also think about a utility company that sells electricity to factories as intermediate goods. Increase in output in certain industrial sectors would lead to increase in outputs in other industrial sectors so that they can produce more outputs and fulfill final demands.

Here is one real example of how forward linkage works. There was a 6.8-magnitude earthquake in the Niigata area of Japan, where there are no car manufacturing facilities. But more than half of car manufacturers had to stop car production for 1 week, despite the existence of solid final demands from consumers. Why did they have to stop production despite the existence of a strong final demand? One manufacturing company that produced piston rings for engines stopped its supplies as their factory in Niigata was hit by the earthquake. The piston rings, which cost \$1–2 per piece at most, were important intermediate goods for car manufacturers. Even though the cost for the piston ring is so small, they are fundamental enough to stop the production of tens of thousands of cars, each of which can be sold for tens of thousand of dollars. Thus, this direction of analysis, from production of intermediate goods to delivery of final goods and services for consumption is called forward linkages and is supply-driven, as opposed to all the processes that we learned in previous sections.

When you conduct policy analysis of industries, you may compare each industrial sector's ratio of backward and forward linkages with the regional averages. If the backward linkages are higher than average, it indicates that the same amount of shock given to this industry will lead to higher type-I output multipliers. If the forward linkages are higher than average, it implies that the relative importance of output from this industrial sector is higher, and it should be determined if the level of output is enough to avoid bottleneck situations among the intricate interindustry dependence in the regional economy.



We can apply this knowledge to tourism industry analysis. If a certain tourism sector's backward linkages are relatively low, due to a higher portion of leakages such as imports of intermediate goods, increases in this sector's output may not stimulate the local industrial sectors as much as planners anticipated. If a luxurious resort hotel in a Caribbean island has an upmarket restaurant that imports most of its required ingredients, due to the leakage, the backward linkage to local industrial sectors will be very small, thus despite a surge in demand, it will not stimulate local economy.

A standard corporate finance textbook indicates that any businesses, including hotel management, should be of course driven by profit and by the notion of profit maximization. It is the absolute amount of revenue (and profit) that matters from the management point of view. From the viewpoint of development of a regional economy, it is not the absolute amount of revenue that is important – it is the degree of linkages of the tourism-related sectors to the host economy that truly matters.

A useful example of how this concept can be applied for analysis of tourism industry in the State of Hawaii has been published by Cai et al. (2006).

3.8.3 Inter-regional input-output and multiregional input-output

What we have seen are the single region/nation I-O model in which we classify one region as endogenous and all other regions as exogenous. As no nation can exist without varying degrees of trade with the RoW, there are trade activities of exports and imports in the transactions table. If a researcher is interested in details of flows of inputs and outputs, there are two methods to capture the details of regional linkages.

3.8.3.1 Inter-regional input-output

In the inter-regional input-output (IRIO) model, which is also referred to as the Isard model as Isard developed this structure in 1951, each region's industrial sectors over the other region's industrial sectors are shown in the form of submatrices. At the transactions table level, which we can use Z to represent a combined transactions table. To make it simple, we can use two regions, north region (N) and south region (S). The IRIO model is useful when industrial sectors of those regions have substantial linkages or interdependences.

$$Z = \begin{bmatrix} Z^{NN} & Z^{NS} \\ Z^{SN} & Z^{SS} \end{bmatrix}$$

The Z matrix with two regions consists of four submatrices, starting from upper left submatrix Z^{NN} , in which industrials sectors in N purchases goods and services from those in the same N, and lower-right submatrix Z^{SS} , in which industrials sectors in S purchases goods and services from those in the same S. Those are two submatrices where production activities form the same regions are captured.

The lower-left submatrix Z^{SN} shows that industrials sectors in N purchases goods and services from those in S region, capturing inter-regional purchase of inputs across the regional border. Similarly the upper-right submatrix Z^{NS} shows that industrials sectors in S purchases



		North			South		
		AG	MNF	Serv	AG	MNF	Serv
North	AG	z11	z12	z31	z11	z12	z31
	MNF	z21	NN z22	z32	z21	NS z22	z32
	Serv	z31	z32	z33	z31	z32	z33
South	AG	z11	z12	z31	z11	z12	z31
	MNF	z21	SN z22	z32	z21	SS z22	z32
	Serv	z31	z32	z33	z31	z32	z33

Figure 3-13 Inter-regional input-output model structure.

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

goods and services from those in the N, capturing inter-regional purchases of inputs on the opposite direction.

In a table structure, IRIO model’s transaction table appears as Figure 3-13.

Each purchase of input can be traced back to selling sectors in either regions in this model, assuming free movements of goods and services without restrictions. This structure will be applicable to two regions where there are no physical border controls and goods and services move to each other freely. State borders, or borders between two cities, would be similar to this structure.

3.8.3.2 Multiregional input-output

In the multiregional input-output (MRIO) structure, we still see two regions but the purchase of inputs from other regions will be captured by the formal structure of trade accounts. We will follow the presentation shown in the Miller and Blair (1985), which has been widely considered as a standard textbook of I-O for graduate students of regional science.

3.8.3.2.1 Trade table

In the MRIO structure, inter-regional flows of goods and services are first captured by the trade table. We will study two regions, east and west. z_i^{EW} Denotes the flow of goods i from east to west, irrespective of the exact purchasing sector in the west, which can be intermediate goods purchaser (i.e. industry) in the west or final demand consumer in the west. We can create a shipment table as shown in Table 3-18.

The first column in Table 3-18 can be added up to create the total amount and can be expressed as follows;

$$T_i^{W1} = z_i^{11} + z_i^{21} + z_i^{i1}$$

Then, each element in column is divided by the total of T_i^{W1} , to create coefficients representing the proportion of all of goods i from east used in the west. We will have an inter-regional trade coefficient, c_i^{EW} .



Table 3.18 Shipment table for multiregional input-output structure for commodity i.

Shipping region		Receiving region		
		W1	W2	Wj
E1		z_i^{11}	z_i^{12}	z_i^{13}
E2		z_i^{21}	z_i^{22}	z_i^{23}
Ei		z_i^{31}	z_i^{32}	z_i^{33}

$$c_i^{EW} = \frac{z_i^{EW}}{T_i^W}$$

$$C^{EW} = \begin{bmatrix} c_1^{EW} \\ c_2^{EW} \\ c_3^{EW} \\ \cdot \\ c_n^{EW} \end{bmatrix}$$

The column vector shows the proportion of goods that came from the region E to the region W. The next step is to construct a diagonal matrix, for the sake of calculations from the previous column vector. The new matrix will be a square matrix of $n \times n$ with all the elements with zeros except the diagonal line (from upper left to lower right), which is the diagonally transposed elements of the previous column vector.

$$\hat{C}^{EW} = \begin{bmatrix} c_1^{EW} & 0 & 0 & \cdot & 0 \\ 0 & c_2^{EW} & 0 & \cdot & 0 \\ 0 & 0 & c_3^{EW} & \cdot & 0 \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & 0 & \cdot & c_n^{EW} \end{bmatrix}$$

The circumflex (^) above C is a sign noting that column vector was transformed into a diagonal square matrix. Now that we have shown how to capture the inter-regional trade flows between two regions, there could be a similar matrix showing intraregional flows within the same region. There could be a matrix \hat{C}^{WW} with elements $c_i^{WW} = z_i^{WW}/T_i^W$ which shows the portion of goods (or services) i that had been produced in the region W and used within the region W. Again trade coefficients are shown along the diagonal line in the square matrix.

$$\hat{C}^{EW} = \begin{bmatrix} c_1^{EW} & 0 & 0 & \cdot & 0 \\ 0 & c_2^{EW} & 0 & \cdot & 0 \\ 0 & 0 & c_3^{EW} & \cdot & 0 \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & 0 & \cdot & c_n^{EW} \end{bmatrix}$$

$$A^E = \begin{bmatrix} a_{11}^E & a_{12}^E \\ a_{21}^E & a_{22}^E \end{bmatrix} \quad A^W = \begin{bmatrix} a_{11}^W & a_{12}^W \\ a_{21}^W & a_{22}^W \end{bmatrix} \quad \hat{C}^{EW} = \begin{bmatrix} c_1^{EW} & 0 \\ 0 & c_2^{EW} \end{bmatrix} \quad \hat{C}^{WW} = \begin{bmatrix} c_1^{WW} & 0 \\ 0 & c_2^{WW} \end{bmatrix}$$



Then in multiregional structure, we will use the matrix

$$\hat{C}^{EW} A^W = \begin{bmatrix} c_1^{EW} & a_{11}^W & c_1^{EW} & a_{12}^W \\ c_2^{EW} & a_{21}^W & c_2^{EW} & a_{22}^W \end{bmatrix}$$

which makes a contrast with the interregional modeling structure where we used the A^{NS} .

In the same manner, instead of using A^{NN} , which was used in the interregional modeling, MRIO uses

So, in the $\hat{C}^{WW} A^W = \begin{bmatrix} c_1^{WW} & a_{11}^W & c_1^{WW} & a_{12}^W \\ c_2^{WW} & a_{21}^W & c_2^{WW} & a_{22}^W \end{bmatrix}$ MRIO modeling, if we have:

$$A = \begin{bmatrix} A^E & 0 \\ 0 & A^W \end{bmatrix} \quad C = \begin{bmatrix} \hat{C}^{EE} & \hat{C}^{EW} \\ \hat{C}^{WE} & \hat{C}^{WW} \end{bmatrix} \quad X = \begin{bmatrix} X^E \\ X^W \end{bmatrix}$$

and

$$Y = \begin{bmatrix} Y^E \\ Y^W \end{bmatrix}$$

This can be shown as $(I - CA)X = CY$, which can be rewritten as $(I - CA)^{-1} CY = X$.

The MRIO model can be useful either when you do not have enough detailed data for two regions' trade patterns or when two regions have a formal border control over goods and services.

Now, let us use some numbers to see how the MRIO works. For the simplicity, let us use a 2×2 matrix for the region east and west.

$$A^E = \begin{bmatrix} 0.2 & 0.18 \\ 0.3 & 0.25 \end{bmatrix} \quad A^W = \begin{bmatrix} 0.15 & 0.29 \\ 0.22 & 0.21 \end{bmatrix}$$

$$\hat{C}^{EE} = \begin{bmatrix} 0.7 & 0 \\ 0 & 0.4 \end{bmatrix} \quad \hat{C}^{EW} = \begin{bmatrix} 0.2 & 0 \\ 0 & 0.3 \end{bmatrix} \quad \hat{C}^{WE} = \begin{bmatrix} 0.3 & 0 \\ 0 & 0.6 \end{bmatrix} \quad \hat{C}^{WW} = \begin{bmatrix} 0.8 & 0 \\ 0 & 0.7 \end{bmatrix}$$

Now we assume that there would be an increase of \$100 in final demand for the output of sector 1 in the region east. How can we calculate the impact on the total output for both regions east and west? Now consider the basic structure of MRIO and construct the matrices accordingly, so that you can calculate the necessary processes. In Figure 3-14 the processes are shown in the order. Namely:

- 1 create a combined A-matrix of two regions;
- 2 construct trade coefficients matrices;
- 3 multiply the combined trade coefficients matrix by the combined A-matrix to create CA;
- 4 create a combined final demand column vector to multiply C, so that you will have CY;
- 5 after deducting CA from the appropriate identity matrix, inverse the result to create a combined inverse matrix, so that the result can be multiplied by the combined column vector of

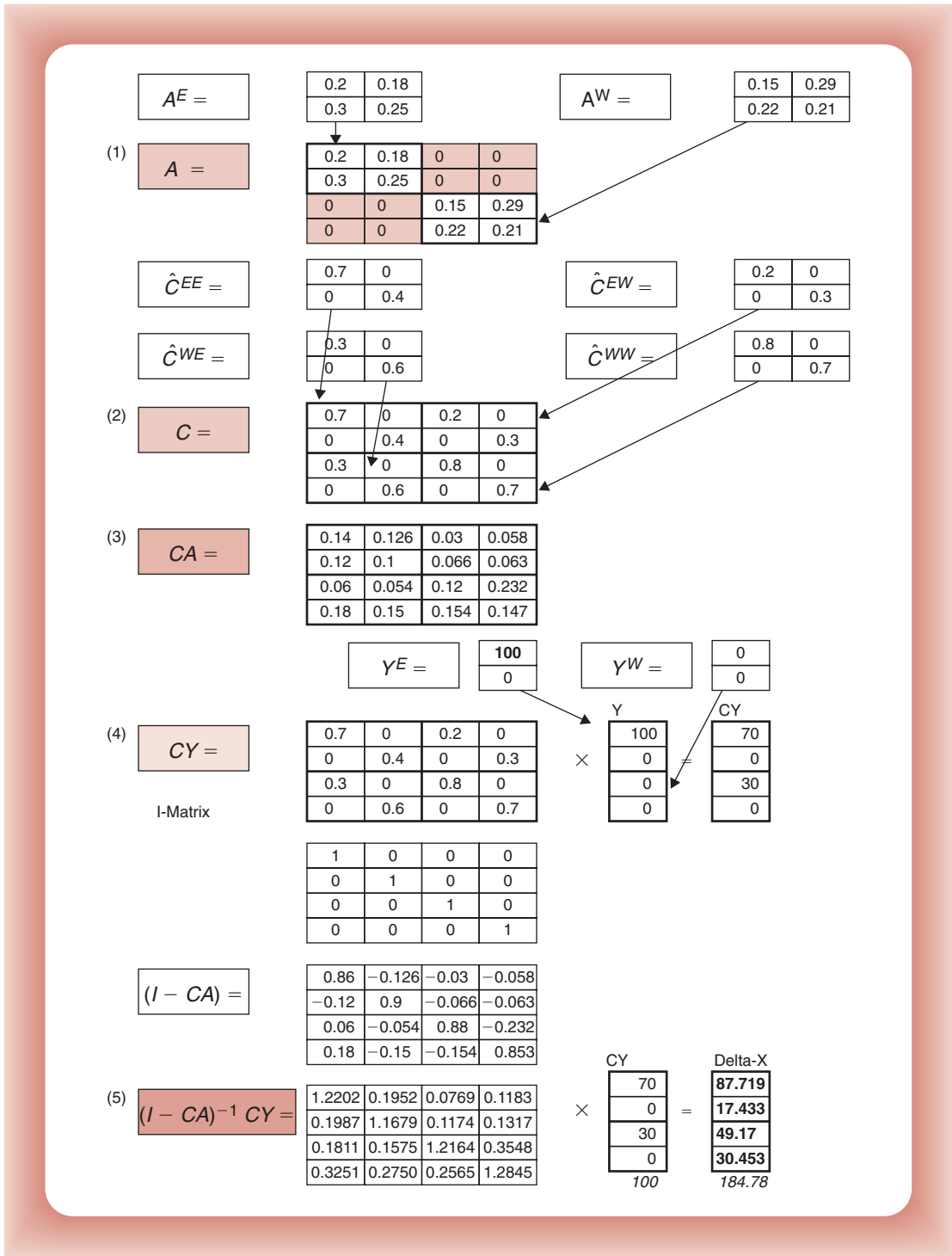


Figure 3-14 Calculation process of multiregional input output model for type-I output multiplier.

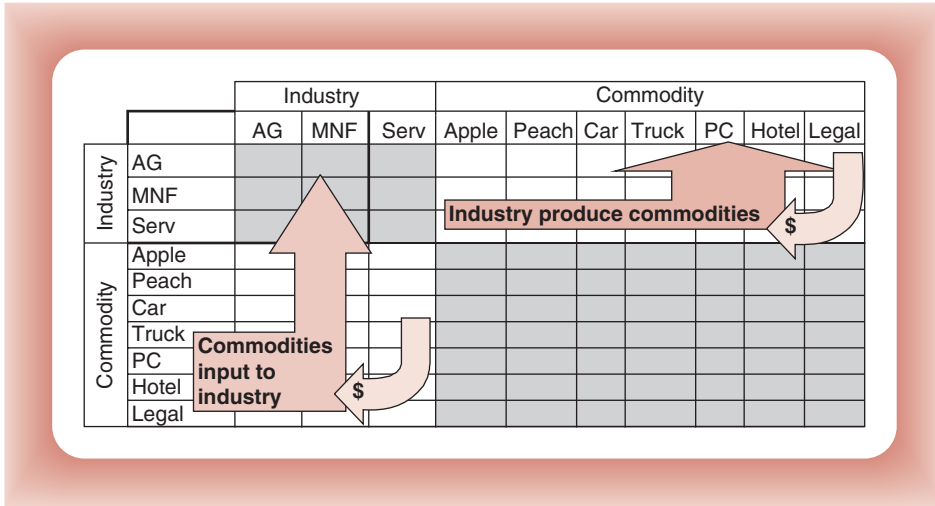


Figure 3-15 Transactions table with disaggregated industry and commodities
 Notes: AG, agricultural sector; MNF, manufacturing sector; PC, personal computer; Serv, service sector.

CY to generate change in total output not only for the region East, where the final demand occurred, but also for the region West, to be in line with the equation $(I - CA)^{-1} CY = X$.

In Figure 3-14, all the processes are shown step-by-step so that you can follow the calculation by using MS-Excel.

3.8.4 Industry and commodity

What we learned about I-O so far assumes that each industry produces one product that that is captured by one single number in each cell representing the total annual transactions value. If the cell where agricultural sector column and manufacturing row intersect shows '2', given a unit, for example millions of dollars, we know that total annual transactions occurred from manufacturing sector to agricultural sector were equivalent to \$2 million. Our assumption was that one industrial sector produces one commodity. But the industry is the entity that produces the commodity and it is possible that the industry produces more than two commodities. In that case, the main commodity that the industry produces is called primary commodity and others are called secondary commodity or byproducts. Commodities can be goods or services. For example, let us consider hotel operations in Japan or the Middle East where hotels have significant revenues from food and beverage sales. Then the hotel sector as an industry may produce lodging places as a primary commodity, and eating and drinking places as a secondary commodity, which can be fairly significant in comparison with data in other nations.

Figure 3-15 shows the basic flows of exchanges of goods (services) and money.

It is the industry that produces the commodity, so that industrial sectors produce and deliver commodities, and money flows from commodities to the industrial sector. It would be the commodities that are delivered either to other industries as intermediate goods (services)



		Industry			Commodity						
		AG	MNF	Serv	Apple	Peach	Car	Truck	PC	Hotel	Legal
Industry	AG										
	MNF										
	Serv										
Commodity	Apple										
	Peach										
	Car										
	Truck										
	PC										
	Hotel										
	Legal										

Figure 3-16 Make and use submatrices.

Notes: AG, agricultural sector; MNF, manufacturing sector; PC, personal computer; Serv, service sector.

or to final demands for consumption, and the money would flow in the opposite direction to the movement of commodities.

This concept will be useful when we learning about TSAs.

3.8.5 Make and use matrix

Once you have industry and commodity tables disaggregated from the I-O table, then you have make matrix and use matrix as shown in Figure 3-16.

The area where commodity rows intersect with industry columns is referred to as use table, which is a submatrix showing which commodities are purchased by the industrial sectors as intermediate inputs. The area where industry rows intersect with commodity columns is referred to as make table, which is a submatrix showing which commodities are produced by the industrial sectors as intermediate inputs for other industries. Note that in this structure, there will be no data at both the area where industry intersects with industry and the area where commodity intersects with commodities.

3.8.6 Producer price and purchaser price

Data in the transactions table of the I-O are recorded at the producer’s price. But the producer’s price is different from purchaser’s price. Let us consider one example. At the tourist area of Orlando, FL, there are many souvenir shops. If a tourist purchases a large high-quality bath towel, it costs \$28. But when it was produced at the factory, it was produced at \$10. Then the transportation cost was \$2, and the wholesaler’s margin was also \$5, so the wholesaler sold the towel to the retailer at \$17. There was another transportation cost of \$3 from the wholesaler to the retailer. Then the retailer finally sold the towel to a consumer at the price of \$28, with retail margin of \$8. When it comes to detailed economic impact analysis, you need to make sure which price is being used. This is shown in Figure 3-17.



	Margins	Price	
Towel factory		\$10.00	← Producer's price
Transportation	\$2.00	\$12.00	
Wholesaler	\$5.00	\$17.00	
Transportation	\$3.00	\$20.00	
Retailers	\$8.00	\$28.00	← Purchaser's price

Figure 3-17 Producer's price and purchaser's price.

3.8.7 Relationship between input-output table and the national accounts data

The following important equation has been taught in courses of macroeconomics, and Miller and Blair (1985) and Coughlin and Mandelbaum (1991) emphasized the relationship with System of National Accounts and with Input-Output framework.

$$Y = C + I + G + (E - M) \quad (3.11)$$

where Y is the GDP, C is the consumption, I is the investment, G is the government expenditures, E is the export, and M is the import.

Let us see how the I-O table structure is related to what you learned in macroeconomics. First, we will expand the structure of the basic I-O transaction table by expanding the final demand (FD) column into four columns and value added (VA) into three rows to demonstrate the concept clearer. The familiar 3×3 industrial sectors are left intact for easy comparison with the original I-O transaction table at the beginning of this chapter.

FD will have consumption (C : households' consumption), investment (I : private investment), government expenditures (G), and export (E : exporting goods and services outside of the study area). VA will have labor (L) and all other value added components (N : rent for leasing land, taxes for government services, interest for using somebody else's money).

To review the interpretation of the I-O structure, we will consider some of the elements. From a viewpoint of the households, $C1$ represents your purchase of agricultural goods, $C2$ the purchase of manufactured goods, and $C3$ the purchase of services, such as your dining out at the restaurant. LC represents your purchase of labor, such as you asked a neighbor's high-school child to wash your car for some money. NC represents your purchase of nonlabor value added, such as you borrowed a bicycle from your neighbor's child for some money. MC represents your purchase of goods and services from outside of the region, and an example in tourism context would be your expenditures that you made during your travel abroad (or outside of the study region).

Other examples in a tourism context would be the explanation along some rows. A theme park as an industrial sector would fall on the point 3. services sector of Figure 3-18. When the



		Ind (AX)			FD (Y)				Total output (X)
		1. AG	2. MNF	3. Serv	C	I	G	E	
Ind (AX)	1. AG	z11	z12	z13	C1	I1	G1	E1	X1
	2. MNF	z21	z22	z23	C2	I2	G2	E2	X2
	3. Serv	z31	z32	z33	C3	I3	G3	E3	X3
VA	L	L1	L2	L3	LC	LI	LG	LE	L
	N	N1	N2	N3	NC	NI	NG	NE	N
	M	M1	M2	M3	MC	MI	MG	ME	M
Total input (X)		X1	X2	X3	C	I	G	E	X

Figure 3-18 Expanded transactions table of input-output structure.

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

local residents come to visit your facility, their expenditures are captured at C3, and expenditures of visitors from outside of your study region (simple case would be foreigners) would be captured at E3. The area that is bounded by L1 to L3 and M1 to M3 means that local labor or capital were used by industrial activities as their required inputs, and residents must have received some payments in exchange.

Now, consider the total output column at the far right, and total input (X) row at the bottom.

The far right column (X) reads as follows;

$$X = X_1 + X_2 + X_3 + L + N + M \tag{3.12}$$

Now look at the bottom row (X).

$$X = X_1 + X_2 + X_3 + C + I + G + E \tag{3.13}$$

Combining two equations, we now have

$$X_1 + X_2 + X_3 + L + N + M = X_1 + X_2 + X_3 + C + I + G + E \tag{3.14}$$

After removing the industry transactions from both sides of the equation and we now see the shorter equation as

$$L + N + M = C + I + G + E \tag{3.15}$$

Further, let us put trade accounts together by moving the M to the other side of the equation.

$$L + N = C + I + G + (E - M) \tag{3.16}$$

This equation shows that, total amount of value added would be equal to the total amount of final demand, subject to trade account adjustment. Combination of L and N represents the total income received by the study region’s residents, and that is the gross regional income. The summation of C, I, and G shows total of consumption, investment, government expenditures



made, which constitutes final demand, and this is indeed the GRP. If the table is a national table, we are talking about the GDP, which in macroeconomics environment is expressed by Y.

Thus, the I-O transaction table displays the GDP (or GRP, if it is for a region) equation, showing solid connection to the System of National Accounts (SNA), which is the universal guideline for reporting national GDP.

3.8.8 Alternative Methods to estimate multipliers

There are alternative concepts to understand how the multipliers work and how they can be estimated. Here two methods are explained.

3.8.8.1 Using Keynesian multiplier formula

Some of you might have seen the formula using the marginal propensity to consume (MPC) in a standard tourism textbook (Goeldner and Ritchie, 2006).

Multiplier can be estimated as follows:

$$\text{Multiplier} = \frac{1}{1 - \text{MPC}} \quad (3.17)$$

Where M is marginal, P is propensity, and C is consume.

$$\text{MPC} = \frac{\Delta \text{Consumption}}{\Delta \text{Disposable income}} \quad (3.18)$$

A tourist group spends \$10 000 in the study region. The MPC has been estimated to be 0.5, which assumes that host region's industrial sectors and local people tend to spend 0.5, or half, of whatever they receive as additional revenues or income.

Then, in addition to initial expenditure by the tourist of \$10 000 will yield the following impacts by way of sequencing rounds of new expenditures as follows (Table 3-14).

As you can see in Table 3-14, with the MPC of 0.5, the initial expenditure of \$10 000 results in the accumulated impact of \$20 000, which yields the multiplier of 2. MPC and the resulting multiplier appear to have the multiplicative inverse relationship. Let us see if that holds with two other cases: case 2 with an MPC of 0.7 and case 3 with an MPC of 0.3 (Table 3-16).

By considering cases 2 and 3, MPCs and the resulting multipliers do not hold a multiplicative inverse relationship. What you can see is the substantial difference in multipliers in response to a small change in parameters. If you look at the sum of all the responding rounds in three cases, excluding the identical initial impact of \$10 000, case 1 was \$10 000, case 2 was \$23 324.21, and case 3 was \$4285.71. While this method remains versatile and useful, we are reminded of its sensitivity to one single parameter. Marginal propensity to save (MPS) is simply the remaining part of the income after you spent some portion. So, $\text{MPS} = 1 - \text{MPC}$.

$$\text{MPS} = \frac{\Delta \text{Savings}}{\Delta \text{Disposable income}} \quad (3.19)$$

Saving is considered as leakage to the regional economy, as you removed the money from circulation. Another leakage is import. When you import goods and services, money flows



Table 3-19 Keynesian estimation of multipliers with MPC = 0.5 as a parameter (case 1).

Case 1	Parameter Table MPC = 0.5		
	Additional Impact per round	Accumulated Impacts	Relative Size of Response
0 round	\$10 000.00	\$10 000.00	1
1 round	\$5 000.00	\$15 000.00	1.5
2 rounds	\$2 500.00	\$17 500.00	1.75
3 rounds	\$1 250.00	\$18 750.00	1.875
4 rounds	\$625.00	\$19.375.00	1.9375
5 rounds	\$312.50	\$19 687.50	1.96875
6 rounds	\$156.25	\$19 843.75	1.984375
7 rounds	\$78.13	\$19 921.88	1.992188
8 rounds	\$39.06	\$19 960.94	1.996094
9 rounds	\$19.53	\$19 980.47	1.998047
10 rounds	\$9.77	\$19 990.23	1.999023
11 rounds	\$4.88	\$19 995.12	1.999512
12 rounds	\$2.44	\$19 997.56	1.999756
13 rounds	\$1.22	\$19 998.78	1.999878
14 rounds	\$0.61	\$19 999.39	1.999939
15 rounds	\$0.31	\$19 999.69	1.999969
16 rounds	\$0.15	\$19 999.85	1.999985
17 rounds	\$0.08	\$19 999.92	1.999992
18 rounds	\$0.04	\$19 999.96	1.999996
19 rounds	\$0.02	\$19 999.98	1.999998
20 rounds	\$0.01	\$19 999.99	1.999999
21 rounds	\$0.00	\$20 000.00	2
22 rounds	\$0.00	\$20 000.00	2

in the opposite direction from the local economy to outside of the local economy. So another version of the estimation of multiplier would be:

$$\text{Multiplier (with leakage of imports considered)} = \frac{1}{(1 - MPC + MPI)} \tag{3.20}$$

where

$$MPI = \text{marginal propensity to import} = \frac{\Delta \text{Imports}}{\Delta \text{Disposable income}} \tag{3.21}$$

For example, with MPC = 0.5, the previous case showed the multiplier of 2. Now let us assume that MPI = 0.1.

Then the multiplier with import leakage considered would be

$$\frac{1}{(1 - MPC + MPI)} = \frac{1}{(1 - 0.5 + 0.1)} = 1.667$$



Table 3-20 Keynesian estimation of multipliers with MPC = 0.7 as a parameter (case 2; a) and MPC = 0.3 as a parameter (case 3; b)

(a) Case 2			
Parameter Table MPC = 0.7			
	Additional Impact per round	Accumulated Impacts	Relative Size of Response
0 round	\$10 000.00	\$10 000.00	1
1 round	\$7 000.00	\$17 000.00	1.7
2 rounds	\$4 900.00	\$21 900.00	2.19
3 rounds	\$3 430.00	\$25 330.00	2.533
4 rounds	\$2 401.00	\$27 731.00	2.7731
5 rounds	\$1 680.70	\$29 411.70	2.94117
6 rounds	\$1 176.49	\$30 588.19	3.058819
7 rounds	\$823.54	\$31 411.73	3.141173
8 rounds	\$576.48	\$31 988.21	3.198821
9 rounds	\$403.54	\$32 391.75	3.239175
10 rounds	\$282.48	\$32 674.22	3.267422
11 rounds	\$197.73	\$32 871.96	3.287196
12 rounds	\$138.41	\$33 010.37	3.301037
13 rounds	\$96.89	\$33 107.26	3.310726
14 rounds	\$67.82	\$33 175.08	3.317508
15 rounds	\$47.48	\$33 222.56	3.322256
16 rounds	\$33.23	\$33 255.79	3.325579
17 rounds	\$23.26	\$33 279.05	3.327905
18 rounds	\$16.28	\$33 295.34	3.329534
19 rounds	\$11.40	\$33 306.74	3.330674
20 rounds	\$7.98	\$33 314.72	3.331472
21 rounds	\$5.59	\$33 320.30	3.33203
22 rounds	\$3.91	\$33 324.21	3.332421

(b) Case 3			
Parameter Table MPC = 0.3			
	Additional Impact per round	Accumulated Impacts	Relative Size of Response
0 round	\$10 000.00	\$10 000.00	1
1 round	\$3 000.00	\$13 000.00	1.3
2 rounds	\$900.00	\$13 900.00	1.39
3 rounds	\$270.00	\$14 170.00	1.417
4 rounds	\$81.00	\$14 251.00	1.4251
5 rounds	\$24.30	\$14 275.30	1.42753
6 rounds	\$7.29	\$14 282.59	1.428259
7 rounds	\$2.19	\$14 284.78	1.428478
8 rounds	\$0.66	\$14 285.43	1.428543
9 rounds	\$0.20	\$14 285.63	1.428563
10 rounds	\$0.06	\$14 285.69	1.428569
11 rounds	\$0.02	\$14 285.71	1.428571



(b) Case 3 Parameter Table MPC= 0.3			
	Additional Impact per round	Accumulated Impacts	Relative Size of Response
12 rounds	\$0.01	\$14 285.71	1.428571
13 rounds	\$0.00	\$14 285.71	1.428571
14 rounds	\$0.00	\$14 285.71	1.428571
15 rounds	\$0.00	\$14 285.71	1.428571
16 rounds	\$0.00	\$14 285.71	1.428571
17 rounds	\$0.00	\$14 285.71	1.428571
18 rounds	\$0.00	\$14 285.71	1.428571
19 rounds	\$0.00	\$14 285.71	1.428571
20 rounds	\$0.00	\$14 285.71	1.428571
21 rounds	\$0.00	\$14 285.71	1.428571
22 rounds	\$0.00	\$14 285.71	1.428571

Again, the concept of this method is very useful, and this method is actually easier to use. It gets a little more challenging to use this method only when you have an access the rigorous I-O data of the study region, from which you can actually calculate various multipliers and the impact analyses for each industrial sectors.

3.8.8.2 Power series approximation of multipliers^{(I - A)⁻¹}

There is also an approximation of effect of multipliers without using the matrix computations that we made. It is just a more mathematically intensive explanation than the previous Keynesian multiplier estimation. The discussions by Miller and Blair will be followed here. Recall in matrix notations in which $0 < A < 1$ (to be precise, all the elements in the A-matrix should be larger than 0: $a_{ij} \geq 0$ for all i and j).

If you remember how you created the A-matrix, you can agree that each of the column sums will be < 1 . Why can we say so? Each industrial sector purchases some amount of value added (such as labor, capital, and imports) that we disregarded in the process of creating A-matrix.

So we can say that:

$$\sum_{i=1}^n a_{ij} < 1 \text{ for all } j$$

(sum of all the coefficients from row 1 to row n along each column in the A-matrix is always smaller than 1, for all the columns)

Now let us consider some matrices equations.

$$(I - A)(I + A + A^2 + A^3 + A^4 \dots A^n)$$

where, for square matrices, $A^2 = AA, A^3 = AAA = AA^2$ and they continue as such.

Now proceed with the above equation.

$$(I - A)(I + A + A^2 + A^3 + A^4 + \dots A^n) = I + A + A^2 + A^3 + A^4 + \dots A^n - A - A^2 - A^3 - A^4 + A^5 + \dots A^{n+1}$$



It appears that you can simplify the equation by erasing + and - , or you match one with another with a different sign.

$$I + A + A^2 + A^3 + A^4 + \dots A^n - A - A^2 - A^3 - A^4 - A^5 - \dots A^{n+1} = I + A - A + A^2 - A^2 + A^3 - A^3 + A^4 - A^4 + A^5 - A^5 \dots + A^n - A^n - \dots A^{n+1}$$

So, after simplifying the equation we have:

$$(I - A^{n+1})$$

Now let us assume that we have a very large n , such as infinity ($n \rightarrow \infty$). The elements in the matrix A^{n+1} will all become zero. ($A^{n+1} \rightarrow 0$)

Now that $A^{n+1} \rightarrow 0$, then $(I - A^{n+1})$ will be $(I - 0) = I$

Now, $(I - A)(I + A + A^2 + A^3 + A^4 \dots A^n) = I$, then by definition $(I - A)$ can become I only when it is multiplied by its multiplicative inverse, $(I - A)^{-1}$

$$(I - A)(I - A)^{-1} = I$$

So we can say that $(I - A)^{-1} = (I + A + A^2 + A^3 + A^4 \dots A^n)$

Since $(I - A)^{-1} Y = X$, $(I + A + A^2 + A^3 + A^4 \dots A^n) Y = X$

Then remove the parenthesis, we will have $Y + AY + A^2Y + A^3Y + A^4Y + \dots A^nY = X$
 $Y + AY + A(AY) + A(A^2Y) + A(A^3Y) + \dots A(A^n Y) = X$

What we see here is that each term after the initial round is the preceding term multiplied by A . This is similar to normal algebra in which

$$\frac{1}{(1 - a)} = 1 + a + a^2 + a^3 + \dots a^n,$$

for $|a| < 1$.

Individual terms in the power series approximation show the round-by-round effects. This way, without using the Leontief inverse matrix, you can estimate the magnitude of effects.

3.8.9 Regional analysis

There are series of certain useful knowledge when you conduct regional analysis, or unit of areas which is smaller than a nation.

3.8.9.1 Regional purchase coefficient (RPC)

Each region produces certain amount of goods and services which may be enough to meet local demands. If the regional production can satisfy only 60% of the local demands, then regional purchase coefficients is 0.6 and we assume the remaining 0.4 is met by imports of those good and services from outside of the region in question.

Formally, the regional purchase coefficient is the ratio of locally fulfilled demand by locally produced outputs to the total regional demands.

Let's define that z_i^{RR} represents shipments of goods i from producers in the region R to all the purchasers in the same region R and $z_i^{\bar{R}R}$ represents shipments of good i from producers outside of the region (=imports) to all the purchasers in the region R .



Then,

$$RPC_i^R = \frac{z_i^{RR}}{(z_i^{RR} + z_i^{\tilde{R}R})}$$

This equation can be rewritten (by dividing the numerator and denominator by z_i^{RR})

$$PRC_i^R = \frac{1}{\left(1 + 1 / \left(z_i^{RR} / z_i^{\tilde{R}R}\right)\right)}$$

And as you may noticed, $1 - RPC_i^R =$ proportion of import of goods i to the region R .

3.8.9.2 Location quotient

Each local region has unique characteristics in terms of produced goods and services. Some regions are good at producing certain goods and some tend to lag behind other regions for production of certain commodities (goods and services).

How we can formally consider the degree of concentration of certain outputs? If we have input-output data on the region in question and those on the national level, we can answer such question. If we put the output of sector i in the region R as X_i^R and total output in the region as X^R , by dividing the former by the latter we see the relative share of the output of sector i in the region R . If we put the output of sector i in the nation N as X_i^N and total output in the region as X^N , by dividing the former by the latter we see the relative share of the output of sector i in the nation. Having both the relative share of the same industrial sector i both at regional and national level, we can compare the relative shares of industrial sector i as follows.

$$LQ_i^R = \left[\frac{X_i^R / X^R}{X_i^N / X^N} \right]$$

If $LQ_i^R = 0.04 / 0.015 = 2.66$, then we can say that the region R is more specialized in the production of the output i than in the nation. So, the $LQ_{accommodations}^R > 1$, it shows more concentration of accommodations sector in the region R than national average, indicating higher tourism-industry dependency than national average. If the $LQ_i^R < 1$, we can say the industry is less localized or less concentrated in the region R than national average.

The following will provide useful information for conducting regional analysis, or units of areas that are smaller than a nation.

3.9 Questions from students

Here are some questions that the author has received in the classroom, in the discussion board of the internet-based teaching management system (Blackboard, WebCT), and by e-mails. While the author acknowledges that they may not be the best answers and that there can be better explanations, these were examples of few of the many possible answers that were given to students.



3.9.1 Timeliness

1 I see that I-O tables are created once in 5 years and it is already a few years behind when the latest table is announced. Isn't it too old when they come out?

If you are looking at absolute numbers, yes, they can be quickly outdated just like financial statements. However, as you recall how you created the A-matrix, what we are more interested in would be the relative relationship of industrial sectors in terms of interdependencies. So the data will not become obsolete as quick as absolute numbers. Imagine that all the industrial sectors grew equally across the different sectors, so that relative dependencies on other industrial sectors did not change. Then there would be no changes in each technical coefficient, elements in the A-matrix.

Now, you may ask how stable the technical coefficients would remain over the longer term, such as 10, 20, or 30 years. That is a question of whether the economic structure of the nation/region of your study changes over time or not. This issue is more formally discussed as a temporal stability of technical coefficients in the I-O table. While the sources for errors in technical coefficients derive mainly from measurement errors in the data collection for transactions and/or temporal stability of technical coefficients, there are interesting research papers on this issue in the regional science (see question (2)).

So the technical coefficients change over longer time. Then your next question would be what to do. There are two ways to respond. First option is to wait for the updated data to be released by the government, and until then use the latest data available for your study. Second option is to try to update the existing I-O table by nonsurvey method, or method also known as RAS method, which is an optimization method to estimate each coefficients from the newer data on total output and total input of each industrial sectors. For details of nonsurvey method to update the existing I-O, I will explain more in the answer for question (2).

2 I heard that there are methods to update the I-O table by myself. How can I do that?

There are series of research papers along this topic. We often face a situation in which we have I-O or SAM data for a target region that dates back years or even decades. The need to update an old I-O/SAM table had been recognized widely and the issue was first documented by Stone and Brown (1962), identifying bi-proportional analysis as the best known and most widely used technique for revising interindustry coefficients in the I-O table with partial information on the new target year. That method, which later became known as RAS, was to create a new I-O table for a target year without using the full survey method but rather using only the target year's total intermediate inputs and outputs, and total industry outputs used to modify the older table. This method can therefore produce n^2 numbers of interindustry coefficients with only $3n$ pieces of information on the target year. For technical details on the way RAS works, please refer to Miller and Blair (1985).

Bacharach (1970) showed in his monograph that the RAS method was the basis for current systematic methods for updating the I-O/SAM with limited current data. The RAS



method was devised as an operational technique and not as a theoretical construct; thus, verification of testing and evaluation of its performance did not follow. Lecomer (1975) put the RAS method in perspective with other methods using the same limited information problem. He concluded that none of the other methods was as successful as RAS, and that this is attributable to the extremely slender informational basis of other methods. Barker (1977) reached a similar conclusion after exploring a series of experiments in which he used trends in forecasting changes in coefficients, allowing for price substitution and incorporating nonhomogeneous production functions. His findings were that an application of a single, comprehensive assumption applied to all the coefficients in the interindustry matrix is not appropriate because some coefficients tend to show the changes independently of the assumption.

Urata (1988) demonstrated that gradual changes in production structure in the Union of Soviet Socialist Republics (USSR) significantly raised capital requirements, in contrast to their significantly negative effect on labor requirements, while the changes in the composition of final demand had the least effect between 1959 and 1972. This is another example of documenting changes in economic structure over time. Tchijov and Sytchova (1987) analyzed the historical data on Japan and attributed the change of coefficients in six different periods from 1951 to 1980 to three divided causes – labor, material, and fixed capital inputs – to show what the major causes of changes in coefficients were in each period.

Sevaldson (1970) pointed out that in general aggregation, I-O tables tend to make the coefficients either more stable or more variable. He stated that increased stability occurs when sectors are aggregated, thereby absorbing the possible substitution effect. The coefficients for use of the sum of their products may be expected to be more stable than the coefficients for the use of each of them individually. As for increased instability, he pointed out that when two or more sectors with different coefficients for the same input are combined, the aggregate coefficient will be an average of the coefficients of the individual sectors, and the average will depend on the relative weight of production in each sector. This means the average coefficient will vary depending on the relative weight even though individual coefficients are constant. The paper demonstrated his arguments by using Norwegian I-O data. Vaccara (1970) discussed the possible causes of changes over time in I-O coefficients using data on the US. The paper states 'Changes in production process do not affect the total capacity of an industry at once – existing capacity in good working order is rarely scrapped because a newer, different, or more efficient production process has been introduced.' The author was dealing with the large industrialized economy of the US, so it is understandable that changes in the technical relationship for an entire economic system occur slowly and orderly.

This general assumption, that changes in regional economic systems occur gradually, slowly, and mostly as a positive, continuous cycle of evolution, appears to be the common denominator across most of the papers in the heyday of the I-O updating methodology discussion of the 1970s and 1980s.



While the topics of estimating technical coefficients were abundant in the past, there are some recent advances of discussions on re-evaluating the RAS method.

Toh (1998) applied the RAS method directly to the Leontief inverse matrix with a modified method to overcome technical problems, though he admitted that the modified method did not necessarily yield better results than the RAS method. Jackson and Murray (2004) evaluated results from various alternative methods and the RAS method, and found that alternative methods can perform sometimes better along certain dimensions and in certain contexts. Linden and Dietzenbacher (1995) verified the appropriateness of the RAS technique with every 5-year data between 1965 and 1985 of member states of the EU, and claimed usefulness of the RAS method. A paper by Percoco et al. (2006) has an extensive review of previous papers about this issue and provides empirical evidence on the structural changes in the Chicago economy. In the paper, the result of simulations show that all the internal multipliers declined over time due to 'the interplay of outsourcing, changes in ownership patterns, and increased intrasector specialization in the face of a general trend ...'

This topic is a relatively intense topic for hospitality and tourism students, but research in the regional science area is abundant.

3 Where is the confidence interval? We just learned in statistics methodology class about error terms and inferential statistics such as confidence intervals. I thought they were cool. Where are those methods in this modeling?

Even though the I-O modeling is highly quantitative by nature, it is what is termed a deterministic modeling, with fixed coefficients. There are no error terms, and that is the reason why the results of I-O simulations come up with such a precise numbers as '12 876 new jobs will be created', or 'increase in total output of \$31 712 983'. This does not warrant accuracy with that level of precision. It would be more prudent to utilize some rounding up method when you present the results. At the initial stage of your I-O study, you may consider the I-O model as purely deterministic model.

There have been some attempts to incorporate the stochastic ingredients into the deterministic I-O modeling. One way is to deal with the technical coefficients in the A-matrix, which is similar to the discussion of updating technical coefficients. The other way is to introduce stochastic characters into the composition of final demand, which can be expressed as dependent variables of econometric models.

4 How do you find I-O? If you do not find it, can you make one by yourself?

I am originally from a Caribbean island nation and the I-O modeling would be extremely useful. Where can I find I-O for my country? If I do not find it, is this something I can make with your guidance?

First, you probably have to search for the existence of I-O yourself. Thanks to abundance of online source, the search is by far easier than before the introduction of the internet. According to one source in 2001, there were 83 nations to make up the I-O table. Once they make I-O table, they tend to share the information with researchers through enquiry or merely through their web pages.



If you do not find an I-O data of the nation that you wish to study, this poses some challenges. Making the I-O data from scratch is not a task for a single researcher, but for a group of multiple government offices with several tens of staffs working together.

5 How do nations make the I-O table? Can our small nation build the I-O table?

I think a better answer would be to quote one of the examples. My explanation is based on the English document entitled *2000 Input-Output Tables for Japan* prepared by the Ministry of Internal Affairs and Communications, Japan (Ministry of Internal Affairs and Communications, 2005). Having been inspired by the successful research on the US economy by Dr. Leontief, the Japanese government started to create first I-O table in 1955. Since then the I-O table has been renewed every 5 years by the joint efforts of 10 different government ministries, an office and an agency, and their primary responsibilities are divided as follows:

- Ministry of Internal Affairs and Communications:
 - Planning, liaising, coordination, and publication,
 - Computerized tabulation and analysis,
 - Export and import sectors,
 - Communications and broadcasting sectors;
- Cabinet Office:
 - Personal service and public service sectors (exclusive of those covered by other authorities),
 - Final demand sectors (exclusive of export and import sectors),
 - Gross value added sectors (exclusive of employee compensations);
- Financial Services Agency:
 - Finance and insurance sectors;
- Ministry of Finance:
 - Salt, alcohol, tobacco, legal, financial, and accounting service sectors;
- Ministry of Education, Culture, Sports, Science, and Technology:
 - Education and research institute sectors;
- Ministry of Health, Labor, and Welfare:
 - Medicine, water supplies (exclusive of those covered by other authorities), medical services, health, social security and environmental health services sectors,
 - Worker dispatching services sectors,
 - Compensation of employees sectors;
- Ministry of Agriculture, Forestry and Fisheries:
 - Agriculture, forestry, fishery, and food industries sectors (exclusive of salt, alcoholic beverages, and tobacco);
- Ministry of Economy, Trade and Industry:
 - Mining and manufacturing industries (exclusive of those covered by other authorities), electricity, gas and heat supply, wholesale and retail trade, as well as business services sectors (exclusive of those covered by other authorities),
 - Office supplies;



- Ministry of Land, Infrastructure, and Transport:
 - Construction, real estate, and civil engineering sectors,
 - Transport, ships, and rolling stock sectors;
- Ministry of the Environment:
 - Waste treatment services.

Since the original book has 636 pages, my intent is to remind you of the overwhelming amount of labor required to create the I-O table from scratch.

Overview of the Process of I-O table creation – The Japanese government made clear explanations on the procedure and intensity of the workload to create the I-O table. Basically the processes are divided into the following five steps:

- a) estimate the row and column for domestic production by sector (total outputs and total input shown at the far-right and bottom of the table) using various censuses and surveys;
- b) estimate the breakdown of all inputs (interindustry inputs and value added sectors) in the column direction, then breakdown of all outputs in the row direction;
- c) figures in the tables are based on purchasers' prices, they are converted into producers' prices;
- d) discrepancies between input data and output data will be adjusted to balance and match;
- e) after the producers' prices are balanced, purchasers' prices are balanced incorporating trade margins and transportation costs in each value to be compiled in a table, which become the basic transaction table.

Balancing numbers in the transaction table requires approximately 200 000 cells for endogenous sectors only, so you understand why Japanese government had to host five extensive meetings, each lasting 4 days and attended by a total of some 1000 related staff members from all pertinent authorities.

So if a nation that you are interested does not have an I-O table, it can be a daunting task for you as a single student to create one with reasonable accuracy. It would be better for you to consult with the government of that nation, because there is a possibility that a nation might have collaborated with officers from the World Bank to create some pro-forma version.

As for the US, Horowitz and Planting (2006) at the BEA, US Commerce Department created highly detailed documentation on the US I-O table, including the data source. The document is entitled *Concepts and Methods of the Input-Output Accounts* (Horowitz and Planting, September 2006; available online at <http://www.bea.gov>).

6 Limitations look devastating, is it still worth studying the I-O and SAM?

Just like any models, the I-O model has limitations as we have notes. I think the answer depends on how you put the advantages and disadvantages in perspective. We know that driving a car can be dangerous, because we know many people are killed by car-related accidents. Unless you live in metropolitan cities such as New York, London, Paris, Tokyo, or Seoul, where public transportation is highly developed for mass transportation, you have no other choice but to drive a car. Because the benefits outweigh the risks, you still drive a car. You just have to be careful when driving.



3.10 Chapter 3 problems

Q3-1 Solve the following tasks without using a computer.

1 You see two matrices of A and B as follows.

$$A = \begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$$

Using pen and a paper, calculate:

$$A + B = ?$$

2 With the same matrices of A and B , calculate:

$$A - B = ?$$

3 Calculate the inverse of matrix A .

$$A^{-1} = ?$$

4 Multiply matrix A by its inverse A^{-1}

$$AA^{-1} = ?$$

Q3-2 Using MS-Excel, follow the instructions from step 1 to step 7.

1 How much input did the service sector purchased from Manufacturing sector?

Transaction T	Ag	MFG	Serv	FD	Total Output
Agriculture	3	5	6	9	23
Manufacturing	2	4	8	10	24
Services	8	5	5	12	30
Value Added	10	10	11		
Total Input	23	24	30		

2 Copy and fill in the numbers from above, but w/o FD and Total Output columns.

Transaction T	Ag	MFG	Serv
Agriculture			
Manufacturing			
Services			
Value Added			
Total Input			

3 Standardize each elements.

Standardizing	Ag	MFG	Serv
Agriculture			
Manufacturing			
Services			
Value Added			
Total Input			



4 Copy and create A-matrix (3 × 3 square matrix), dropping VA and Total Input.

A-Matrix	Ag	MFG	Serv
Agriculture			
Manufacturing			
Services			

5 Type appropriate numbers to create the (3 × 3) I-Matrix

I-Matrix

6 Subtract the A-matrix from I-matrix.

(I – A)	Ag	MFG	Serv
Agriculture			
Manufacturing			
Services			

7 Inverse the (I – A) matrix.

(I – A) ⁻¹	Ag	MFG	Serv
Agriculture			
Manufacturing			
Services			

(3 × 3)

Once you calculate the results for step 7, indicate which sector has the higher type-I output multiplier?

Q3-3 You are given the 15 × 15 transaction table of a US economy in 1999 as follows. This sheet can be found in the attached MS-Excel sheet.

I have already created basic formats in the sheet for you so that you do not have to type. You just have to think and calculate. Here are your tasks.

1 By using this transaction table create an A-matrix by standardizing elements. (5 points)

Commodities/Industries: Inter-Industry Transaction Matrix		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	(US\$ million)	
IOCode	Name	Agriculture, forestry, fishing, and hunting	Mining	Utilities	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing	Information	Finance, insurance, real estate, rental, and leasing	Professional and business services	Educational services, health care, and social assistance	entertainment, recreation, accommodation, and food services, except government	Government	Total Final Uses (GDP)	Total Commodity Output	
1	Agriculture, forestry, fishing, and hunting	55 800	1	23	912	138 434	1993	258	8	11	1510	5950	603	9154	304	1551	35 794	252 306
2	Mining	386	22 476	60 507	5686	139 358	17	10	2519	1	1451	106	10	28	8	9497	-61,579	180 481
3	Utilities	5958	2574	359	3078	48 427	5412	12 364	3311	4819	28 519	14 330	11 433	15 736	5937	48 192	176 990	387 440
4	Construction	895	33	5446	1014	8118	2040	4017	1452	3443	28 388	8256	9357	6248	3735	44 271	868 763	995 474
5	Manufacturing	46 582	17 781	13 808	207 916	1 257 656	40 653	57 564	60 001	69 820	80 111	78 627	114 361	99 728	57 606	194 326	1 400 908	3 797 446
6	Wholesale trade	10 432	2658	2249	23 094	221 251	23 002	7539	11 768	12 030	9909	13 264	16 767	19 517	8583	29 898	447 463	859 423
7	Retail trade	165	287	98	47 482	10 269	1780	2840	1578	541	11 085	5979	2244	2116	6726	156	907 831	1 001 177
8	Transportation and warehousing	7590	4705	24 518	15 712	117 205	13 613	17 547	71 823	9147	27 436	22 354	14 208	8812	5287	35 469	189 589	585 017
9	Information	1178	467	750	8761	38 819	13 147	15 495	9036	193 016	27 802	68 779	33 419	15 520	12 538	58 631	357 572	854 932
10	Finance, insurance, real estate, rental, and leasing	14 229	17 657	8448	29 222	100 451	37 975	69 142	30 251	59 948	570 465	111 938	115 665	57 455	39 889	75 169	1 877 909	3 215 812

(Continued)

Commodities/Industries: Inter-Industry Transaction Matrix		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	(US\$ million)	
IOCode	Name	Agriculture, forestry, fishing, and hunting	Mining	Utilities	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing	Information	Finance, insurance, real estate, rental, and leasing	Professional and business services	Educational services, health care, and social assistance	entertainment, recreation, accommodation, and food services	Other services, except government	Government	Total Final Uses (GDP)	Total Commodity Output
11	Professional and business services	4767	14 160	10 680	77 411	310 604	83 443	122 422	50 723	119 131	239 495	279 027	127 013	48 998	43 689	197 095	384 383	2 113 039
12	Educational services, health care, and social assistance		9 107	633	105	2 605	700	517	510	2519	955	2129	11 565	600	842	31 559	1 401 975	1 457 327
13	Arts, entertainment, recreation, accommodation, and food services	395	840	1221	2018	18 959	4737	5866	4049	15 270	22 726	28 512	21 189	20 529	4172	20 478	577 658	748 618
14	Other services, except government	3259	287	917	10 189	44 013	7095	7806	8554	13 854	22 132	22 201	11 078	7695	6172	28 486	383 720	577 457
15	Government	113	28	398	1167	3232	3247	4473	1172	4594	9147	13 182	14 200	3218	3746	9607	1 646 870	1 718 393
Total Value Added		98 616	105 593	201 644	464 853	1 351 630	622 864	765 804	294 878	483 972	2 125 736	1 220 153	793 132	371 515	253 712	1 326 717	10 480 820	–
Total Industry Output		250 491	190 550	331 777	899 129	3 852 724	869 537	1 094 575	567 444	1 000 982	3 223 070	1 901 251	1 296 479	687 227	454 007	2 128 664	–	18 747 908



- 2 The third table is the 15×15 identity matrix (I-matrix). Using the A-matrix and I-matrix, calculate the $(I - A)$ -matrix and show the result in the fourth table. (5 points)
- 3 Based on the fourth table $(I - A)$ -matrix, calculate an inverse of $(I - A)$ -matrix. (5 points)
- 4 Having calculated the inverse of $(I - A)$ -matrix, sum up the column elements to show the output multiplier in each sector. (10 points)
- 5 Now that you have the inverse of $(I - A)$ -matrix (15×15 : yellow part only), why do you not simulate the following economic impact analyses for the leader of this economy as follows?
 - (a) Implement a policy to increase final demands for the goods and services of the information sector by \$400 million. (5 points)
 - (b) Implement a policy to increase final demands for the government by \$400 million. (5 points)
 - (c) Implement a policy to increase final demands for the Wholesale Trade sector by \$400 million. (5 points)
- 6 If your business is in *the accommodation/food services*, and you wish to vote for the policy to maximize a positive impact on your sector (sector #13), which policy will it be? Type out an appropriate number in the space in the MS-Excel Sheet. (10 points)

Hint: You MUST go through the exercises of Cyber Lab 1-1, which is posted on my web page (note: this is to be included in the attached CD-R). The case is designed in a way that without Cyber Lab 1-1, you have no way to figure out what to do. YOU CANNOT DO THIS at the last minute.

Hint: We have 15×15 square matrix, and you will need 15×1 column vector as a change in final demand ($\Delta FD = \Delta Y$). If you multiply the square matrix with the column vector, what you have will be another column vector.

$$(I - A)^{-1} \times \Delta Y = \Delta X$$

$$(15 \times 15) \times (15 \times 1) = (15 \times 1)$$

Appendix 3-1

How to calculate the inverse matrix of a 3×3 square matrix

We have a 3×3 square matrix A. This is one of the methods of how you can calculate the inverse of a 3×3 square matrix manually.

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Determinant of A = $a_{11}a_{22}a_{33} + a_{21}a_{32}a_{13} + a_{31}a_{12}a_{23} - a_{11}a_{32}a_{23} - a_{31}a_{22}a_{13} - a_{21}a_{12}a_{33}$

First, make sure that determinant of A will not be zero before you proceed further.



$$A^{-1} = \frac{1}{\text{Det}A} \times \begin{bmatrix} a_{22}a_{33} - a_{23}a_{32} & a_{13}a_{32} - a_{12}a_{33} & a_{12}a_{23} - a_{13}a_{22} \\ a_{23}a_{31} - a_{21}a_{33} & a_{11}a_{33} - a_{13}a_{31} & a_{13}a_{21} - a_{11}a_{23} \\ a_{21}a_{32} - a_{22}a_{31} & a_{12}a_{31} - a_{11}a_{32} & a_{11}a_{22} - a_{12}a_{21} \end{bmatrix} =$$

$$A^{-1} = \frac{1}{a_{11}a_{22}a_{33} + a_{21}a_{32}a_{13} + a_{31}a_{12}a_{23} - a_{11}a_{32}a_{23} - a_{31}a_{22}a_{13} - a_{21}a_{12}a_{33}}$$

$$\times \begin{bmatrix} a_{22}a_{33} - a_{23}a_{32} & a_{13}a_{32} - a_{12}a_{33} & a_{12}a_{23} - a_{13}a_{22} \\ a_{23}a_{31} - a_{21}a_{33} & a_{11}a_{33} - a_{13}a_{31} & a_{13}a_{21} - a_{11}a_{23} \\ a_{21}a_{32} - a_{22}a_{31} & a_{12}a_{31} - a_{11}a_{32} & a_{11}a_{22} - a_{12}a_{21} \end{bmatrix}$$

This might have given you good incentive to master how to program the inverse matrix calculations in MS-Excel.

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Chapter **4**

Social Accounting Matrix Model and its Application





4.1 Brief history

As mentioned in the I-O history, the idea of depicting how the economy works was presented in the '*Tableau Economique*' presented by the French Economist Francois Quesnay in 1758. Dr. Leontief pioneered the modern work by leading detailed analyses of interactions among industrial sectors in first half of the twentieth century. A British scholar, Sir Richard Stone further developed the concepts in a way that an economy can be explained comprehensively by expanding to include all the other key activities in the society in addition to industrial activities. In that regard, SAM can be considered as an extension of the I-O framework in terms of how it is presented in a matrix format as in I-O.

The importance of SAM derives not only from the point that it is a technical expansion of the I-O, but from the point that additional wealth of data can be turned into highly useful information for development of the national or regional economy. Sir Richard Stone received a Nobel Prize in Economics in 1984 for having made fundamental contributions to the development of systems of national accounts and hence, greatly improved the basis for empirical economic analysis. (From an official internet site of the Nobel Foundation [http://nobelprize.org/nobel_prizes/economics/laureates/1984/.](http://nobelprize.org/nobel_prizes/economics/laureates/1984/)) His prime emphases were on income distribution to different groups of households and subsequent final demands by different groups of households, thus, how different groups of people in the regional/national economy would receive income through economic developments. There are numerous intriguing research papers that have been published in the field of regional science, applied economics, and international development along the SAM and its applications.

4.2 Conceptual introduction to simple modeling of social accounting matrix

An understanding of the I-O structure would give you an advantage for learning the SAM, which can be considered as an extension of I-O. In the I-O modeling, we basically disregarded the final demand from the right column and the value added from the bottom row. Interindustry transactions among industrial sectors remain endogenous and final demand and value added parts become exogenous.

In the SAM structure, we extend the structure to include all the transactions in the economy, so that all the transactions of goods and services and corresponding monetary flows in the whole economy can be captured. SAM shows how the money flows in the economy/society that is analyzed. A highly simplified version of the SAM would still involve the understanding of three important entities, and their existences can enable us to represent how our society functions among those, namely, production activities, factors, and institutions.

4.2.1 Key concepts of institutions, production activities, and factors of production

Figure 4-1 shows a simplified visual depiction of concepts of the SAM, which shows how the money flows in the society.

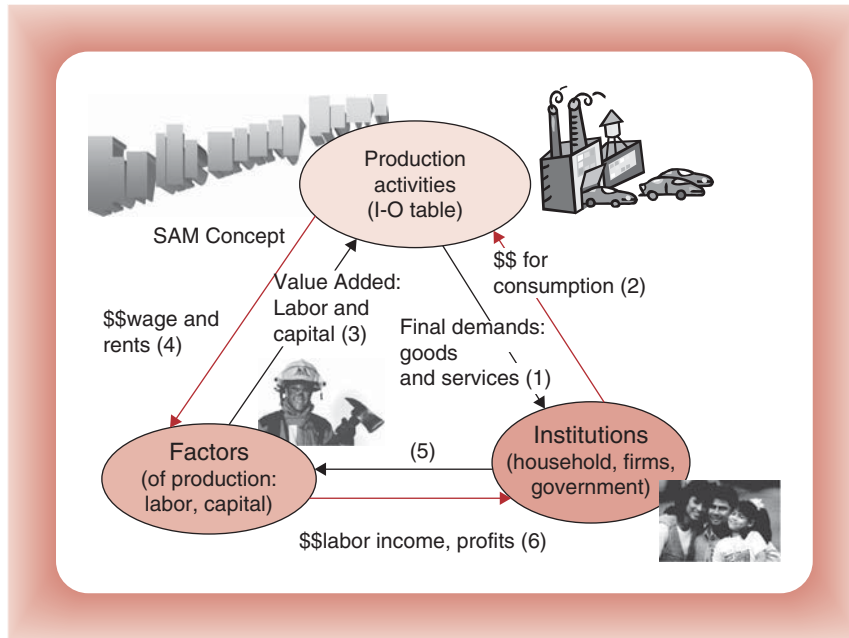


Figure 4-1 Structure of the social accounting matrix.

We will consider each component individually.

- Institutions – This word sounds unfriendly. If the word does not give you any image, consider this as a household, namely you, and your family, if any. That simplified concept will suffice for a while, until more detailed explanations are made.
- Production activities – The top circle in Figure 4-1 represents production activities, and this is indeed the I-O that we just learned. In the production activities, industrial sectors sell and purchase goods and services. As we learned in I-O, industrial sectors depend on inputs from others to produce outputs, which can be sold either as intermediate goods or as finished products to satisfy final demands.
- Factors – This is referred to as factors of production in the table. It can be considered as an exchange market for factors of production, or just an exchange market for labor and capital. Just like any other market, such as foreign exchange market, vegetable market, or real estate market, there should be sellers and buyers for a place to function as an exchange market. What the buyers and sellers put in this market are labor and capital. Note that the word capital has broader meaning here than that used in accounting and finance.

Now, we follow step-by-step how the goods, services, and money flow in the society, so that we determine who the buyers of labor are, why they buy labor, who owns the labor, and why labor is put on the market.



4.2.2 Trilateral interactions in the social accounting matrix table

In the SAM structure, each component interacts with two other components in a unique manner. Indeed monetary flows occur in one direction and counter-flows occur in the other direction. It is important to understand the basic structure and flows among three components. We will consider each flow individually.

4.2.2.1 Step 1: Flow between institutions and production activities

Institutions consist of household, firms, and governments, but let us simplify the idea by concentrating on the largest component, household. As mentioned previously, if the household still sounds unfamiliar, you may put yourself here. As you live, you certainly have multiples of final demand for goods and services. You probably have to purchase your apples, orange juice, rice, bread, clothes, stationary, and gasoline in your daily life. Think where those goods came from or who produced those goods. As you travel on holiday, you may want to stay at a good hotel. You may enjoy the spa service at a *Four Seasons Hotel* or a *Ritz Carlton*. You did not purchase the tangible spa (unless its cash flows from operations are securitized for sales as a financial product), but you purchased an intangible service or wonderful experience. Now the question would be who provided you with a wonderful spa treatment, and who created such a wonderful intangible product as spa treatment?

You, as institutions, purchase goods and services to fulfill your final demands from the industrial sectors as shown by arrow (1) in Figure 4-1. And concurrent with your purchase of goods and services, you must have paid money for the goods and services that you consumed. The monetary flow occurred from you (i.e. institutions) to the industrial sectors, which may be the agriculture sector for your apple, manufacturing sector for your clothes, stationery, and gasoline, or services sector for the spa treatment services. The flow of money for consumption of goods and services are shown by arrow (2) in Figure 4-1. This is how the industrial sectors receive inflow of money from institutions for their consumption. In exchange for providing goods and services, production activities receive money from you (i.e. institutions).

4.2.2.2 Step 2: Flow between production activities and factors

Once the production activities (i.e. industrial sectors) respond to your request for the output as final demands, such as apples, clothes, rice, bread, computers, orange juice, and plasma televisions, or for services such as spa treatment and a clean hotel room, they have to produce more of such products. Recall in the I-O structure, in order for an industrial sector to produce outputs, many intermediate goods and services are required from other industrial sectors, which end up stimulating the output of other sectors. A factory that produced orange juice will produce bottled orange juice when they are given all the necessary inputs for their production, such as oranges from agriculture sector and plastic bottles from manufacturing sector. But in reality, without one important input that we took for granted in the I-O structure, the factory will not be able to produce orange juice. What is missing?

A very important input that is definitely required is the labor, which was not a product of other industrial sectors. Indeed in the I-O structure, we ignored the labor component as we



Figure 4-2 Hotel industry's labor utilization of institution (household)'s labor from factors. Note: A person put their labor in the factor's market (exchange market for labor and capital) and the hotel industry found her (his) quality of labor appropriate to do the job.

Source: Photograph taken by the author in Managua, Nicaragua, September 2007. (Plate 2)

disregarded the value added. Another major component that would be required for production activities is the capital.

When production activities need labor or capital, they seek for the factors, which you may consider as an exchange market for labor and capital. Note that the meaning of capital in SAM context is broader than that in finance and accounting. It may include land, office space, physical production facilities such as tractors or machinery, or hotel building as a real estate in addition to money as a capital. Production activities look for qualified labor and when they find it, they will use the labor for the production of output as shown by arrow (3) of Figure 4-1.

People say there is no such thing as a free lunch, and that is the case for the production activities' input of labor. Labor from factors has to be compensated with the monetary compensation, which is called wage as shown by arrow (4) of Figure 4-1. It is interesting to note that wage is paid for the labor that you provide, and not for your mere physical existence as a person. When production activities utilized land or tractors, which are included in the broad definition of the capital, production activities have to pay the rent, which also has broader meaning than what we usually refer as a monthly payment for an apartment. Rent payment is also captured by arrow (4) of Figure 4-1, which is a consideration or penalty for using somebody else's capital.

4.2.2.3 Step 3: Flow between factors and institutions

Now that factors receive monetary flows in the name of wages and rents as shown by arrow (4) of Figure 4-1, let us see what happens next. We have to go back to a basic question of who



owns the labor and capital. It is you (i.e. institutions, roughly equal to households) who own these. Even though the quality and quantity may vary, you own those important endowments. So, the next question is whether all of you will receive some sort of money due to the ownership of labor and capital. In an ideal world, everybody owns the labor and capital and therefore everybody receives some monetary rewards. In reality, not everybody will automatically receive some monetary rewards for ownership of labor and capital. After all, it is the capitalism that survived the Cold War and now it is the rule of the game that we have to be fully aware.

Let us first consider labor. You have to leave your house (unless you work entirely online from your home office) and make yourself available to the exchange market where production activities advertise for workers as shown by arrow (5) of Figure 4-1. Quality of labor may be perceived as a decisive factor for production activities to hire certain people out of a larger choice of candidates, and different perceptions on the productivity of such labor result in different salaries. If you are employed as a housekeeper making beds, your wage may not be as high as someone who has specialized in yield management and obtained a hotel management degree and works in the same department of the same hotel. If you are unable to work satisfactorily (e.g. cannot make consistently tidy beds in the expected time), your labor may no longer be required and you may be dismissed and become unemployed (you are available to the labor market but there are no production activities that require your labor) as shown by arrow (5) of Figure 4-1. Generally, many of you will find some opportunity in which production activities would be interested in utilizing your labor as necessary input for their production. The manager of the spa at the luxury hotel may hire you if your qualifications and experience are likely to provide him/her with the required level of productivity at their facility. In that case, your labor is exchanged with wages as shown in the arrow (4) of Figure 4-1 and the money continues to move to the owner of the labor, you (i.e. institutions), in the name of labor income, as shown by arrow (6) of Figure 4-1.

As for the capital, the similar picture applies in that even if you own capital (money, physical assets, commercial real estate, etc.), unless you put them on the exchange market as shown by arrow (5) of Figure 4-1, there would be no chance for your capital to receive rents from production activities as shown by arrow (4) of Figure 4-1. And even if you put your capital in the exchange market, depending on the business environment, your capital may not be utilized by production activities. Once you put your capital on the market and production activities wants to utilize your capital, you will have a cash inflow of rents (i.e. return on your capital from your viewpoint) as shown by arrow (4) of Figure 4-1 and to be transferred to you as the owner of capital in the name of profits as shown by arrow (6) of Figure 4-1.

4.2.2.4 Step 4: Back to the institutions

The monetary rewards for letting others use your labor and capital brought a fresh cash inflow to you (i.e. institutions) via factors of production. If it was your labor that brought the labor income to you, you may want to reward yourself, for example, with a spa treatment, by buying new set of wheels and tires for your car, or by purchasing a new display for your desktop computer. Those final demands by you again stimulate the production activities, and money flows from you to the production activities. This returns to step 1, and the money



starts a new cycle. Since the SAM tables are shown as a two-dimensional table, a conceptual understanding on how the money flows among them should help you understand the structure of the SAM tables in the following section.

4.3 Structure of the social accounting matrix table

In terms of interpreting the relationships among rows and columns, our knowledge of I-O can be applied to SAM. A column represents each required input as if it was the recipe for that column, and a row represents destinations of outputs, showing who buys certain portion of outputs.

In a typical SAM table, the names of rows and columns are no longer those of industrial sectors as in I-O tables.

4.3.1 Overview of structures

4.3.1.1 Caution: lack of uniform formats (not in substance but on appearance)

Some caution is needed when considering a SAM structure. Even though the contents and underlying concepts are the same, display orders of each ingredient may be different, due to the lack of uniform system of accounts. For example, our explanations put the production activities, represented by the I-O, at the top left of the SAM structure. This presentation has a small benefit for us to extend the structure of the I-O smoothly to include in broader segments of the economy. In some other presentations of SAM, production activities, represented by I-O, comes in the middle of the large matrix, among the various submatrices. In other cases, the I-O component is displayed at the bottom right of the SAM, as if you have to disregard what you learned in the I-O structure. None of these representations are incorrect. The different appearances of these tables are not problematic as long as the basic concepts are understood.

Table 4-1 shows a simplified SAM structure with the basic components.

Table 4-1 Social accounting matrix transactions – simplified structure.

	Production activities (interindustry)			Factors (2)	Institutions (HH) (3)	Others (trade) (4)	Total
	AG (1a)	MNF (1b)	Serv (1c)				
AG (1a)	A				C	(1, 4)	
MNF (1b)							
Serv (1c)							
Factors (2)	F					(2, 4)	
Institutions (3)				W	T	(3, 4)	
Others (4)	(4, 1)			(4, 2)	(4, 3)		
TOTAL							

Notes: AG, agricultural sector; FD, final demand; HH, household; MNF, manufacturing sector; Serv, service sector.



The table contains production activities, factors (of production), and institutions as mentioned previously. A new component, Others include trade accounts with the RoW, which can be any trade with regions/nations outside of the territory of your SAM table. If your SAM represents a nation, then the RoW refers to other nations. If your SAM represents certain region such as state or prefecture, then the RoW includes other regions (other states or prefectures) in the same nation and the RoW.

... Production activities columns

Area A of Table 4-1 represents production activities within the industrial sectors, which are the activities that the I-O captures. In that sense, A is a submatrix containing the transaction table of the I-O structure. For example, in this SAM transaction table, you can see through the 3×3 interindustry transactions table, where agriculture, manufacturing, and services sectors interact with each other to purchase and sell intermediate goods and services. The production activities column shows you the recipe, i.e. all the necessary ingredients (inputs), to produce outputs.

As we have noted, industry requires labor input. Spa facilities at the Intercontinental Hotel require not only inputs of flowers, shampoos, massage oil, towels, but also inputs of the labor of the staff to sell as a luxurious spa package to guests. Those labor inputs are captured at the area F, where factors (of production) are required as inputs by the production activities. So the labor was provided from factors row to production activities column, as shown by arrow (3) in Figure 4-1. The area F also indicates that monetary flow occurred in the opposite direction simultaneously. Namely, production activities must have given the monetary consideration, wages, to the factors (i.e. arrow (4) in the Figure 4-1).

Again, the industrial sectors pay the wages in exchange for the labor they utilize, and not for a mere ownership of the labor. For example, your general manager pays the wage for your hard work that they can utilize for their service production, and not merely for your presence. The reason why such an obvious fact is mentioned is to explain the reason for the lack of any interactions between the productions activities column and institutions row. Another example would be capital (in a broader sense than in finance and accounting). If one tribe chief owns a huge amount of cash or land, it does not automatically mean the chief will receive profits and rent. Only when the chief's capital is provided for production activities will the chief's capital will receive payments for rent. When the chief's land has no tenants, when the chief's cash is kept in a closet (because nobody can pay the interest rate that the chief demands), there would be no rent, even though the chief owns those capitals.

The last area where the production activities column intersects with others (trade) (the cell containing (4, 1)) shows ingredients that production activities require from outside of the studied geographic region of the SAM. If your SAM represents a nation, this area represents imported inputs that industrial sectors require for their production of goods and services. Figure 4-1 did not include any trade with outside nation/region, but in the real world, no nation can remain completely secluded from the RoW.



... Factors (of production) column

The factors of production column has fewer interactions with other rows as it does not have any inputs from production activities or factors. It has significant inputs from the institutions row which, based on what we have learned so far, must have received money in exchange. These two flows are depicted by arrow (5), representing input from institutions (row 3) to factors (column 2), and by arrow (6), representing the money flowing from factors (column 2) to institutions (row 3) in the Figure 4-1. This area is shown as W where the earnings of factors are distributed to the owners of those factors. A brief explanation of arrow (5) in Figure 4-1 with regards to the table is difficult, but it may be interpreted as placement of endowments (to the exchange market of labor and capital). Ownership of endowment does not guarantee a flow of income to the owners. Even if a person has a doctorate, the person cannot receive a wage until he/she is employed. Likewise, the owner of land worth \$1 billion cannot receive an income until the land is rented out.

At the bottom of the factors column is the area that intersects with the Others (trade) row exists, which is shown as (4, 2). An example of this would be a Dominican hotel employee working at a hotel in Dubai. When the person provides his/her competitive labor for production activities in the host nation, their employment is exchanged for wages. However, if they left their family in their home countries, their labor income will not all be spent via institutions in the host nation, as some will be sent to their family members in their home nations. This is a leakage that occurs from factor payment to institutions.

... Institutions column

The largest components of the institutions are households, as we discussed in the I-O structure. Institutions also include governments and firms, even though their relative sizes are not as large as households. The institutions column has the area C, where it intersects with rows of the production activities. What would households need from production activities?

Households need to fulfill their final demands by purchasing goods and services from various industrial sectors, such as fresh tomatoes from the agriculture sector, bottled orange juice from the manufacturing sector, and a spa treatment from the services sector. Those are consumption by consumers as shown by arrow (1) in Figure 4-1. In exchange for delivering goods and services, industrial sectors receive payment, which is shown by arrow (2) in the Figure 4-1.

Part of the money which flows into the industrial sectors will be utilized to compensate the required labor input, and the money will be paid by production activities to the factors. The circular flow of money will continue. This circulation of monetary flow beyond the boundary of production activities (i.e. the I-O) is well captured in the SAM structure.

There is one point that should be noted regarding tourism-related expenditures. While hosting visitors from outside of the region/nation provides the study region the same effect as exports and goods and services, it is not captured as pure exports (at (1, 4) where production activities intersects with the others column). Even though foreign visitors are nonresidents,



their tourism-related expenditures in the study region are captured as if those are made by the local residents at C (where production activities intersect with institutions).

Interesting interactions occur in the area where institutions column intersects with institutions row. Recall that institutions include households, as well as firms and governments. Since households is the larger component within institutions, we disregarded the other two for the sake of simplicity of the model. Let us now consider interactions between households and governments. In many of the nations, governments collect a proportion of gross income of households as income tax as long as people are employed and the monetary flow occurs from households to governments. (Some oil-exporting nations in the Arabian Gulf region have no income tax, as the significant government revenues come from sales of oil to the RoW.) In some nations, there is a generous government transfer, such as food stamps in some Western nations or even subsidy for families with extra children, such as France or Japan. In those cases, the monetary flows occur from government to households. Also, governments may issue sovereign or municipality bonds, with which coupon payments (i.e. interest payments) may be made from the government to households and firms, unless they are zero-coupon bonds. Households may hire some labor directly from other households for domestic jobs, such as baby sitting, lawn cutting, snow removal, etc. What are common among those transactions would be that they are interinstitutions transfers of goods (services) and payments.

The fifth cell, shown as (4, 3) is the cell which intersects with Others. While the (4, 1) and (4, 2) are both related with cross-boundary transactions, the case for (4, 3) is somewhat different, even though they all have common features such as leakages. Let us concentrate on the larger component of the institutions, i.e. households. When households receive wages, rents, and profits in exchange for their delivery of labor and capitals, not all the money they receive would be used. Certain portion of the wages may be saved. In the SAM model, the saving by households (4, 3) would be considered as a leakage from the model, just like (4, 1) and (4, 2) are considered as leakages, because settlement payments for imports are the money outflow from the model.

... Others (trade) column

The others column is often titled RoW, as it deals with interactions outside of the regional/national economy. The column side of the others represents mainly exports of goods and services, where monetary flow comes into the domestic economic system.

The cell where the column intersects with production activities, row (1, 4), is basically the receipt of monetary payments by the industrial sectors in exchange for industrial sectors' exports of goods and services to outside the economic system. This is where the money comes into the economic system from outside to stimulate interindustry transactions.

The next cell in the column, (2, 4), where the column intersects with factors of production requires is more complex. When we looked at the cell where the factors column intersects with the others, it was the leakage of factors income.



For example, a Finnish employee is working on the Executive Floor at 6-star luxury hotel in Dubai, United Arab Emirates (UAE). The employee left behind her family members in Helsinki, to which she remits her income. Then on the SAM table of the UAE, her labor is put as required ingredients of the hotel sector, which is captured at F. Then when the factors gives the wage back to its owner, the employee, instead of putting all the wage into the domestic institutions as shown in *W*, she makes remittance of the money, which appears in the cell (4, 2), as if UAE hotel sector imported the factors. At the same time, if we consider the Finland's SAM table, her remittance from abroad will be recorded at (2, 4) as if she exported her factors to overseas.

The cell where the column intersects with institutions (3, 4) is where the institutions' receipt from outside of the region is recorded. This cell usually does not have large numbers. Recall that households receive substantial income from factors only when they put their labors and capital into the factors, which is an exchange market for labor and capital. There is not much to receive if their resources (labor and capital) are not put into the economic system.

4.3.2 Matrix operations for social accounting matrix modeling

Transactions table of SAM looks similar to that of I-O modeling. SAM transaction tables usually have more rows and columns outside of the interindustry accounts where the industrial sector intersects with other industrial sectors. Techniques required to move along from the transaction table to the I-matrix are similar.

As mentioned previously, the order and even the names of rows and columns may differ from one SAM table to another, but we use this simplified style of presentation in which interindustry matrix is a 3×3 square submatrix, and factor and institutions shown in rows and columns. Others include trade accounts, where the others row represents imports by each sector shown in columns and the others column represents exports by each sector shown in rows. Table 4-2 shows an example of a SAM transaction table.

You see that the shaded areas in Table 4-2 contain zeros, as those areas are not expected to have any transactions.

Table 4-2 Completed social accounting matrix transactions table.

	AG	MNF	Serv	Factors	Institute (HH)	Others	TOTAL
AG	1	2	1	0	2	5	11
MNF	1	3	2	0	2	5	13
Serv	2	2	4	0	4	4	16
Factors	4	2	5	0	0	2	13
Institute	0	0	0	10	1	1	12
Others	3	4	4	3	3	0	17
TOTAL	11	13	16	13	12	17	

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

**4.3.2.1 Row interpretation in transaction table**

Let us consider production activities component, which is indeed the I-O component, showing the interindustry transactions and beyond. Looking at the first row of the production activities at agriculture sector's output, the number would look like row vector of

$$[1 \quad 2 \quad 1 \quad 0 \quad 2 \quad 5 \quad 11] \text{ in Table 4-2.}$$

This means that the agricultural sector sold total amount of goods of 1 to the agriculture sector, 2 to the manufacturing sector, 1 to the services sector, 2 to institutions, and 5 to the others, such as exports, thus making the total output of 11.

To put the numbers into equation 3.1,

$$(1 + 2 + 1) + (2 + 5) = 11$$

$$\text{Intermediate goods} + \text{final demands} = \text{total output}$$

Intermediate goods are sold to industrial sectors as necessary ingredients, or as inputs for those sectors. By looking at the row of the agriculture sector, you can see the destination of the agriculture sector's outputs. In this case, total of 4 provide industrial sectors with intermediate goods and the total of 7 goes to satisfy the final demands. In this table, total amount of transactions are recorded with the actual currency unit, such as dollars, so the table is called a transaction table. The final demand consists of 2 from the institutions (households) and 5 from the others. An example of this portion is final demand from outside of the study region (nation), which can be considered as exports from the study region. The agriculture sector shipped the goods outside of the study region, and received monetary inflow in exchange. The cell where the agriculture sector's output intersects with factors is zero. This is in line with the structure of SAM as we learned in Figure 4-1. It is the households, the owner of labor and capital, who has the money to purchase goods from the industry, and it is not the factors of production, which by structure will not be able to have final demands. This structure of having separate factors and institutions poses the difference from the extended I-O structure such as type-II structure in which households shown in a single column and in a single row are added as if it were another industrial sector in the I-O model.

4.3.2.2 Column interpretation in transaction table

You see that the agricultural sector's column in Table 4-2 has

$$\begin{bmatrix} 1 \\ 1 \\ 2 \\ 4 \\ 0 \\ 3 \\ 11 \end{bmatrix}$$

This can be interpreted that there was the purchase by the agricultural sector of 1 from agricultural sector, of 1 from manufacturing sector, 2 from service sector, 4 from factors of production



(labor and capital), 0 from institutions, and 3 from others, thus making the total agricultural sector's purchase of 11. In the I-O example that we studied in chapter 3, we saw only one row, which was value added, below the interindustry transactions rows. As was the case with I-O table, the numbers that you see in the column depicts all the required inputs, with the bottom number showing the total inputs for the sector in the period of 1 year. This can be likened to a recipe list all the required ingredients, i.e. the agricultural sector required 1 ingredient from the agricultural sector, 1 from the manufacturing sector, etc. The cell where the agriculture column intersects with institutions row is 0. This is in line with what we learned in Figure 4-1. The column shows 3 at the intersection with others, and this can be imported goods from the outside of the study region.

Just like the I-O model, total output amount is equal to total input amount. In this case, the total output of 11 equals the total input of 11. In order to produce total output of 11, the agricultural sector required total inputs of 11 (total outputs = total inputs).

4.3.2.3 Endogenous versus exogenous

In the I-O table, we followed a general rule that interindustry transactions remain endogenous (inside of the model) and others were treated as exogenous (outside of the model). This was clear and universal, leaving little opportunity for researchers' discretion for incompliance. There was a notable exception for type-II multipliers simulations, where only the households sector was added as if it were the additional industrial sector. As for SAM, as we reviewed, there appears to be wider scope for researchers' discretion (flexibility) as to which sectors should remain endogenous, and which sectors were made exogenous, because of lack of clearly shared uniform rules.

You may wonder what would happen if you take the complete SAM table by keeping all columns and rows endogenous and conduct series of matrix operations. That way, we may avoid ambiguous discussion regarding which columns and rows should be taken out as exogenous. Because it is a square matrix, however, there would be no solution for the inverse operation of the complete SAM-based matrix. In the SAM structure, researchers have to decide which activities are to be kept as exogenous, and transform the chosen ones from

Table 4-3 Transactions table with endogenous columns only.

	AG	MNF	Serv	Factors	Institutions (HH)
AG	1	2	1	0	2
MNF	1	3	2	0	2
Serv	2	2	4	0	4
Factors	4	2	5	0	0
Institutions	0	0	0	10	1
Others	3	4	4	3	3
TOTAL	11	13	16	13	12

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.



endogenous to exogenous. In our example, we keep the factors of production and households in the institutions as endogenous and take all others as exogenous (Table 4-3).

Now you have interindustry, factors of production and institutions (households) columns only. In the sample, the matrix has 7 rows and 5 columns (a 7×5 matrix). In other words, we have interindustry square matrix (which means that numbers of rows and columns are the same, such as a matrix of 3×3), factors of production row (labor, and capital), institutions (households), Others, and the total input rows which consist of column sum of each column.

4.3.2.4 Standardization

Here, you standardize the required inputs in the transaction table by putting them in relative terms along each column. The process is rather simple. You take each required inputs in each column to be divided by the column sum (=total input). For example, let us take the agriculture sector's column. The relative input from the agricultural sector to the agricultural sector would be calculated as 1 divided by 11 = $1/11 = 0.0909$, the relative input from the manufacturing sector to the agricultural sector would be calculated as 1 divided by 11 = $1/11 = 0.0909$, etc. Now, repeat the processes for all the other cells and columns.

Once all the calculations are complete, you see all the transaction amounts are converted into relative inputs to each column's total input. What you see are the relative inputs to total inputs of each column in relative terms. After standardization, the table will appear as Table 4-4.

Before we consider steps of matrix operations, we us focus on how the concept we learned is reflected over the numbers in the SAM table.

4.3.2.5 Flows between production activities and factors

In Figure 4-1, we learned how the production activities required factors of production. That is captured in the factors' row of Table 4-4.

Production activities (industrial sectors) require labor and capital from factors of production, which is like an exchange market for labor and capital. These are represented by arrows (3) and (4) in Figure 4-1. If we consider the agriculture sector column, for the total input of \$1.00, \$0.36 of labor and capital are required. In exchange, the agriculture sector pays \$0.36

Table 4-4 Standardized transactions matrix with endogenous columns only.

	AG	MNF	Serv	Factors	Institutions (HH)
AG	0.0909	0.1538	0.0625	0	0.1667
MNF	0.0909	0.2308	0.1250	0	0.1667
Serv	0.1818	0.1538	0.2500	0	0.3333
Factors	0.3636	0.1538	0.3125	0	0
Institutions	0	0	0	0.7692	0.0833
Others	0.2727	0.3077	0.2500	0.2308	0.2500
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.



for every input of \$1.00 (which means every output of \$1.00). In comparison, the input structure of manufacturing sector is less labor intensive. Note that production activities (industrial sectors) require no inputs from institutions, thus all zeros are recorded.

Now look at factor's column of Table 4-4. There are no inputs from production activities (industrial sectors) or factors of production. The cell where the factors column intersects with the institutions row is the reflection of arrows (5) and (6) in Figure 4-1. Institutions (roughly households or you) put their endowments into the exchange market for labor and capital (arrow 5 in Figure 4-1: the institutions row to factors column here), and in exchange factors pay monetary rewards back to the owner of those labor and capital, institutions, which you see as money flow from factors column to institutions row (the arrow 6 in Figure 4-1).

Imagine that you have a car and a driving license, and decide to earn some income at a pizza delivery shop. You, as institutions, decide to use labor (labor of a person who has a driving license and is willing to do deliveries) and capital (a car) in the exchange market (factors market) to be utilized by the production activities (in this case, the delivery of the hot pizza). In return, factors pays money to you (your salary and costs for providing your car is shown in 0.7692). Recall the money flows from columns to rows in exchange for flow of goods, services, and other inputs such as labor and capital from rows to columns. So what would happen next?

After the institutions (households) receive the monetary flow, they are back to the consumption mode as shown in the institutions column. With the newly received income, you want to visit restaurants (purchase from services sector), buy a new car produced in the same nation (purchase from manufacturing sector), buy your favorite apples (purchase from agriculture sector), or ask for a 1-day cleanup of your messy room from a cleaner (purchase of services from other institutions). You may purchase goods made in some other foreign nations to be imported (import to be shown as purchase from others).

The institutions column is where the institutions spend their money to have their final demand for goods and services satisfied either by the three domestic industrial sectors, institutions (interinstitutional transfer) or imported goods and services, which is shown at the intersection with others.

The required processes are the same as in the case for the I-O simulations. They are indeed the same steps used in the I-O tables in Chapter 3; namely:

- (i) Standardization (reviewed above),
- (ii) Creating standardized matrix,
- (iii) Create an appropriate identify matrix,
- (iv) Subtract the standardized matrix from the identify matrix,
- (v) Calculating the inverse of the result of the above.

They will be shown together from standardization of the SAM transaction table to the inverse matrix (Figure 4-3).

In this case, creation of the inverse matrix of 5×5 will require understanding of the relevant matrix computations in the MS-Excel, which were covered in the I-O case.

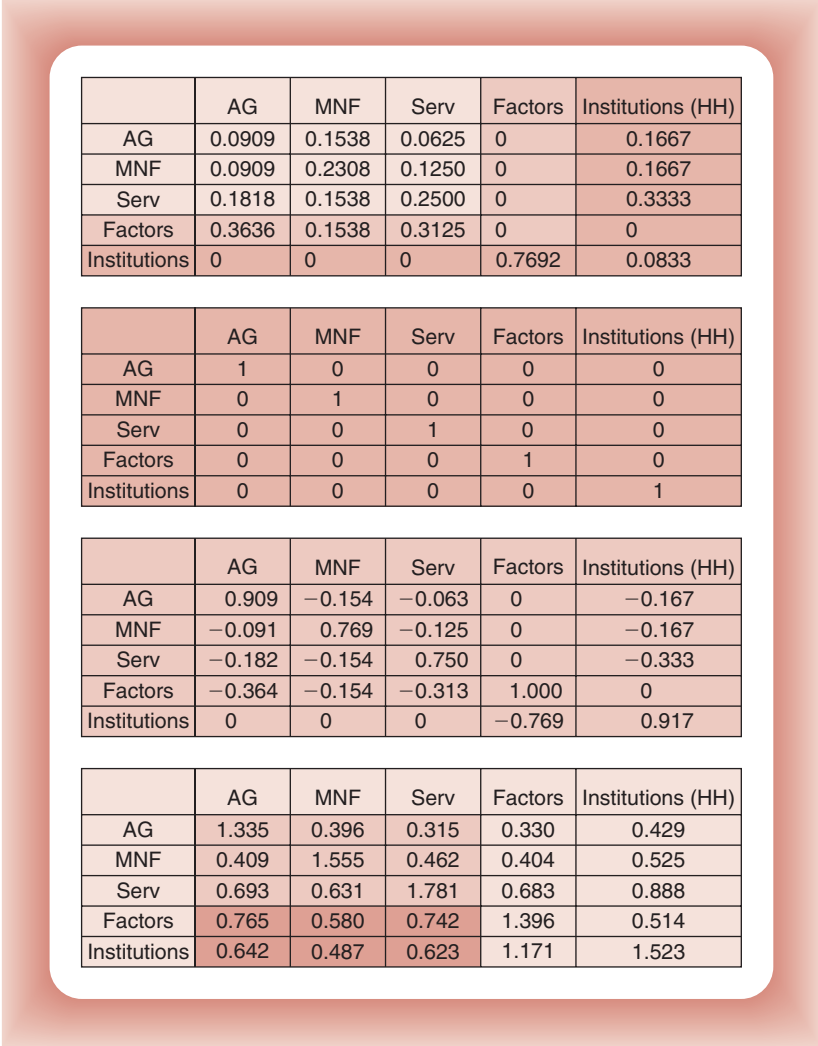


Figure 4-3 Series of matrix computations from the standardized transactions matrix with endogenous columns to the inverse matrix.

Notes: AG, agricultural sector; MNF, manufacturing sector; Serv, service sector.

After you obtain the inverse matrix, you can sum up the column under each industrial sector just as we did with the I-O inverse matrix table. This time, we will make two calculations per each column. One is the sum of the numbers in the production activities only, and the other is the total sum of the column. if we take the agriculture sector’s column, the first one is $1.335 + 0.409 + 0.693$, and the second one is $(1.335 + 0.409 + 0.693) + 0.765 + 0.642$. The results will be 2.437 and 3.843. The additional effect, the difference between two numbers, is attributed to the assumption that the factor payment passed back to institutions (wage paid to household) are assumed to stimulate additional sets of consumption (i.e. increase in final demand). This is the basic concept of induced effect of the SAM output multipliers. Care is needed when it comes to applying them to impact analyses (see following section).



4.4 Economic impact analysis using social accounting matrix

4.4.1 Applications of social accounting matrix modeling

The additional expenditures by the institutions causes another round of final demands whose additional impact is captured as induced effect (induced impact, induced shock), which became traceable in the model due to our expansion of the I-O model framework (production activities only) to SAM framework (trilateral transactions among production activities, factors, and institutions are captured within the framework).

As we have already discussed the main difference between type-I and type-II multipliers is whether the households are included as an additional industrial sector (the case of type II) or not (the case of type I). So what would be the difference between type-II multipliers and SAM multipliers?

In the SAM multipliers, two new concepts of institutions and factors are included together. Even though households is the largest component of the institutions, institutions has two other components – firms and governments, which are not included in the type-II multiplier structure but are included in the SAM structure. SAM structure indeed includes all the parties and transactions in the society as comprehensive as possible.

4.4.1.1 Caution: lack of common procedures for the choices of exogenous sectors for social accounting matrix impact analysis

From the viewpoint of simplicity and clarity, the simplest type-I multiplier impact analysis has more virtue than type II and SAM-based impact analyses, despite the popular belief that SAM multiplier calculations are more sophisticated and more informative.

While the popular practice by SAM modelers appears to put governments, capital accounts, and the others (RoW trade accounts) outside of the original SAM table as exogenous, there are no uniform systems or rules as to which sectors are removed out of the model for SAM impact analysis. There is more scope for researchers' discretion in the impact analysis, unless each result explicitly mentions which sectors are made exogenous. In contrast, type-I multipliers, or indirect impact studies, which are based on the common understanding of leaving industrial sectors only as endogenous, will leave researchers' discretion to a minimum, thus there would be less risk of comparing one study with the other studies.

To make matters worse, unlike the interindustry production activities accounts, which are the I-O table components, order of accounts or even the contents of accounts may vary from one SAM to another. This is because researchers are not prohibited from creating, adding, modifying, or deleting accounts based on the availability of data of relative importance to the study region's economic structure. Lack of common format leads to a larger scope for discretions, and unless they are made explicit, there remains more uncertainties regarding accuracy when comparing the results of SAM-based impact analyses. Because the comprehensive, default SAM table is a complete singular square matrix by definition, the inverse cannot be calculated unless discretion is used to identify certain sectors as exogenous. This discretion does not necessarily create uniform practice regarding the choice of sectors to be treated as exogenous, outside of the model.



These problems may appear to undermine the validity of SAM-based impact analyses. For the sake of comparative analysis of economic impacts over different regions, it may be prudent to use the I-O-based impact analysis unless you know exactly how you make certain sectors exogenous and maintain the assumptions explicit in the SAM modeling. There would be less uncertainty involved in the creation of type-I multipliers than SAM multipliers as we learned in the previous chapter on the I-O model.

SAM, however, enables the calculation of certain parameters that the I-O model does not allow, and thus it is more versatile. In the next section, we will discuss this further and explain why SAM modeling was considered worthy of receiving a Nobel Prize in Economics.

4.4.2 Concept of household disaggregation

4.4.2.1 Tools to solve problems in society

As a hospitality or tourism student, you might have taken accounting and finance courses. In financial accounting, you learned how to record what had exactly happened with a company for the last 365 days, and based on those records, you learned how to analyze the health and performance of the company using techniques in managerial accounting. Then in a corporate finance course, you learn how the management team has to meet the requirement of the shareholders in terms of return on their equity, and you learn that the ultimate goal of corporate finance is to maximize the shareholder value. This knowledge is required to run a profit organization.

Now let us assume that you step up your viewpoint and you have to consider how to improve life for people in your nation. First, let us assume that your nation is a developing country where you have significant numbers of poor citizens. The important question is whether an economic development would be good for all of your citizens. In general, development of your economy as a whole is believed to be good for all. If so, the next question is whether the benefit of economic development would be equally distributed among your citizens. It would be highly beneficial for us to determine if the development is causing a widening gap of income levels between the coastal regions and inner regions, between male- and female-led households, between urban and rural residents, between educated and uneducated people, between rich and poor households, etc. It would be extremely helpful if we could compare the results of estimated income distribution patterns quantitatively to be caused by different development policies. By disaggregating households into more than two groups, SAM can guide us to find those answers quantitatively.

As we can use the household decomposition technique in SAM to address some of the problems in society, tourism and hospitality students can use this technique to put the tourism project in perspective and comparing directly with other nontourism projects. If the goal of the society is to alleviate poverty among local residents, we should take an objective approach to compare whether the proposed tourism development project would have any superiority in poverty alleviation over other proposed nontourism development projects, which can be development of manufacturing facilities, power plants, refineries, food processing centers, telephone call centers, etc. Because tourism development projects rarely receive as much respect as the



Table 4-5 Sample of social accounting matrix with households disaggregated into high-income households and low-income households – transactions table.

	A	B	C	Factors	Insti-L	Insti-H	Others(RoW)	TOTAL
A	1	2	1	0	0.8	1.2	4	10
B	1	3	2	0	0.9	1.1	2	10
C	2	2	4	0	1.5	2.5	4	16
Factors	4	2	5	0	0	0	0.8	11.8
Insti-L	0	0	0	4	0.1	0.2	0.1	4.4
Insti-H	0	0	0	6	0.4	0.3	1.1	7.8
Others	2	1	4	1.8	0.7	2.5	0	12
TOTAL	10	10	16	11.8	4.4	7.8	12	

Notes: H, high-income households; L, low-income households; RoW, rest of the world.

development of more trendy agendas such as nanotechnology or research development facilities in most nations, it would be better to evaluate tourism and hospitality projects in perspective in broader society, along side other proposed projects to compete for the limited resources of public funds acquired through taxation. Household disaggregation would be a useful tool for such purposes to measure subtle differences among multiple policy choices. The tourism specialist must broaden his/her view and allow tourism to compete with other industries, so that the local community, voters, and donors can also understand the comparative advantages and disadvantages of tourism development as an industry.

We learned that in terms of required knowledge and technique, SAM has much in common with the I-O model. Significant contribution of SAM modeling comes from the idea of disaggregating households into more than two different groups. Recall that factors of production are owned by the institutions, and that households is the largest component of the institutions, and that households plays an important role as an intermediary of monetary flow in society to obtain the labor income and rent from the factors of production and pass the money flow back into the production activities as shown in Figure 4-1.

What if we divide the households into two groups, low-income households and high-income households? We will be able to see how income will be distributed to the two groups. If you give the same amount of change in final demand with different column vectors, you can compare each shock by looking at how the incomes are distributed to low- and high-income households (Table 4-5).

Technically speaking, we will follow the same computation processes as we did in the I-O and SAM models. The next step is to standardize each column (Table 4-6).

Note that we considered the Others (RoW) to be exogenous. The remaining matrix became a 6×6 square matrix. The next step is to create a conformable 6×6 identify matrix so that the standardized matrix can be deducted from the identify matrix (Table 4-7).

The results of subtraction of the standardized matrix from the identify matrix, which is $(I - A)$ -matrix, are then calculated (Table 4-8).



Table 4-6 Sample of social accounting matrix with households disaggregated into high-income households and low-income households – standardized matrix.

	A	B	C	Factors	Insti-L	Insti-H
A	0.1	0.2	0.0625	0	0.181818	0.153846
B	0.1	0.3	0.125	0	0.204545	0.141026
C	0.2	0.2	0.25	0	0.340909	0.320513
Factors	0.4	0.2	0.3125	0	0	0
Insti-L	0	0	0	0.338983	0.022727	0.025641
Insti-H	0	0	0	0.508475	0.090909	0.038462

Notes: H, high-income households; L, low-income households.

Table 4-7 Sample of social accounting matrix with households disaggregated into high-income households and low-income households – identify matrix.

	A	B	C	Factors	Insti-L	Insti-H
A	1	0	0	0	0	0
B	0	1	0	0	0	0
C	0	0	1	0	0	0
Factors	0	0	0	1	0	0
Insti-L	0	0	0	0	1	0
Insti-H	0	0	0	0	0	1

Notes: H, high-income households; L, low-income households.

Table 4-8 Sample of social accounting matrix with households disaggregated into high-income households and low-income households – (I – A)-matrix.

	A	B	C	Factors	Insti-L	Insti-H
A	0.9	-0.2	-0.0625	0	-0.181818	-0.153846
B	-0.1	0.7	-0.125	0	-0.204545	-0.141026
C	-0.2	-0.2	0.75	0	-0.340909	-0.320513
Factors	-0.4	-0.2	-0.3125	1	0	0
Insti-L	0	0	0	-0.338983	0.977273	-0.025641
Insti-H	0	0	0	-0.508475	-0.090909	0.961538

Notes: H, high-income households; L, low-income households.

Then the next step is to calculate the inverse of (I – A)-matrix. Just as we did the inverse matrix computation in our I-O matrix with MS-Excel, we can use the same function of inverse matrix operations (Table 4-9).

This is the completion of the calculations of (I – A) inverse matrix and it is the beginning of impact analysis of income distributions over the two disaggregated households.



Table 4-9 Sample of social accounting matrix with households disaggregated into high-income households and low-income households – inverse of $(I - A)$ -matrix.

	A	B	C	Factors	Insti-L	Insti-H
A	1.486898	0.67921	0.429235	0.461101	0.614757	0.496993
B	0.60966	1.943785	0.615598	0.57799	0.791653	0.608944
C	0.972391	1.107034	1.982212	0.920016	1.198096	1.010634
Factors	1.020564	1.006389	0.914255	1.587543	0.778639	0.636409
Insti-L	0.369075	0.363949	0.330629	0.574116	1.307386	0.257505
Insti-H	0.574582	0.566602	0.51473	0.893794	0.535362	1.400888

Notes: H, high-income households; L, low-income households.

4.4.2.2 Quantitative policy impact analysis over income distribution

Having calculated the inverse matrix, we can calculate impact analyses of certain shocks to the economy. If we give the same amount of initial shocks to the different industrial sectors, then we can see how the same shock would cause different responses from various industrial sectors. Because we are using the SAM structure in which factors and institutions are included, we can gain more than the responses in the industrial sectors. If we consider that the initial shock is to be enticed by certain policy implementations, such as marketing campaign to boost its exports (increase in exports = increase in final demand ΔY), trade with foreign regions, increase in government's direct expenditures (increase in government expenditure = increase in final demand ΔY), then we can quantitatively analyze the impact of each policy in perspective.

With the disaggregated household groups of low-income and high-income household, we can see which policy benefits the high-income household more, which policy benefits low-income households more, or which policy option generates the least benefits to each households.

Let us continue with such example. We have Table 4-9 which was the result of inverse matrix of 6×6 . Now we will propose three policies, each with the same amount of positive \$0.1 as a total amount of initial impact. Because we have only three industrial sectors, we simply give the same amount of \$0.1 to the three different sectors, representing three different policies. As you see Table 4-6, \$0.1 is equivalent of 1% of total output of sector A, 2% of total output of sector B, and 0.625% of total output of sector C.

- Policy 1 is expected to stimulate sector A's output for \$0.1 to meet increase in final demand for the sector A's goods or services;
- Policy 2 is expected to stimulate sector B's output for \$0.1 to meet increase in final demand for the sector B's goods or services;
- Policy 3 is expected to stimulate sector C's output for \$0.1 to meet increase in final demand for the sector C's goods or services.



	Policy-1(ΔY)	TO-1 (ΔX)
A	0.1	0.14869
B	0	0.06097
C	0	0.09724
Factors	0	0.10206
Insti-L	0	0.03691
Insti-H	0	0.05746

	Policy-2(ΔY)	TO-2 (ΔX)
A	0	0.06792
B	0.1	0.19438
C	0	0.11070
Factors	0	0.10064
Insti-L	0	0.03639
Insti-H	0	0.05666

	Policy-3(ΔY)	TO-3 (ΔX)
A	0	0.04292
B	0	0.06156
C	0.1	0.19822
Factors	0	0.09143
Insti-L	0	0.03306
Insti-H	0	0.05147

Figure 4-4 Final demand column vectors and total output column vectors.

Notes: H, high-income households; L, low-income households.

In the same manner as we did with impact studies with the I-O, 6×6 square matrix of $(I - A)$ inverse has to be multiplied by 6×1 column vector which represents one of the above three policies. In the respective column vector, all other numbers will remain zero other than the industrial sector that was given the positive shock of \$0.1. Thus, we will create three different final demand column vectors to represent changes in final demand for each policies. And the result of each matrix multiplication can be shown as 6×1 column vector, representing responses from different sectors and groups to the positive shock of \$0.1 to the regional economy (Figure 4-4).

Let us consider the changes occurring at the bottom two rows in each matrix multiplications. Table 4-10 shows the collection of the two bottom rows from each total output column vectors.

Even though all three policies bring benefits to both low-income and high-income households, their relative effects show some difference. In this case, in all the three policies, high-income households tend to benefit more than the low-income households. Policy 1, which is expected to stimulate sector A's output for \$0.1 to meet increase in final demand for the sector A's



Table 4-10 Income distribution resulting from three policies over low- and high-income households shown as net changes to annual income.

	Policy 1	Policy 2	Policy 3
Insti-L	3.691%	3.639%	3.306%
Insti-H	5.746%	5.666%	5.147%

Notes: H, high-income households; L, low-income households.

goods or services, brings the highest benefits to both households group. Policy 3, which is expected to stimulate sector C's output for \$0.1 to meet increase in final demand for the sector C's goods or services, brings less benefits to both households group despite the same amount of direct shock given to the same economy. Effects of Policy 2 are in between the other two. Recall that exactly the same amount of shocks was given in three policies. Why are the net changes to their annual income not equal?

There are several possible reasons.

- there can be differences in the relative requirements of labor input in each sector's production activities. Some industrial sectors require more labor input, i.e. are labor intensive, and some industrial sectors require less labor input among the total input. Because total input equals total output by definition at the transaction table, we can say the relative size of labor input per output may be attributed to the difference in changes in income to different household groups;
- there can be differences in the composition of required labor inputs from different household groups. If an industrial sector requires inputs of highly trained, highly educated specialized labor force, it would generate high-salary jobs, but not as many low-salary jobs;
- there can be differences in the relative dependence on imported goods and services in each sector's production activities. The higher the imported components in relative to total inputs, the higher the total leakages from the study region, which results in lower impacts on the region.

Those reasons can be verified by further analysis of SAM tables.

4.5 Applications of social accounting matrix for impact studies

4.5.1 Steps for impact studies

In terms of required technical skills in matrix operations, steps for impact studies using SAM would be very similar to those for the I-O-based modeling that were covered in detail in Chapter 3.

The processes are:

- start from a transaction table ($n \times n$);
- standardize each column by taking each elements divided by the column sum;



- take out groups of columns and rows that are designated as exogenous (this is unique in SAM modeling). Let us make a notation for the smaller numbers of rows and columns as $n' \times n'$;
- take the resulting standardized square matrix (equivalent of A-matrix: $n' \times n'$) and subtract it from the I-matrix with corresponding numbers of columns and rows;
- take the resulting matrix and conduct inverse matrix operations. The resulting inverse matrix is the foundation for the subsequent impact analysis;
- create a $n' \times 1$ column vector using the applicable initial shock. For tourism impact analysis, composition of this column vector is very important;
- as matrix multiplication of $(n' \times n') \times (n' \times 1) = (n' \times 1)$, the resulting impacts will be given in the $(n' \times 1)$ column vector format.

From this point, you may choose to conduct different types of impact analyses, such as total output, employment, income, etc. just as you did in the I-O modeling.

4.5.2 Pros and cons of impact studies computer software packages

Software packages exist that enable you to perform impact modeling without matrix computations. They can be very powerful tools for impact studies, and available choices to fine tune some assumptions actually allow researchers to incorporate sophisticated parameters into the modeling.

A less-known fact would be that their regional economic data may be exported into database software such as MS-Access, which can re-export them to common spreadsheet programs such as MS-Excel or to matrix computations software such as Matlab, for the sake of increased flexibility for simulations. In this case, IMPLAN is the data sources for your impact studies that you conducted.

Some researchers share the concern that IMPLAN can be the ready made, impact package software and pose a danger of allowing novitiates to conduct easy impact studies. While the concerns have good validity, particularly for students who do not know how the multipliers are calculated, superiority and versatility of the packages together with availability of regional data can offer simulative learning experiences in regional impact modeling with proper guidance from instructors. Personally, this author does not believe it is a good idea to let students use ready-made software without going through the series of matrix operations to get the skills to calculate multipliers, particularly in the case of hospitality and tourism students who did not take prior economics or impact modeling courses.

4.6 Questions from students

Having taught several courses on SAM at hospitality and tourism management schools, I have accumulated a variety of questions and possible answers. There appear to be frequent and common questions about specific topics. Please allow me to quote some of those in rather unscientific way of selecting those based on my subjective memories.



1 While the extended transaction table of I-O with L, N, M and C, I, G, E were very helpful in understanding the link between the I-O and macroeconomics, now I am confused with the SAM table which looks slightly different from what we saw. Are they the same or different table with similar appearances?

The SAM table, and what you learned as the extended I-O transaction table with macroeconomics notations, are the same tables with slightly different appearances. Indeed, my suggestion is to look at a typical SAM table and see how all those key components of L, N, M and C, I, G, E are hiding outside of the interindustry transactions often in the form of submatrices. First, identify what you have already learned, the I-O component. Then look for other components. In SAM, you often see slightly different names on components and their orders of presentation in the SAM table due to lack of uniform rules over how components are presented. If you cross out what you identified one by one, you can determine correctly what the remaining components are.

2 How do you find a SAM table?

SAM is hard to find, even though the existence of I-O means the existence of at least partial data towards SAM. In early studies of SAM, there were more research papers using SAM on developing nations, such as Iran, Sri Lanka, and Botswana.

If it is the regional data for the US, IMPLAN has those data available for a fee. International financial institutions such as World Bank group may have those proprietary data but the data are not open to public use. If you can explain that you are in need of data for a dissertation, you may get a copy.

There are some textbooks which show varying degrees of SAM data on certain nations.

Cohen (2002) wrote two books on SAM. *Social Accounting and Economic Modeling for Developing Countries – Analysis, Policy and Planning Applications* is application of SAM for the developing nations, and the book contains SAM data for some developing nations. The other book is entitled *Social Accounting for Industrial and Transition Economies – Economy Wide Models for Analysis and Policy*, and it is application of SAM for the analysis of transition patterns of industrialized European nations, such as Poland, Hungary, Germany, Italy, Spain, The Netherlands, etc.

Pradhan, Saluja, and Singh (2006) wrote a book on SAM application to India specifically and the book includes appendices with reasonably detailed SAM tables for India with three different periods of 1994–1995, 1997–1998, and 2002–2003. This book has clear explanations of how the I-O/SAM work, which can be useful for students.

3 Statistical models have important assumptions such as normality, noncollinearity, homoskedasticity, etc. I-O/SAM also has limitations of the model such as fixed coefficients, no supply constraints assumptions. Does it mean that it is not worth studying all these models?

Just like any other quantitative model building in which researchers try to reflect the real world into simpler solvable set of calculations, the existence of a series of limitations should not be underemphasized. Even if the model is not a perfect reflection of how the real world



functions, it is a matter of relative comparison whether we should bother to have the best estimate of how issues in the real world functions and explain why one action triggers another set of reactions, or just ignore it due to time and cost requirements.

In the stochastic group of quantitative models, you have some form of established measurement mechanism against possible violations of assumptions, such as normality, equal variance of error terms, and independence of variables. There are also experimented and well-documented remedies for detected violations of assumptions.

In the deterministic group of quantitative methods, there is no formal widely accepted measurement mechanism against violations of assumptions, such as fixed coefficients, no supply constraints, fixed commodity input structure, homogeneous sector output. There are no formally established remedies for detected violations of assumptions, such as those for the stochastic group of quantitative models. As long as you remember the limitations of each model, you may find it beneficial to use the model to check what happens in the real world. Nobody can predict for sure what would happen in the real world. By understanding why and how something happened in the past appears to make a slight difference among observers over accuracy of what would happen in the world from now. If you find some values in investing your time and passion into such a slight difference, you may find it worthwhile to study these models. It is your business decision in life.

4 I sometimes see papers on CGE [computable general equilibrium] presenting itself as a panacea to all the problems of I-O/SAM-based modeling. How does CGE relate to I-O/SAM?

While some people may advocate usage of CGE modeling as if it were panacea to all the problems with I-O/SAM, it might be a very unfortunate overstatement based on the fact that the core part of CGE model programming is still the I-O/SAM of the study region. Any inaccuracy built into the I-O/SAM data will remain in the calibration of CGE, which may deflate some, if not all, of the inaccuracy problems carried over from I-O/SAM. Programmers of CGE (such as GAMS) would agree that the heart/engine of the whole system is the I-O/SAM table. It is similar to a situation that the overall performance of the car will remain constrained with the basic performance of the engine even though leather seats, sports suspension, etc. may increase the apparent comfort of the car.

CGE modeling require an I-O/SAM table as its core component, but the constraint deriving from the degree of accuracy of the I-O/SAM data as a foundation are not well presented, and important assumptions on the market clearance for each specific model building are not necessarily disclosed in all the papers in the tourism field, making verification for following researchers' reconstitution attempts more difficult. Even though processes and results of CGE modeling would be more challenging to communicate to general public and politicians due to its mathematical complexities of assumptions, those assumptions have to be spelled out clearly in tourism-related papers.

Having said this, I believe that there are good reasons to apply the CGE technique in some instances, particularly the cases in which equilibrium of supply and demand are heavily



disturbed by some considerable exogenous shocks, such as surge/plunge of tourism demand for small economic regions and surge/plunge of prices of goods and services by exogenous shocks. Either the exogenous shocks are relatively sudden and large, or the study region is relatively small and open, potential benefits of CGE would be higher. Estimating impacts of Asian Financial Crisis in late 1990s over economies of each nation were well-modeled by researchers at the Asian Development Bank, where initial impacts of surge of domestic interest rate, collapse of currency market are used to estimate surge of unemployment rate in the economy. Aziz (2002) was a good example of such usage of CGE.

5 Is the output generated from ready made software such as IMPLAN good for my thesis? How about a dissertation?

This is such a straightforward question that I am happy to share my view. Please make sure to ask the same question to other scholars to put answers in perspective. While the IMPLAN has very sophisticated options and settings, it also allows a novice user to generate some outputs relatively easily (Olsen, 2004). It is my opinion that the accuracy of the I-O/SAM data in the IMPLAN database is relatively high, but it is up to the discretion of the user who inputs an initial shock into the model. When you deal with tourism, due to lack of a single sector as a tourism industry, you have to disaggregate the tourism expenditure into several initial shocks to different sectors to create a final demand column vector. You may use the survey results to collect an accurate representation of the population.

Unless you have unique primary data on the final demand column vector, the output may be good for a term paper, but may not carry enough rigor to be accepted for a Master-level thesis. Dissertations at doctorate level require your unique contribution to the body of knowledge that researchers and scholars accumulated for years, so the required rigor would be even higher than a mere calculation of impacts with the ready-made software.

If you identify the potential of the sophisticated impact calculation software such as IMPLAN, you can indeed go into considerable depth. Their database is very rich and updated annually. But you may have to fight against some general allegations that information obtained from the ready-made-software is not rigorous enough. That is rather unfortunate, as the IMPLAN users' conference, held biannually, displays intriguing work by many regional government researchers and economists each time.

4.7 Chapter 4 problems

Q4-1 Answer the following questions.

- (a) Explain in a few sentences how the money flows in the society according to the social accounting matrix model.
- (b) Who owns the factors of production? Answer in a few sentences.
- (c) Does the ownership of the factors of production guarantees receipt of income?



- (d) You became a general manager of a hotel in a resort area. Your head office is considering a chain-wide operating cost-reduction campaign and asks whether you would use centrally purchased frozen food items shipped to your hotel instead of the current fresh food from local market. With the proposed change, you can reduce not only the food costs at your restaurant, but also the total wages by reducing the number of prep-cooks in your kitchen. The proposed cost reduction is expected to reduce your hotels operating expenses by a few percent and thus increase the net income.
- a. As a general manager, will you rather decide to join the proposed cost reduction campaign?
 - b. If so, what would be the possible effect, if any, to the local economy?
- (e) Assume that you are currently one of students in a hospitality program. Discuss why you have to invest your precious time and tuition to educate yourself in using the trilateral structure of SAM shown in Figure 4-1.
- a. Where in the SAM structure do you think you are?
 - b. After graduation, how will you get your investment back? What are you expected to do to get your investment (of time and money) back in this SAM world?

Q4-2 Using the data provided in MS-Excel, follow the instructions.

Policy analysis with social accounting matrix simulations

This is the case study format, in which you are required to read the case to work on the MS-Excel sheet provided separately.

[Background]

10 years after graduating from your school, you became a Minister of National Economic Planning of a hypothetical nation. Now you are faced with serious national policy choices.

Your nation has limited fiscal and administrative resources and you are required to implement one policy out of several possible choices. The Prime Minister, the only person above you in terms of national economic policy, is concerned how each policy will cause changes in personal income levels for people within different income groups. Luckily enough, you have social accounting matrix data with 20×20 industrial sectors; with additional data on household divided into nine annual incomes levels as follows: (K refers to thousands of dollars)

[Income Groups/annual basis]

Households <5K

Households 5–10K

Households 10–15K

Households 15–20K

Households 20–30K

Households 30–40K

Households 40–50K

Households 50–70K

Households >70K



Here are the five stimulation policy choices, consisting of three export promotions and two domestic stimulation policies. To make the comparison valid, each policy will have the same initial impact (direct effect = Δ final demand) amounts as follows:

National Policy Options

1 Boosting agriculture export of \$100 billion

Though your nation does not have the relatively cheaper labor cost on a global basis, a domestic pressure group asserts that efficient production methods will surely stimulate other industrial sectors which will create 'lots of jobs'. Your nation has diplomatic skills to maneuver the international protectionism against exports of your agricultural products.

2 Boosting manufacturing exports of \$100 billion

Your nation has many manufacturing activities, and some products have good international competitiveness in terms of quality, price, and durability. Both the management and trade unions are requesting that you promote industrial policies to boost your manufacturing exports.

3 Boosting tourism exports of \$100 billion

Your nation has strong international charm to attract foreign visitors. Streamlining the entry visa procedure will certainly contribute to a massive surge in international tourists. Though there are no domestic pressure groups representing the tourism industry per se, you vaguely recall one class at Cornell in which the teacher said something like the economic impact of the tourism sector tended to be underestimated with regard to its economic impact.

4 Boosting national defense budget of \$100 billion

The Defense Minister perceives external threats and wishes to boost the national budget to cope with the threat. An increase in the defense budget has been believed to have positive impact over some income groups, but you are not too sure if the benefits will be equally distributed over the different income groups. Though this is not an export option, you may assume that funding of \$100 billion is available from the budget surplus of the previous Prime Minister's cabinet.

5 Boosting state level budget for education of \$100 billion

The Prime Minister agrees with the Education Minister that the prime educational system need overhauling, even though quality of the higher education is perceived to be among the top league in the world. You may choose to let the local governments spend money for educating young people by funding them the total sum of \$100 billion. You also believe in the value of education, but you are not too sure how the economic impact of such a policy will affect the income distribution of your people, due to your perception of relative lack of interindustry linkages of educational sector with other sectors.

**The Mission: Quantitative Policy Analysis**

Because **the Prime Minister is mostly concerned with the estimated effects of changes in income on households** to be caused by five policies, **your mission is to find out the relative changes in the income for each policy over each income group.**

This is how you proceed. All the tasks can be done in the MS-Excel sheet given separately.

1 You are given a SAM-based transaction table, together with the second SAM-based transaction table. *Units are in \$ million.* You start working only from the third matrix to calculate the standardized A-matrix. I-matrix will be given as a relief for tedious jobs. Complete all the procedures to generate **an inverse of (I – A)-matrix.**

- Z-matrix 1 and 2 ← *Given (shaded in yellow and blue)*
- A-matrix → please complete (shaded in light green)
- I-matrix ← *Given (shaded in cobalt blue)*
- (I – A)-matrix → please complete (shaded in cobalt green)
- (I – A)⁻¹-matrix → please complete (shaded in dark pink)

(30/100 points given)

2 Now that you have calculated the Leontief inverse matrix (40 × 40), you are now required to conduct a series of impact analysis to simulate the five policies above.

Hint (1): Remember, the final demand column vector (FD:ΔY) would appear as zeros except with the sector you wish to give impact on. Thus giving a shock of \$100 billion to an agriculture sector would look like:

$$FD(\Delta Y) = f - vector = \begin{bmatrix} 100,000 \\ 0 \\ 0 \\ 0 \\ \cdot \\ \cdot \\ 0 \end{bmatrix} \quad (\rightarrow \text{This will be } [40 \times 1] \text{ column vector})$$

Hint (2): All policy simulations would require the single sector to be shocked by 100000 except the Tourism policy options, because the tourism industry is not represented by a single sector. This is the core concept of tourism satellite accounts, about which we will learn soon. Thus you are given more explicit hints in the MS-Excel sheet on how to model the tourism impacts to the economy.

Then as you simulate the impact analysis, you will notice that a summary table together with the relative change in income (to be displayed as a percentage) have been constructed with formula (column cells: AX253–AX262). You will find the summary table in the MS-Excel sheet which looks like this, immediately on the right of cells (cell: AY253–BC262).



Relative Change in Personal Income: Policy Simulation Table

Agriculture	Machinery	TOURISM*	FedGov. Defense	SL Education
				Households <5K
				Households 5–10K
				Households 10–15K
				Households 15–20K
				Households 20–30K
				Households 30–40K
				Households 40–50K
				Households 50–70K
				Households >70K

After conducting each quantitative simulation,

- Copy the cells (cell: AX253–AX262)
- Choose 'Paste special' under 'Edit', then paste by choosing 'Value' into the appropriate column cells in the summary table (one of the columns situated among AY253–BC262). Complete the table in the MS-Excel sheet.

(30/100 points given)

- 3 Using the space entitled 'Comment space for Prime Minister', please briefly answer the following question of the Prime Minister based on your quantitative analyses of the five policy options.
1. Which policy generates the highest positive change in income? Over which income group? (5 points)
 2. Which is the best policy for the poorest household (income <\$5K/year)? (5 points)
 3. How are the relative benefits of national defense spending boosting policy over the middle class? (income \$20–30K, \$30–40K, and \$40–50K/year households: compare the numbers for those households for defense column, then compare them horizontally across four other different policies)? (5 points)
 4. How effective is the policy of boosting tourism export in relative to the other export policies (agriculture and manufacturing) with regard to the relative change in income for all citizens? (5 points)
 5. Why does the tourism promotion policy seems to have relative effectiveness in dealing with poverty problems in this nation? (Make good educated arguments based on what you see in this case and what you learned in class and from textbooks. This part is graded in accordance with the amount of thoughts and analysis into it.) (10 points)



6. Why does the poorest household tend to remain poorer no matter what you try to do? Base your argument on what you found in your calculation using Figure 4-1: Structure of SAM (10 points)

(40/100 points)

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Chapter **5**

Introduction to Tourism Satellite Accounts





As we saw in the introduction, tourism is a difficult industry to quantify. Tourism emerged as a viable industry too late to be included in the national accounting system. Therefore, we have to work around the established national accounting systems.

Without a technique such as TSA, we may still make an attempt to estimate how large the tourism industry is. We may pick up industrial sectors that appear to have strong association with tourists, such as hotels and airlines as a representative group of tourism industry. But if you pick up only atypical industrial sectors that cater to tourists, you have a risk of underestimating the true size of tourism as an industry. Tourists have to eat, move around (by renting a car or using public transport), buy souvenirs, purchase attractions and theme park tickets, etc. We may widen the selection of industrial sectors beyond hotels and airlines and attribute all the sales of those industrial sectors to tourists' expenditure. Is it reasonable for us to assume that all the sales at coffee shops in large shopping centers in Cairo, Dublin, Honolulu, etc. can be attributed to expenditures by tourists only, even though some of the shopping centers may look like the case? While some sports clubs in a resort setting appear to cater only to tourists, how about sports clubs in Moscow, Osaka, or Hong Kong? If there are clients other than tourists, who are they and how should we treat their expenditures? Unless you introduce certain criteria and rules, inclusion of all the revenues at tourists-affiliated industrial sectors would result in overestimating the true impact of the tourism as an industry. It appears that we have to formulate a concept of a group of industrial sectors that cater to tourists, almost an idea of an industrial complex, to analyze tourism as an industry.

In this chapter, we consider the conceptual part of how the framework to capture tourism as an industry should be made, and we look into examples of how data can be presented along a TSA format.

5.1 Brief history

OECD states that around 30% of international trade of services in the OECD zone can be attributed to tourism and that the travel component of the service sector of OECD nations, which now amounts to 30 nations, generates around 70% of the worldwide tourism business (OECD, 2000). In response to the surge of relative importance of tourism as an industry in the last part of the twentieth century, national and international organizations proposed methods to capture tourism as an industry. It was not until 1991 that Statistics Canada, Canada's national statistical agency, presented a proposal on TSA at the Ottawa Conference on Tourism, followed by presentation of its first results in 1994.

The Commission of the European Communities, the International Monetary Fund, OECD, the United Nations, and the World Bank jointly published the *1993 System of National Accounts* (SNA) to update various issues of measurement of market economies in the world from previous versions in 1953 and 1968. Section B, 1. Production and products in chapter XXI SATELLITE ANALYSIS AND ACCOUNTS, mentions issues of measuring tourism. In 1995, the WTO initiated proposals on TSA, and in 2000 OECD published a manual entitled *Measuring the Role of Tourism in OECD Economies*. (Contents of the *1993 System of National Accounts* are available



at the web page of United Nations Statistics Division: <http://unstats.un.org/unsd/sna1993/introduction.asp>.)

5.2 Some key concepts

In order to capture ambiguous subjects of tourism into the measurable framework, TSA has several key definitions with which tourism as an industry will be distinguished from the rest of the economic activities. Here are some of the key concepts that would be helpful for us to follow the TSA logics.

5.2.1 Visitor and tourist

While a word 'tourist' gives us the connotation of leisure travelers, there are nonleisure travelers, such as company employees who travel to meet clients, or nonleisure personal travelers such as visiting ailing parents in their hometown. A word 'visitor' will include those travelers. There are some cases where we should exclude certain visitors, however. Diplomats, military personnel, and migrant workers are excluded from visitors. In the TSA-related documents, the word 'tourists' might have been carefully replaced with visitors, which has a different meaning to tourists. So, the important idea for differentiation would be not whether a person would be a tourist or a nontourist, but whether a person would be a visitor or a nonvisitor. In other words, the word 'tourism' is officially used, but the word 'tourist' is not officially used as an important definition in the discussion of TSA. This is one of a few points where students become confused. It appears that students tend to think that the word 'visitor' is another technical jargon that is used in TSA and that it is approximately similar to what they know as 'a tourist'. There may be an extra need for TSA experts to explain the definition of 'visitors' in comparison with 'tourists'. Figure 5-1 shows the basic concept of visitors.

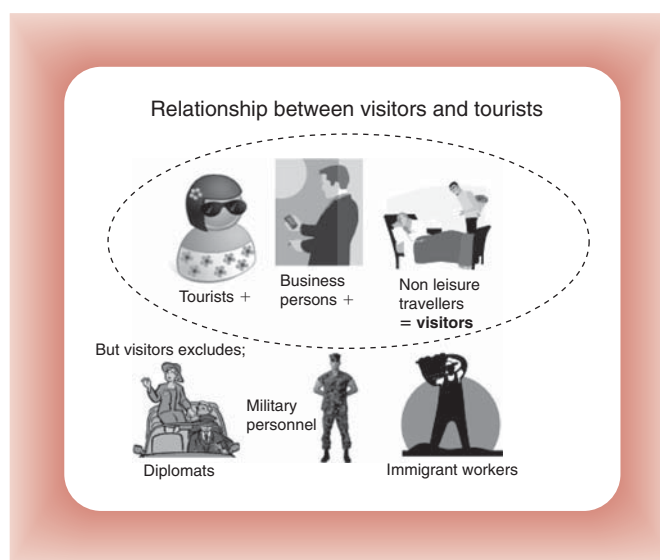


Figure 5-1 Conceptual image: visitors in relation to tourists.



5.2.2 Usual and unusual environment

To illustrate the concept of usual and unusual environment, here are several questions. If you visit a soccer World Cup game in Germany or the Olympic Games in Greece from UK, you are most likely classified as visitors. Here are some more questions;

- If you visit a Ritz-Carlton hotel 10 miles (16 km) from your residence, are you considered as a visitor?
- Many of those who live in Tokyo, Japan enjoy their occasional visits to the Tokyo Disneyland, which is located in Chiba prefecture but only about 10 miles (16 km) away from the central part of Tokyo. Are Tokyoites considered as leisure visitors when they visit Tokyo Disneyland?
- A person commutes over 50 miles (80 km) one way every day for years by Shinkansen (bullet train) from his residence in Oyama to his work in Tokyo and to be paid in a head office of a large bank in Tokyo. Was the person a nonleisure visitor because of the distance traveled (more than 50 miles)?
- If a British banker went to the Gold Coast, Australia and stayed there for 1 month to close a business deal, is she considered a visitor?
- If a Korean student went to the US to study English for 6 months, but thanks to his hard work, obtained good English scores in TOEFL and switched status to a full-time graduate student to stay 2 years, is he still a visitor?

Now you want to introduce one simple method to decide whether a person in question can be considered as 'a visitor'. One of the possible methods would be 'distance' to be used as a cutoff line, with those who travel above a certain distance to be considered visitors. We have a minor problem, however, that there is no universal agreement on the distance. In the US, the Consumer Expenditure Survey (CES) by the Bureau of Labor Statistics, the American Travel Survey by the Bureau of Transportation Services use difference distance (75 miles and 100 miles, respectively), and indeed the distance criteria for visitors is different from one nation to the other. If you insist on imposing universal distance such as 50 miles (80 km), then for a nation like Bahrain in the Arabian Gulf or Aruba in the Caribbean, there would be almost nobody ever to be classified as domestic tourists (= leisure visitors) at all (see Figure 5-2).

This discussion on usage of certain distances to distinguish usual and unusual environment is one example of the fact that some parts of TSA are still evolving, and that more feedback from various sources should be a welcome addition to improve the concept. We need hospitality and tourism students to study and contribute to the advances of TSA, as majority of the existing advancements have been made by contributions from economists who may have less exposure and experience to the operations of hospitality businesses.

5.2.3 Supply-based concept and demand-based concept

Let us consider the I-O concept that we learned earlier. How did we classify the industry? We looked at the products, or output, from each industrial sector to classify the group of industrial

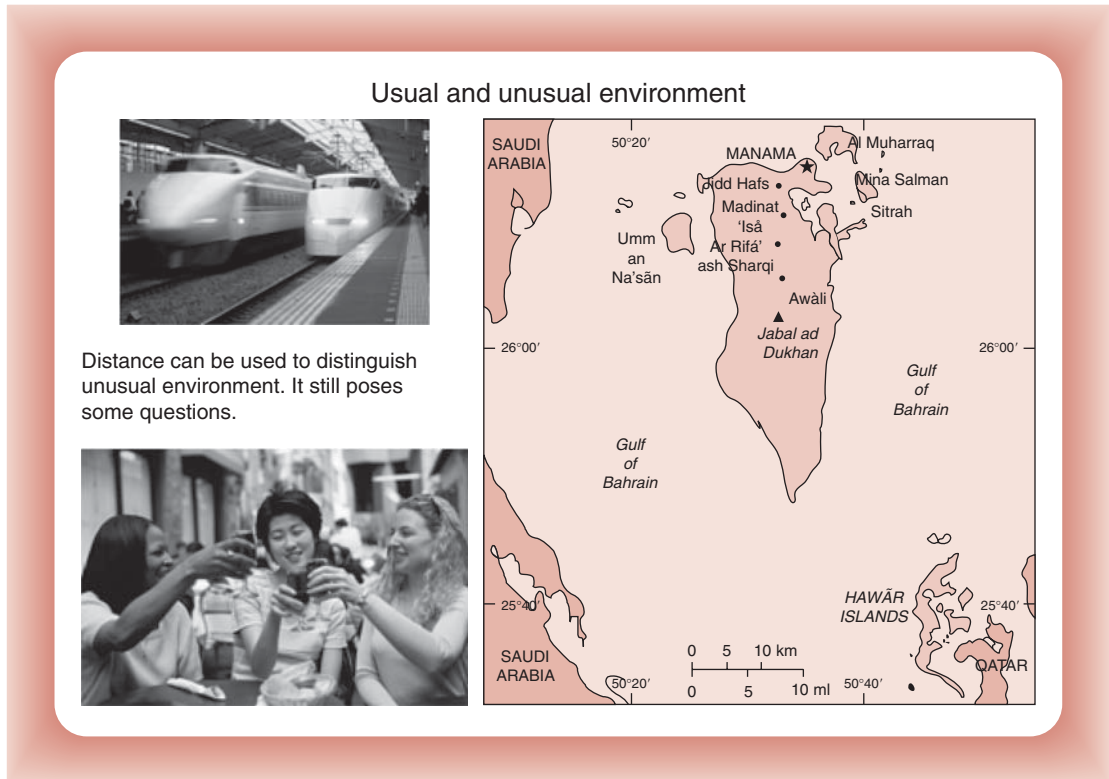


Figure 5-2 Usual and unusual environment.

Source: CIA World Factbook.

sectors. You have no difficulty in identifying apple and tomatoes as outputs from the agriculture sector as they share common characteristics. Characteristics of outputs that industry produces can usually help us identify the specific industrial sector.

5.2.4 Supply-based concept

In the process of the above consideration, we did not pay attention to a question of who purchased those bananas or water melons. Apples are apples irrespective of buyers' characteristics, such as whether the buyer was households, governments, or firms, or they purchased apples for final consumption or for intermediate goods to produce apple pies. In order to attribute a product to the producing industry, we will consider the output. As we learned in the I-O concept, production activities produce outputs to be supplied either to other industrial sectors as intermediate goods or to households for our final demand. If you look at only the product characteristics to classify the industry, it can be considered as a supply-based concept that you use to classify it. Your opinion that a gun was the product of the manufacturing sector is not affected by whether the buyer was the government (military, police forces), firms (private securities company, criminal group, rebel forces), household (hobbyist, self-defense), or the purpose of consumption (for peace keeping, attack, criminal activities, show of force).



5.2.5 Unique characteristics of tourism products

Now, let us consider typical products that tourists purchase. After John and his family travel from Europe to Boston, US, he goes through immigration. Then he exchanges his Euro into US dollar (banking sector), buys a local map and a bottle of water (retail sector), and picks up a taxi (transportation sector) to a hotel. After checking in, they walk around the area and purchased some souvenirs and snacks for children (retail sector). After some relaxation at the hotel, they walked to the movie theater across the block and purchased entrance tickets (entertainment sector). Then they went to the seafood restaurant for a meal (restaurant sector).

Now look at what John's family purchased in Boston. All the goods and services that they purchased were mostly from the Services sector, but can you identify by the characteristics of the product which products can be easily distinguished as 'tourism products'? Banking services can be purchased not only by visitors (leisure visitors = tourists, and nonleisure visitors = nontourists) but also by nonvisitors who live and work in Boston, which is one of the thriving large metropolitan cities in the US. Retail shops and taxis can be used by both visitors and nonvisitors. Souvenirs and snacks may be purchased by both visitors and nonvisitors, and the same applies to entertainment products. The last example was the consumption at the restaurant. While tourists such as John's family can spend at restaurants, nonvisitors also choose to eat there. So the supply-based product characteristics will not work well to define tourism. Indeed, the concept of tourism is demand-based.

5.2.6 Demand-based concept of tourism

In dealing with tourism-related economic activities, we have to consider the demand-side. We will build up the activities by determining who purchased the product, and decide whether such a purchase was made by a visitor. We cannot assert that all the revenues at the seafood restaurant were caused by visitors because it also attracts non-visitors (see Figure 5-3).

5.3 General compositions tourism satellite accounts

While detailed logics and explanations are shown in the comprehensive OECD manual (OECD, 2000), it showed detailed suggested tables for TSA without actual numbers.

In general, a TSA study would include, but not be limited to, the following concepts and discussions:

- definitions of visitors, usual environment;
- definition of tourism demand;
- meaning of tourism industries and tourism commodities;
- reviewing the examples of tourism commodities and the producers;
- defining names of tourism industries and corresponding tourism commodities;
- production table (make table) of tourism commodities and identification of the producers of those tourism commodities;

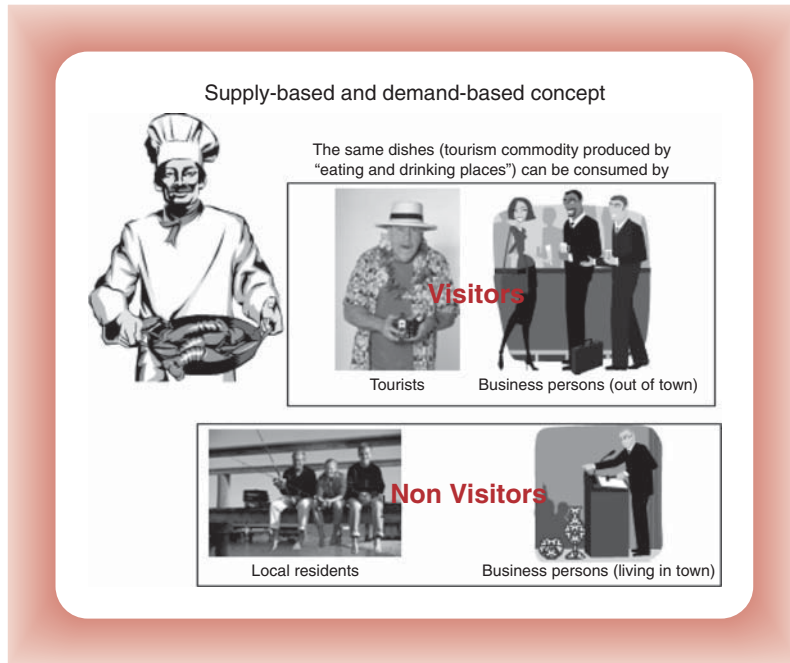


Figure 5-3 Demand-based concept of tourism: the case of tourism commodity produced by eating and drinking places.



Figure 5-4 Example of an event with a mixture of visitors and nonvisitors.

Notes: Photograph taken by the author at the 2007 ZORA! Neale Hurston Festival, Eatonville, Orange County, FL, US. In commemorating the life of one of the most famous black writers, who lived in "the Oldest Black Incorporated Municipality in America" the annual festival has been held for the last 18 years. (Plate 3)

- supplies and consumptions of tourism commodities and all other commodities;
- decomposition of total demand for all commodities into tourism demand for tourism commodities, then further decomposition of tourism demand into different type of visitors for various commodities;



- tourism output, intermediate needs, and value added;
- tourism employment and compensation.

Measuring the Role of Tourism in OECD Economies – OECD Manual on Tourism Satellite Accounts and Employment 2000 shows their recommendation of 22 tables (including 13 types of table with subcategories) whose titles are shown in Table 5-1.

Table 5-1 List of tables recommended by Organisation for Economic Co-operation and Development manual in 2000.

#	Table	Table name
1	1	Production account of characteristic tourism industries: net basis and gross basis – current prices
2	2	Tourism supply and demand by type of commodity and by type of visitor: net basis at purchaser's price – current prices
3	2A	Tourism supply and demand by type of commodity and by type of visitor: gross basis at purchaser's price – current prices
4	3	Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: net basis – current prices
5	3A	Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: gross basis – current prices
6	4	Tourism value added of characteristic industries and other industries: net basis
7	4A	Tourism value added of characteristic industries and other industries: gross basis
8	5	Tourism employment of characteristic industries and other industries
9	6	Visitors' characteristics (same day visitors and tourists – recorded on a net basis for tour operators)
10	6A	Visitors' characteristics (same day visitors and tourists – recorded on a gross basis for tour operators)
11	7	Characteristic tourism industries' gross capital acquisition – at current prices
12	8	Characteristic tourism industries' gross capital stock – at current prices, end of period
13	9	Production account of characteristic tourism industries: net basis – at prices of previous period
14	9A	Production account of characteristic tourism industries: gross basis – at prices of previous period
15	10	Tourism supply and demand by type of commodity and by type of visitor: net basis at purchaser's prices – at prices of previous period
16	10A	Tourism supply and demand by type of commodity and by type of visitor: gross basis at purchaser's prices – at prices of previous period
17	11	Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: net basis – at prices of previous period
18	11A	Supply by characteristic tourism and other industries to meet tourism demand by different types of visitors: gross basis – at prices of previous period
19	12	Tourism value added of characteristic industries and other industries: net basis – at prices of previous period

**Table 5-1** Continued

#	Table	Table name
20	12A	Tourism value added of characteristic industries and other industries: gross basis – at prices of previous period
21	13	Characteristic tourism industries' gross capital acquisition
22	14	Characteristic tourism industries' gross capital stock

Source: Compiled by author from OECD, 2000, pp. 59–85.

These tables are rather comprehensive in nature, and as the book title indicates, they are more like manuals and official guidance of formats for fellow economists who have knowledge of the SNA. In the classroom setting, however, hospitality and tourism students find difficult to follow the logic of subsequent TSA tables without seeing the actual numbers. It might help you to follow at least one example of how various tables in TSA had been made and presented with real numbers. In that regard, the case of the TSA for the US will be presented, due to its clarity and comprehensive display of the nation's actual data.

5.4 Tourism satellite accounts case studies

In the first section, we will review all the processes of how the TSAs are created by following one of the best and freely available technical papers available in 2008. With the permission of the author, Dr S. Okubo at the BEA, US Commerce Department, we will follow the paper with additional discussions along the series of tables that constitutes TSAs. Please note that responsibilities for comments and opinions solely belong to this author, and may not necessarily reflect those of Okubo and Planting (1998). Even though the absolute data in this particular paper may appear outdated, the structures and explanations are clear and remain valid for the future.

The first long section is on the US TSA and will be followed by shorter sections to update research papers by the BEA and summarize other TSA studies in other nations in the world.

5.4.1 US federal level tourism satellite accounts

In the US, the BEA, Department of Commerce has been following the nation's needs to develop TSAs. BEA's team developed a series of papers on TSAs, including the one entitled *US Travel and Tourism Satellite Accounts for 1992* by Okubo and Planting (1998). Teams at BEA already published several updates after the original paper by Okubo and Planting, but the basic framework and sequences of the presentation are still along those presented in the first work. We will consider how respective tables are created one by one, to facilitate the understanding of the logics and contents of typical TSA presentations with real numbers.

In the US, the TSA is referred to as the travel and tourism satellite accounts (TTSA), which appears to be the same in substance as a TSA. The report starts with a summary of the whole study and shows the results of the measurement of size and impact of the tourism activities in the US.

**Table 5-2** US travel and tourism satellite accounts – key indicators of tourism activity: range of estimates, 1992.

	Demand (\$ billions)	Value added (\$ billions)	Employment (thousands)	Percent		
				Share of GDP		Share of employment
				Demand	Value added	
Method 1	284.2	120.5	3749	4.6	1.9	3.2
Method 2	294.9	124.5	3933	4.7	2.0	3.3
Method 3	332.8	135.7	4353	5.3	2.2	3.7

Original Note: See the section 'Methodological overview' for a discussion of the three methods.

Source: Okubo and Planting, 1998, Table 1, p. 8. Bureau of Economic Analysis, reproduced with permission.

5.4.1.1 Summary display

Table 5-2 is the display of summary results, which, in terms of sequence, you will create at the end of the all other work. This is a table that appears in an abstract (in academic setting) or in an executive summary (in business report setting).

You can see what you will get eventually, the final product of TSA work, which includes how large the tourism demand is (range between \$284.2 billion and \$332.8 billion: first column from left), how large the value added of tourism activities are (range between \$120.5 billion and \$135.7 billion: second column from left), how many jobs are attributed to tourism activities (range between 3.7 million to 4.3 million: third column from left), and relative share of those tourism activities in the whole US economy by percentages shown in three columns from right under the heading of 'percent'. Tourism demand represents range of 4.6% and 5.3% of US GDP, valued added created by tourism demand represents range of 1.9% and 2.2% of the US GDP, and finally jobs attributed to tourism activities range from 3.3% and 3.7% of the all the jobs in the US.

These data are very valuable for policy makers, taxpayers, and government officials. Unless they know the relative size and significance of tourism activities as a quasi industrial sector, they cannot compare the tourism industry with other existing industries. Once the tourism as an industrial sector can be put in perspective, there can be rational discussions on how much of government and taxpayers resources should be allocated to this industrial sector, how much of educational resources be allocated to students and workers in these sectors, or how important the development of this particular sector is for the creation of employment for the citizens, etc. These resources allocation issues are equivalent to management issues for profit organization and without analysis of accurate accounting data, management cannot allocate limited precious internal resources into the optimal growth opportunities. From that viewpoint, TSA is a tool that would provide the region/nation with accounting data on tourism as an industry, so that stakeholders can make better decisions and create list of priorities over regional/national industrial policies.



Table 5-3 US travel and tourism satellite accounts – alternative framework for measuring travel and tourism activities.

	BEA	OECD	WTO
Statistical unit	Visitor	Visitor	Visitor
Concept of visitor	Person traveling outside of usual environment for less than 12 months	Same as BEA	Same as BEA
Concept of usual environment	Place of usual activities – residence, work, leisure Minimum distance determined by available data sources –50–100 miles from residence	Place of usual activities – residence, work, leisure Tourism determined by minimum distance from usual environment Minimum distance defined by country	Same as OECD
Criteria distinguishing tourism from nontourism expenditures	Direct contact between visitor and supplier of tourism commodities	Same as BEA	Same as BEA
Tourism demand	Expenditures by visitors	Same as BEA	Same as BEA
Tourism commodities/tourism industries	Determined by what US visitors do	Determined by share of commodity purchased by visitors or produced primarily as an attraction for visitors	Same as OECD
Infrastructure investments – private and public	Future extension of TTSAs	Private purchases of fixed assets, for example, capital investment in hotel structures Public purchases include airports, long-distance bus stations List still under discussion	Private purchase of fixed assets are same as OECD

Notes: BEA, Bureau of Economic Analysis; OECD, Organisation for Economic Co-operation and Development; WTO, World Tourism Organization.

Source: Okubo and Planting, 1998, Table 2, p. 11. Bureau of Economic Analysis, reproduced with permission.

5.4.1.2 Evolving nature of travel and tourism satellite accounts – need to embrace the differences

Table 5-3 is start of the time-consuming work, displaying comparative compatibility of concepts and definitions among BEA, OECD, and WTO, thus showing no numbers.

You see consensus among BEA, OECD, and WTO over Statistical unit, Concept of visitor, Criteria distinguishing tourism from nontourism expenditures, Tourism demand, while



the topics of Concept of usual environment, Tourism commodities/tourism industries and Infrastructure investments – private and public showed slight difference among three.

As for the concept of usual environment, BEA accepts minimum distance determined by available data sources, some of which are using 50 miles and some others are using 100 miles. The OECD and WTO version left more flexibility regarding the distance by stating ‘minimum distance defined by country’. It is understandable that while BEA deals with only one nation, OECD deals with many more nations, with various stakes in tourism activities, and thus has to be flexible to differing opinions among member nations.

As for tourism commodities and tourism industries, BEA said these are determined by what US visitors do (which can be interpreted that the degree of substances in each commodities and industries are given priority to be included in the TSA or not over possible issue of detailed conformity with other nation’s TSA). Even though it sounds contrary to the idea of global standard creation, most of the important commodities and industries are fairly identically included over different TSA. It is possible that creation of a TSA may be funded by external funding sources, which may have request the inclusion of certain interested sectors. Some nations, for example, may not have a passenger rail system, thus may find it useless to keep the passenger rail commodity and industry, and instead include some other commodities/industries that may not exist in other nations. This is an issue of global conformity and local adaptability, and it is possible that the more TSAs that are developed, the more we see the directions on the issue. Until that clarification happens in the field, we have to embrace some degree of differences in detail among different nations.

As for the issue of infrastructure investments, OECD advocates reflection of private purchases of fixed assets, for example, capital investment in hotel structures. WTO takes the same stance. While WTO and BEA did not discuss public purchases, OECD suggested that public purchases, including airports, bus stations for long-distance travel, should be incorporated into the tourism activities. These points have been updated since the creation of this table, but they will be reviewed separately from the US TTSA. At this point, you can see that TSA is still an evolving new subject, to which you have more scope to contribute.

5.4.1.3 Defining tourism commodities and contents

Table 5-4 shows the description of tourism commodities and its contents. If you are a casual consumer of TSA, you may not find this table useful very often. If you have to develop TSA for your region/nation, suddenly this table would become a useful beacon for your assignments regarding what should be included or excluded in each commodity categories.

Let us take one example of hotels and lodging places as a tourism commodity. I previously stated the hotel’s commodity would be a comfortable room to stay, but there would be many more than that to be considered as ‘hotel and lodging places’ tourism commodity. It includes lodging receipts from hotels, motels, guestrooms, and rooming and boarding houses serving the general public; other receipts of hotels and motels, sporting, and recreational camps; and recreational vehicle parks and camp sites, but it excludes meals served by hotels and motels. This exclusion of meals in the tourism commodity of ‘hotels and lodging places’ is because those meals are considered as tourism commodity of ‘eating and drinking places’, even though they were produced by the hotels.



Table 5-4 Classification of commodities in the travel and tourism accounts.

Description of commodity	Content
Tourism commodities:	
Hotels and lodging places	Includes lodging receipts from hotels, motels, guestrooms, and rooming and boarding houses serving the general public; other receipts of hotels and motels, sporting and recreational camps, and recreational vehicle parks and camp sites Excludes meals served by hotels or motels
Eating and drinking places	Includes food and beverage receipts and tips Excludes catering services and school lunch sales by state and local governments
Passenger rail	Includes receipts from rail passengers for travel and dining and tips
Passenger bus and other local transportation	Includes receipts from passengers for intercity, charter, and local bus services and subway and limousine services
Taxicabs	Includes taxi fares and tips
Domestic passenger air fares	Includes receipts from domestic air passengers for airfares, meals and beverages, movies, and other receipts
International air fares	Includes receipts from international air passengers
Passenger water	Includes receipts from passengers for water transportation
Auto and truck rental	Includes receipts for rental of automobiles and trucks
Other vehicle rental	Includes receipts for rental of recreational vehicles and utility trailers
Arrangement of passenger transportation	Includes commissions for the arrangement of passenger transportation and net receipts for tours
Recreation and entertainment	Includes miscellaneous entertainment receipts such as amusement parks, fairs, museums, gambling, and other recreation and amusements
Participant sports	Includes participant sports such as golf and tennis
Movie, theater, ballet, and musical events	Includes receipts for admissions to movies and theater and music programs
Sports events	Includes admissions to sports events
Petroleum retail margins	Includes retail margins on petroleum sales
Other retail margins	Includes retail margin on all other goods
Travel by US residents abroad	Includes travel expenditures by US residents abroad
Non-tourism commodities (= commodities not classified as tourism commodities):	
Gasoline and oil	Includes sales of gasoline, diesel fuel, lubricating oils, and grease
PCE* nondurable commodities	Includes sales of all other nondurable commodities
Selected services	Includes receipts for selected services that may be used by tourists on, during, or after a trip, such as parking, tolls, and automotive repair services
Wholesale trade margins and transportation costs	Includes wholesale margins and transportation costs on all goods
All other commodities	Includes all other commodities not considered above

Note: PCE, personal consumption expenditures.

Source: Okubo and Planting, 1998, Table 3, p. 12. Bureau of Economic Analysis, reproduced with permission.



Another point is the existence of nontourism commodities at the bottom of the table. For example, if you consider the commodities of gasoline and oil, they do not appear to be as much tourism commodities as a rainbow T-shirt saying ‘Waikiki’. But we have to list these nontourism commodities, as tourists in the US probably spend more money buying fuel than T-shirts.

5.4.1.4 Travel and tourism satellite accounts industries and commodities

Table 5-5 lists the tourism industries and their corresponding commodities. If you recall how the I-O tables were structured, you have a clear advantage of understanding what messages this table is conveying. Commodities are those items, tangible and intangible goods or services to be consumed by tourism activities (of visitors and nonvisitors) and industries are those that produce respective commodities. If you are a consumer of TSA, you may not find this table extremely useful, but you will find it valuable if you have to produce regional/national TSAs to measure the tourism activities in the study region.

Table 5-5 Travel and tourism satellite accounts industries and commodities.

Industry	Commodity
Hotels and lodging places	Hotels and lodging places
Eating and drinking places	Eating and drinking places
Railroads and related services	Passenger rail
Local and suburban transit and interurban highway passenger transportation, except taxicabs	Passenger bus and other local transportation
Taxicabs	Taxicabs
Air transportation	Domestic passenger air fares International air fares
Water transportation	Passenger water
Automotive rental and leasing, without drivers	Auto and truck rental Other vehicle rental
Arrangement of passenger transportation	Arrangement of passenger transportation
Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing, including track operation; marinas; libraries, museums, art galleries, and botanical and zoological gardens	Recreation and entertainment
Membership sports and recreation clubs	Participant sports (golf, tennis, etc.)
Motion picture theaters; dance studios, schools, and halls; theatrical producers (except motion pictures), bands, orchestras, and entertainers	Movie, theater, ballet, and musical events
Professional sports clubs and promoters	Sports events
Gasoline service stations	Petroleum retail margins
Retail, excluding eating and drinking places and gasoline service stations	Other retail margins
Industries producing nondurable PCE goods	PCE nondurable commodities

**Table 5-5** Continued

Industry	Commodity
Automobile parking, automotive repair shops and services, and toll highways	Parking, automotive repair, and highway tolls
All other industries	Wholesale trade margins and transportation costs Gasoline and oil
(Travel by US residents abroad has no industry counterpart. US residents traveling abroad purchase commodities that are produced abroad, and the TTSA's include only domestically produced commodities)	Travel by US residents abroad

Notes: PCE, personal consumption expenditures; TTSA, travel and tourism satellite account.

Source: Okubo and Planting, 1998, Table 4, p. 13. Bureau of Economic Analysis, reproduced with permission.

One example of an industry and commodity would be a visitor's stay at a hotel. The visitor needed a comfortable place to stay in Detroit near the airport. The person found the chic Westin Hotel and a room. The person consumed the tourism-related commodity called hotel and lodging places (commodity), which is produced by the hotel industrial sector called hotel and lodging places (industry).

If you look at air transportation as an industry, you find that it produces two commodities. One commodity is domestic passenger air fares which probably is the easier one to guess, and the other is called international air fares. The first one can be, for example, a Delta Air Lines' seat from Atlanta, GA to Chicago, IL, Northwest's seat from Miami, FL to Washington, DC, or Southwest's seat from Las Vegas, NV to Oakland, CA. What are common denominators of those commodities? They are offered by American air carriers from a domestic destination to another domestic destination. How about the followings? Continental Air's seat from Tokyo, Japan to Guam, US, Northwest's seat from Osaka, Japan to Shanghai, United Air's seat from New York, US to Amsterdam, The Netherlands. What are the common denominators of those commodities and industry? Those commodities are produced by US domestic airline companies and sold to Americans and nonAmericans between two destinations and at least one city is not in the US. If a Japanese tourist travels to Saipan, US (Northern Mariana Islands in the Pacific – popular destination for Asians) on Continental Air, Japanese tourist pays the money in exchange for consumption of the commodity (a seat from Narita, Japan to Saipan, US) produced by the American company. So from viewpoint of US economy, domestic industry produced a commodity which was consumed by a nonAmerican.

Do most of the industries produce only the corresponding commodities? For example, hotel and lodging places as an industry produce only the commodity called the hotel and lodging places? You will see the answer to this intriguing question in the next section.

5.4.1.5 Tourism commodities and producing industries table

Tourism commodities are tourism-related goods and services that are purchased by visitors, nonvisitors for final consumption, and by other industries as intermediate goods.

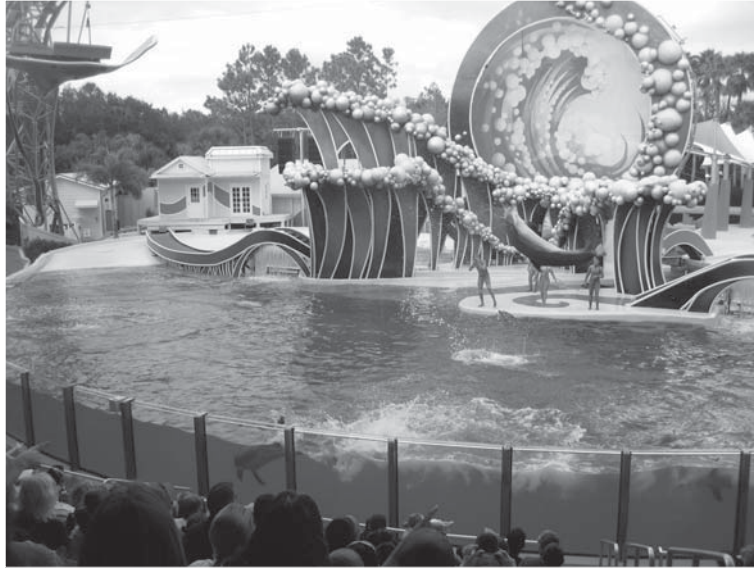


Figure 5-5 Dolphin show at Sea World, Orlando, FL, US.

Source: Photograph taken by the author, December 2006. Note one is in the air! (Plate 4)

That may be enough explanations if you had prior education as an economist. Tourism and hospitality students will also understand the meaning precisely only if at least one example is presented.

If you are a tourist visiting an overseas destination, you stay at the hotel. Imagine yourself in a foreign destination. What you need to consume as a tourist is the tourism-related product – a comfortable and convenient place to stay for the duration of your visit, which is produced by the hotel industry. To put this transaction in TSA perspective, we see that a tourist consumed the tourism-related product called hotel and lodging places (in the row), which is produced by the hotel industrial sector called hotel and lodging places (in the column).

If you are a marketing specialist, you may argue that the commodity that is consumed by visitors should be expressed as ‘unforgettable experience of comfortable stay with an oversized heavenly bed and the latest modern amenity including 42 inch LCD and complimentary ultra-high speed wireless internet connection, personalized courteous service delivered with impeccable quality located at the convenient central tourism and attractions area’ because you think that is visitors’ perception of what they buy. Yes, it is the commodities that the hotel industries produce for consumption by the visitors. But due to the space limitations, the same title of hotel and lodging places is reused both for the name of the industry and that of the commodity in Table 5-6.

You notice that the hotel sector produces another commodity, eating and drinking places. Again, you have to imagine your hotel stay in Orlando. Can you look for restaurant experience at the hotel? With the exception of certain segment of hotels which exclusively offer only hotel rooms, many hotels have limited or full-service restaurant units. Depending on the location of the hotel business, the hotel’s production of restaurant commodity component could

Table 5-6 Production account of tourism industries and all other industries 1992 (\$ million).

Commodity	Industry *1																			Domestic production (producers' prices) *5
	Hotels and lodging places	Eating and drinking places	Rail-roads and related services *2	Local and suburban transit and inter-urban highway passenger transportation, except taxicabs *2	Taxi-cabs	Air transportation	Water transportation	Automotive rental and leasing, without drivers	Arrangement of passenger transportation	Industries producing recreation and entertainment commodities *3	Membership sports and recreation clubs	Industries producing movies, theaters, ballet, and musical events *4	Professional sports clubs and promoters	Gasoline services stations	Retail excluding eating and drinking places and gasoline services stations	Industries producing nondurable personal consumption expenditure commodities other than gasoline and oil	Automobile parking, automotive repair shops and services, and toll high-ways *2	All other industries		
Hotels and lodging places	55 913	-	-	-	-	-	-	-	-	-	239	-	-	-	-	-	-	68	56 220	
Eating and drinking places	16 613	220 685	-	-	-	-	-	-	-	1222	3256	13	-	2165	14 484	-	-	9710	268 148	
Passenger rail	-	-	1226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1226	
Passenger bus and other local transportation	-	-	-	13 158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13 158	
Taxicabs	-	-	-	-	6614	-	-	-	-	-	-	-	-	-	-	-	-	-	6614	
Domestic passenger air fares	-	-	-	-	-	48 449	-	-	-	-	-	-	-	-	-	-	-	17	48 466	
International air fares	-	-	-	-	-	22 605	-	-	-	-	-	-	-	-	-	-	-	-	22 605	
Passenger water	-	-	-	-	-	4000	-	-	-	-	-	-	-	-	-	-	-	-	4000	
Auto and truck rental	-	-	-	-	-	-	14 318	-	-	-	-	-	-	31	628	-	58	59	15 094	
Other vehicle rental	-	-	-	-	-	-	420	-	-	-	-	-	-	4	30	-	-	-	454	
Arrangement of passenger transportation	-	-	-	-	-	-	-	13 030	-	-	-	-	-	-	-	-	-	-	13 030	
Recreation and entertainment	10 428	-	-	-	-	-	-	-	27 595	10	-	-	-	-	295	553	-	1054	39 935	
Participant sports	-	-	-	-	-	-	-	-	1956	8231	-	-	-	-	-	-	-	-	10 187	
Movie, theater, ballet, and musical event	-	-	-	-	-	-	-	-	-	-	21 468	-	-	-	-	-	-	98	21 566	
Sports events	-	-	-	-	-	-	-	-	-	-	-	2867	-	-	-	-	-	1660	4527	
Petroleum retail margins	-	13	-	-	-	-	-	-	-	48	-	-	-	25 488	-	-	95	272	25 916	
Other retail margins	531	579	-	-	-	-	84	-	1111	184	79	27	-	482 384	-	783	14 165	499 927		
Travel by US residents abroad	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gasoline and oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Personal consumption expenditures nondurable commodities other than gasoline and oil	-	-	-	-	-	-	-	-	-	-	-	-	-	9511	106 426	821 872	-	7653	114 079	
Parking, automotive repair, and highway tolls	-	-	-	-	-	-	-	-	-	-	-	-	-	2939	39 123	-	68 354	4566	114 982	
Wholesale trade margins and transportation costs	-	-	30 110	6	-	9522	7416	-	-	-	-	-	-	-	-	15 461	-	609 457	671 972	
All other commodities	758	14 847	2506	2714	-	7252	15 265	6588	78 3868	-	2 086	3550	530	13 653	381 576	1443	7 538 648	7 995 362		
Industry output	84 243	236 124	33 842	15 878	6614	87 828	26 681	21 410	13 108	35 800	11 920	23 646	6444	31 157	560 108	1 325 888	70 733	8 231 223	10 822 647	
Intermediate inputs	32 449	124 678	12 934	10 222	2853	50 188	17 108	10 669	4781	13 788	5026	13 252	1844	9307	185 152	817 218	32 236	3 245 037	-	
Compensation of employees	32 615	81 265	14 727	13 635	2258	29 740	4650	3733	5037	10 973	5348	6042	3716	10 038	228 000	237 576	19 474	2 936 215	-	
Indirect business taxes	6372	14 115	815	111	24	5629	492	1621	520	2249	640	1043	265	3720	71 394	28 492	3040	365 049	-	
Other value added	12 807	16 066	5366	-8090	1479	2271	4431	5387	2770	8790	906	3309	619	8092	75 562	242 602	15 983	1 684 922	-	

Original notes: *1, Industries are defined on a Standard Industrial Code (SIC) basis. *2, Includes government enterprises. *3, Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing including track operation; marinas; and libraries and museums, art galleries, and botanical gardens. *4, Motion picture theaters; dance studios, schools and halls; theatrical producers (except motion pictures), bands and orchestras, and entertainers. *5, The industry output for domestic production is in purchaser's prices because it includes margins and transportation costs.



be substantial. For example, in Japan, it is quite common that more than half of the hotel's revenue can be attributable to sales at their food and beverage operations, as the role of hotels in society is oriented more towards a social place to meet and dine.

In Table 5-6, your knowledge on I-O will be valuable. In other words, without the knowledge of both how the I-O table is displayed and of major components in the I-O, this table may be a very challenging one to follow. That is the reason why it is recommended that you learn the basics of I-O before studying the TSA tables as the TSA tables contain jargon and knowledge from the I-O structure.

The table looks like I-O table at a glance, but there are some differences:

- 1 Rows and columns are put in reverse. This means the directions of flows for goods and services, and those for monetary payments are the opposite to what we learned for a typical I-O. In this table, goods and services flow from top (industry) to left (commodity), and the money flows from left (commodity) to top (industry).
- 2 Each industrial sector's output is recorded at the bottom of the commodities row, not at the bottom of the table. This looks unfamiliar to you, having learned the structures of I-O/SAM, but in this table, the total output of each industrial sector is shown in a row at the lower part of the table at fifth row from the bottom.
- 3 Intermediate inputs for each industrial sector are aggregated to one single row. Though this is shown different from the I-O table, it depicts interdependence among industrial sectors. In this table, total of intermediate inputs for each industry is shown in one number. This table as a whole shows many industrial sectors that are considered to be as tourism industries. Some of the industrial sector may not be considered as tourism industries but produces tourism commodities that are consumed by visitors.
- 4 Value added components are shown in three rows of compensation of employees, indirect business taxes, and other value added. Value added components are shown over three rows at the bottom. By definition of the I-O structure, intermediate inputs plus value added will be total output, which is shown here as industry output.

5.4.1.6 Column interpretations

Let us look at the first column, hotel and lodging places industry, to discuss the cell which intersects with industry output. You see \$84 243 million. This means the hotel and lodging places industry produced the total of \$84 243 million of output. if we recall that total output equals total input by definition of the I-O structure, then as stated in point (4) above, total input should equal to the sum of intermediate inputs and value added component.

$$\text{Total input} = \text{intermediate inputs} + \text{value added} (= \text{compensation of employees} + \text{indirect business taxes} + \text{other value added})$$

$$84\,243 = 32\,449 + (32\,615 + 6372 + 12\,807)$$

Now look at the upper part of the same column. The sum of all the commodities that the hotel and lodging places industry produced should be equal to the total output. The industry



produced five different commodities, which are hotel and lodging places, eating and drinking places, recreation and entertainment, other retail margins, and all other commodities.

Total output = hotel and lodging places + eating and drinking places + recreation and entertainment + other retail margins + all other commodities

$$84\,243 = 55\,913 + 16\,613 + 10\,428 + 531 + 758$$

Now, we can compare the total input with total output.

$$\begin{aligned} \text{Total input} &= 32\,449 + (32\,615 + 6\,372 + 12\,807) = 55\,913 + 16\,613 + \\ &10\,428 + 531 + 758 = \text{total output} \end{aligned}$$

Calculations on these summation show that total input equals total output. We can see that prior knowledge on the I-O can help understanding of how the TSA tables are structured, because TSA is based on the I-O structure as Okubo mentions in her paper.

5.4.1.7 Row interpretations

An example of the first row, hotel and lodging places' commodities would be a good start to follow the logics of how the numbers in rows are displayed. Total productions of hotel and lodging places commodities in the US were \$56 220 million, as we see the domestic production at the far right number. We can see from this table which industrial sector produced hotel and lodging places' commodities by looking at the numbers in the first row. Along the industries, hotel and lodging places industry (look at the column heading on top) produced \$55 913 million of hotel and lodging places commodities (look at the row heading on left), and membership sports and recreation clubs produced \$239 million of hotel and lodging places commodities. Outside of the tourism-related sectors, all other industries also provided \$68 million of hotel and lodging places commodities.

As a second example, the second row is the eating and drinking places commodities, which will show production of the commodities by various industrial sectors. Total productions of eating and drinking places commodities in the US were \$268 148 million, as we see the domestic production at the far right number. compared with the comparable number for the hotel and lodging places commodities, this number is more than four times larger. We can see from this table which industrial sector produced eating and drinking places commodities by looking at the numbers in the first row.

Along the industries, hotel and lodging places industry (look at the column heading on top) produced \$16 613 million of eating and drinking places commodities (look at the row heading on left). What does this mean? An industrial sector called hotel and lodging places (commonly known as hotels) produced \$16 613 million equivalent of dining experience (perhaps combination of tasty meals, nice drink, good service and nice atmosphere, resulting in an intangible commodity as a dining experience). What is important for you to observe here is that by looking at eating and drinking places commodity (start from the second row heading on the left of the table) you find many numbers along this row. It is not only the restaurant industry (= eating and drinking places industry) that can produce the commodity



(= dining experience), but also many other industries can produce the commodity (= dining experience).

Let us continue to look along the second row. Around the middle of all columns, you find that industries producing recreation and entertainment commodities produced \$1222 million of eating and drinking places commodities. Furthermore, membership sports and recreation clubs produced \$3256 million of eating and drinking places commodities, industries producing movies, theaters, ballet, and musical events produced \$13 million of eating and drinking places commodities, gasoline service stations produced \$2165 million of eating and drinking places commodities, and finally retail excluding eating and drinking places and gasoline service stations produced \$14 484 million of eating and drinking places commodities (e.g. coffee and sandwiches in the food court of a shopping mall). Outside of the tourism-related sectors, all other industries also provided \$9710 million of eating and drinking places commodities.

It is not a technical note but you may see that two tourism industrial sectors show unique allocation of commodities productions. Railroads and related services sector and water transportation sector have wholesale trade margins and transportation costs commodities figures higher than their primary commodities productions of passenger rail and passenger water figures. Interactions between industry and commodities show not only the trade of goods and services but also the money transfer in exchange, so you can see unique structure of each tourism industrial sector's business models.

5.4.1.8 Supply and consumption table

After you learned which industries produce corresponding tourism-related commodities in the previous table, you see the next table showing how the tourism-related commodities are supplied and who actually consumes the tourism-related commodities (Table 5-7).

In the table, there are two large column groups of supply and consumption, and on the row (left) the same commodities items as in the previous table. Indeed, the first column under domestic production (producers' prices) is identical to the column that appeared in the far right end of the production table (Table 5-6).

5.4.1.9 Interpretation of total supply and total consumption of commodities

Around the middle of the columns, there is a column entitled total supply, which shows the row-wise sums of each commodity. If you look at the first row of hotels and lodging places commodity, \$56 220 million equivalent of hotels and lodging places commodity were supplied by the domestic production (top, far left), details of which can be traced back in the previous table (Table 5-6). Hotels and lodging places commodities are supplied by government sales of \$357 million, making the total supply of hotels and lodging places commodities to be \$56 577 million.

Total consumption will be met by total supply. The first column under consumption is intermediate, which is the demand for hotels and lodging places commodity from other industrial sectors as intermediate goods and services. hotels and lodging places commodity to be used as intermediate goods and services for other industrial sectors production activities was \$27 260 million, which was larger than the PCEs of \$23 680 million. Consumption by governments and their employees was captured under the column government expenditures

Table 5-7 Supply and consumption of tourism and all other commodities, 1992 (\$ million).

Commodity	Supply							Consumption					
	Domestic production (producers' prices) *1	Imports	Government sales	Change in business inventories	Wholesale trade margins and transportation costs	Retail margins	Total supply *2	Intermediate	Personal consumption expenditures	Gross private domestic fixed investment	Exports of goods and services	Government expenditures excluding sales *3	Total consumption
Hotels and lodging places	56 220	-	357	-	-	-	56 577	27 260	23 680	-	-	5637	56 577
Eating and drinking places	268 148	-	-	-	-	-	268 148	32 335	231 193	-	309	4311	268 148
Passenger rail	1226	-	-	-	-	-	1226	310	829	-	-	87	1226
Passenger bus and other local transportation	13 158	-	-	-	-	-	13 158	2612	10 455	-	-	91	13 158
Taxicabs	6614	-	-	-	-	-	6614	3641	2586	-	-	387	6614
Domestic passenger air fares	48 466	-	-	-	-	-	48 466	21971	21 308	-	-	5187	48 466
International air fares	22 605	9808	-	-	-	-	32 413	3073	12 377	-	16 395	568	32 413
Passenger water	4000	301	-	-	-	-	4301	-	4125	-	176	-	4301
Auto and truck rental	15 094	-	-	-	-	-	15 094	10 668	3234	-	-	1192	15 094
Other vehicle rental	454	-	-	-	-	-	454	245	209	-	-	-	454
Arrangement of passenger transportation	13 030	-	-	-	-	-	13 030	9004	2814	-	1107	105	13 030
Recreation and entertainment	39 935	-	3708	-	-	-	43 643	770	42 057	-	-	816	43 643
Participant sports	10 187	-	-	-	-	-	10 187	1284	8903	-	-	-	10 187
Movie, theater, ballet, and musical events	21 566	145	-	-	-	-	21 711	8194	13 313	-	43	161	21 711
Sports events	4527	101	444	-	-	-	5072	1303	3096	-	320	353	5072
Petroleum retail margins	25 916	-	-	-	-	-	-	-	-	-	-	-	-
Other retail margins	499 927	-	-	-	-	-	-	-	-	-	-	-	-
Travel by U.S. residents abroad	-	39 964	-	-	-	-	39 964	10 361	29 603	-	-	-	39 964
Gasoline and oil	14 079	5283	-	518	62 204	25 916	206 964	78 264	115 234	-	2994	10 472	206 964
Personal consumption expenditures nondurable commodities other than gasoline and oil	875 179	137 493	1219	9432	197 752	299 313	1 501 524	415 108	972 568	2564	72 583	38 701	1 501 524
Parking, automotive repair, and highway tolls	114 982	-	181	-	-	-	115 163	37 134	75 560	-	17	2452	115 163
Wholesale trade margins and transportation costs	671 972	-	-	-	-	-	-	-	-	-	-	-	-
All other commodities	7 995 362	438 542	121 167	-4520	412 016	200 614	9 172 221	3 925 205	2 635 574	788 427	508 665	1 314 350	9 172 221
Total	10 822 647	631 637	127 076	5430	671 972	525 843	11 575 930	4 588 742	4 208 718	790 991	602 609	1 384 870	11 575 930

Original notes: *1, The total for domestic production is in purchasers' prices because it includes margins and transportation costs. *2, Total supply in purchasers' prices is equal to domestic production in producers' prices plus imports, government sales, wholesale trade margins, and transportation costs are not shown explicitly in this column because they are included in the purchasers' values for the gasoline and oil, personal consumption expenditure nondurable commodities other than gasoline and oil, and all other commodities. *3, Includes consumption and investment expenditures and excludes government sales. Government sales are included as part of supply.

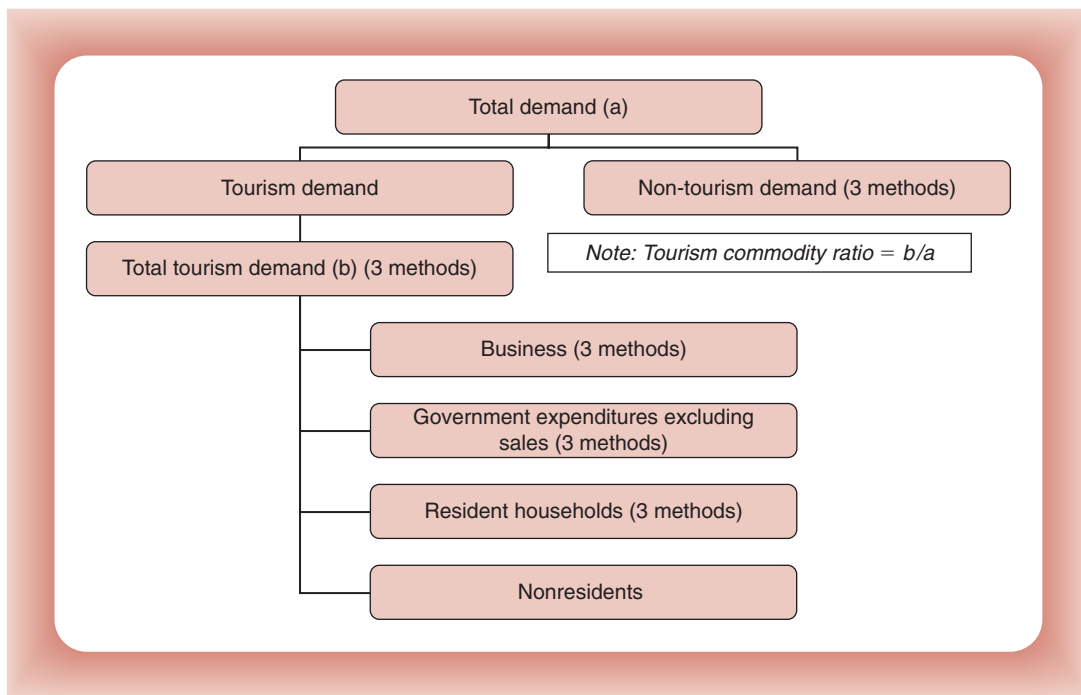


Figure 5-6 Visual images of structure of tourism demand by type of visitors.

Source: Made by author based on Okubo and Planting, 1998, Table 7, p. 16. Bureau of Economic Analysis, US Department of Commerce.

excluding sales of \$5 637 which is about 10% of total consumption of hotels and lodging places commodity. If you look across the different commodities, there are four other commodities of which consumption from other industrial sectors were larger than PCEs.

Finally, if you look at the columns under the heading consumption, what you see here are from left to right, intermediate, personal consumption, investment, exports, and government expenditure, i.e. AX, C, I, EX, and G. You have imports (IM) under the supply. With this information, you can calculate the GDP of the US in 1992 using the numbers at the bottom total rows, if you remember that $GDP = C + I + G + EX - IM$.

5.4.1.10 Tourism demand by type of visitor

The original tourism demand by type of visitor table is complex due to the inclusion of three methods. The basic structure of this table can be drawn simply shown as shown in Figure 5-6 and the original table including the three different methods is shown in Table 5-8.

In order to simplify the structure only the numbers shown in method 1 will be discussed here (Table 5-9).

5.4.1.11 Tourism demand and nontourism demand

As shown in the Figure 5-6, at the top left column of the table there is the total demand column. Familiar names of commodities, identical from the top commodity hotels and lodging

Table 5-8 Tourism demand by type of visitor, 1992.

Commodity	Total demand	Tourism demand												Nontourism demand			Ratio 1			
		Total tourism demand			Business			Government expenditures excl. sales			Resident households			Non-residents			Method 1	Method 2	Method 3	
		Method 1	Method 2	Method 3	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3				
Hotels and lodging places	56 577	56 577	56 577	56 577	27 260	27 260	27 260	5637	5637	5637	11 342	11 342	11 342	12 338	-	-	-	1	1	1
Eating and drinking places	268 148	45 431	48 685	58 484	17 917	17 917	17 917	3696	3696	3696	13 812	17 066	26 865	10 006	222 717	219 463	209 664	0.17	0.18	0.22
Passenger rail	1226	1226	1226	1226	310	310	310	87	87	87	653	653	653	176	-	-	-	1	1	1
Passenger bus and other local transportation	13 158	3367	3934	4898	583	698	893	55	57	61	2170	2620	3385	559	9791	9224	8260	0.26	0.3	0.37
Taxicabs	6614	1478	3002	4624	748	1592	2490	71	152	237	531	1130	1769	128	5136	3612	1990	0.22	0.45	0.7
Domestic passenger air fares	48 466	48 466	48 466	48 466	21 971	21 971	21 971	5187	5 187	5187	16 773	16 773	16 773	4535	-	-	-	1	1	1
International air fares	32 413	32 159	32 159	32 159	3073	3073	3073	314	314	314	12 377	12 377	12 377	16 395	254	254	254	0.99	0.99	0.99
Passenger water	4301	4150	4150	4150	-	-	-	-	-	-	3138	3138	3138	1012	151	151	151	0.96	0.96	0.96
Auto and truck rental	15 094	12 132	12 132	12 689	8400	8400	8400	1055	1 055	1055	2207	2207	2764	470	2962	2962	2405	0.8	0.8	0.84
Other vehicle rental	454	125	209	209	-	-	-	-	-	-	101	185	185	24	329	245	245	0.28	0.46	0.46
Arrangement of passenger transportation	13 030	2919	2919	2919	-	-	-	105	105	105	1975	1975	1975	839	10 111	10 111	10 111	0.22	0.22	0.22
Recreation and entertainment	43 643	14 509	15 500	17 547	-	-	-	-	-	-	9820	10 811	12 858	4689	29 134	28 143	26 096	0.33	0.36	0.4
Participant sports	10 187	3575	3678	4781	1207	1207	1207	-	-	-	1747	1850	2953	621	6612	6509	5406	0.35	0.36	0.47
Movie, theater, ballet, and musical events	21 711	3973	4673	6475	820	820	820	-	-	-	2326	3026	4828	827	17 738	17 038	15 236	0.18	0.22	0.3
Sports events	5072	1464	1385	1800	413	413	413	-	-	-	775	696	1111	276	3608	3687	3272	0.29	0.27	0.35
Travel by U.S. residents abroad	39 964	39 964	39 964	39 964	10 361	10 361	10 361	-	-	-	29 603	29 603	29 603	-	-	-	-	1	1	1
Gasoline and oil	206 964	11 208	11 864	17 485	2067	2210	3434	181	194	300	7251	7751	12 042	1709	195 756	195 100	189 479	0.05	0.06	0.08
Personal consumption expenditure nondurable commodities other than gasoline and oil	1 501 524	35 384	37 362	47 443	-	-	-	-	-	-	18 599	20 577	30 658	16 785	1 466 140	1 464 162	1 454 081	0.02	0.02	0.03
Parking, automotive repair, and highway tolls	115 163	6077	7008	10 852	109	197	303	61	101	158	5769	6572	10 253	138	109 086	108 155	104 311	0.05	0.06	0.09
All other commodities	9 172 221	-	-	-	-	-	-	-	-	-	-	-	-	-	9 172 221	9 172 221	9 172 221	-	-	-
Total	11 575 930	324 184	334 893	372 748	95 239	96 429	98 852	16 449	16 585	16 837	140 969	150 352	185 532	71 527	11 251 746	11 241 037	11 203 182	-	-	-

Original notes: *1, The tourism commodity ratio is total tourism demand divided by total demand. See section 'Methodological overview' for a discussion of the three methods.

Source: Okubo and Planting, 1998, Table 7, p. 16; reproduced with permission.



Table 5-9 Tourism demand by type of visitor (shortened version), 1992.

Commodity	Total demand	Tourism demand					Nontourism demand	Tourism commodity ratio 1		
		Total tourism demand	Business	Government expenditures excluding sales	Resident households	Non-residents			Method 1	Method 1
Hotels and lodging places	56 577	56 577	27 260	5637	11 342	12 338	–	1		
Eating and drinking places	268 148	45 431	17 917	3696	13 812	10 006	222 717	0.17		
Passenger rail	1226	1226	310	87	653	176	–	1		
Passenger bus and other local transportation	13 158	3367	583	55	2170	559	9791	0.26		
Taxicabs	6614	478	748	71	531	128	5136	0.22		
Domestic passenger air fares	48 466	48 466	21 971	5187	16 773	4535	–	1		
International air fares	32 413	32 159	3073	314	12 377	16 395	254	0.99		
Passenger water	4301	4150	–	–	3138	1012	151	0.96		
Auto and truck rental	15 094	12 132	8400	1055	2207	470	2962	0.8		
Other vehicle rental	454	125	–	–	101	24	329	0.28		
Arrangement of passenger transportation	13 030	2919	–	105	1975	839	10 111	0.22		
Recreation and entertainment	43 643	14 509	–	–	9820	4689	29 134	0.33		
Participant sports	10 187	3575	1207	–	1747	621	6612	0.35		
Movie, theater, ballet, and musical events	21 711	3973	820	–	2326	827	17 738	0.18		
Sports events	5072	1464	413	–	775	276	3608	0.29		
Travel by US residents abroad	39 964	39 964	10 361	–	29 603	–	–	1		
Gasoline and oil	206 964	11 208	2067	181	7251	1709	195 756	0.05		
Personal consumption expenditure nondurable commodities other than gasoline and oil	1 501 524	35 384	–	–	18 599	16 785	1 466 140	0.02		
Parking, automotive repair, and highway tolls	115 163	6077	109	61	5769	138	109 086	0.05		
All other commodities	9 172 221	–	–	–	–	–	9 172 221	–		
Total	11 575 930	324 184	95 239	16 449	140 969	71 527	11 251 746	–		

Original notes: *1, The tourism commodity ratio is total tourism demand divided by total demand. See section 'Methodological overview' for a discussion of the three methods. Source: Shortened by the author based on Okubo and Planting, 1998, Table 7, p. 16; reproduced with permission.

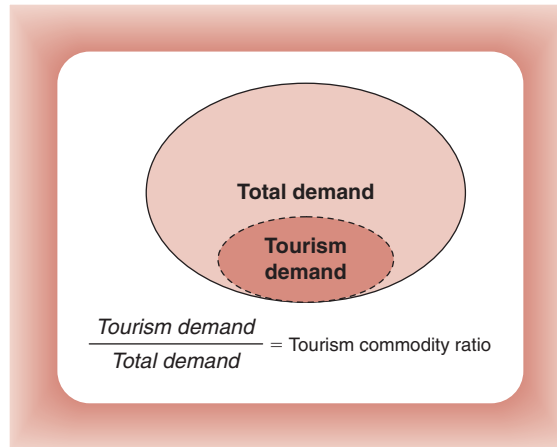


Figure 5-7 Visual image of tourism commodity ratio.

places to the bottom all other commodities except margins items in the supply and consumption of tourism and all other commodities table are also present. Total demand can be disaggregated into Nontourism demand and tourism demand, which will be further disaggregated into Business, Government expenditure excluding sales, resident household, and non-residents.

Let us consider some examples. First row is the hotel and lodging places commodity for which there was \$56 577 million of total demand. Hotel and lodging places commodities are unique in that demand for them consists of 100% tourism demand and 0% nontourism demand. Again, we have to be reminded that tourism demand derives from visitors who can be either leisure visitors (= tourists) or nonleisure visitors and that tourism demand includes, as you clearly see, demand from business, governments and nonresidents who may come as leisure traveler or foreign business or governments workers. Total tourism demand of \$56 577 million was generated from business (\$27 260 million; 48.2%), government expenditure (\$5637 million; 10.0%), resident household (\$11 342 million; 20.0%), and nonresidents (\$12 338 million; 21.8%). Since total demand for hotel and lodging places commodity is equal to total tourism demand for hotel and lodging places commodity, then the tourism commodity ratio is 1.00. The tourism commodity ratio is visualized in Figure 5-7.

$$\text{Tourism commodity ratio} = \text{total tourism demand} / \text{total demand}$$

The eating and drinking places commodity is on the second row of Table 5-9. While the total demand for eating and drinking places commodity is \$268 148 million, the total tourism demand is \$45 431 million based on method 1 data. With these two numbers, we can calculate the tourism commodity ratio as \$45 431/\$268 148 = 0.17 (i.e. 17%).

While the eating and drinking places commodity is consumed by nontourism demand of \$222 717 million, we will divide the total tourism demand into the following four subgroups: business (\$17 917 million), government (\$3696 million), resident household (\$13 812 million), and nonresidents (\$10 006 million).



5.4.1.12 Tourism gross domestic product calculations

Table 5-10 displays the importance of tourism industries and other industries for the production of tourism output and tourism-related value added. Each industry produces output and a certain portion of the output are purchased by visitors; that portion is shown as tourism-industry ratio in this table. This is a very important table for policy makers and government officials because it enables them to explain to taxpayers and stakeholders the significance of tourism as an industry to the national/regional economy with real data.

For the purpose of simplification, a shortened version of Table 5-10 has been created where only method 1 columns are provided (Table 5-11).

First we will consider how the numbers in this table were produced.

5.4.1.13 Industry output column

The numbers in the industry output column were transposed from the industry output row (fifth row from the bottom) of Table 5-6 (see Figure 5-8). (Recall that these numbers in Table 5-6 were calculated as the total of the entries in the industry columns above them, representing the industry's production of relevant commodities.)

5.4.1.14 Intermediate consumption column

Numbers in intermediate consumption column were taken from the intermediate inputs row, the fourth row from the bottom in Table 5-6 (Figure 5-9). (Recall that these numbers in Table 5-6 were from the national I-O data, representing the industry's intermediate inputs to produce respective commodities.) Intermediate inputs are shown next to industry output data in Table 5-6 and intermediate consumption are shown next to industry output data in Table 5-11, thus both can be transposed from row vectors to column vectors.

5.4.1.15 Value added column

The numbers in the value added column in Table 5-11 do not appear to have a corresponding row in the bottom part in Table 5-6. For example, the first number in the column 51 794 is the value added for hotels and lodging places in Table 5-11, but we cannot find the same number in the original table (Table 5-6). So how can we obtain this number?

If we remember how Table 5-6 was created, together with the basic knowledge of the I-O structure, we can find the data. Let us review how the first column (hotels and lodging places column, the first from left) was calculated:

Total input = intermediate inputs + value added (= compensation of employees + indirect business taxes + other value added)

$$84\,243 = 32\,449 + (32\,615 + 6372 + 12\,807)$$

If we sum up the value-added portion $32\,615 + 6372 + 12\,807$, then we will get 51 794, which is the number we see in the top of value added column (Figure 5-10).

Because of the I-O structure, if you see the transaction table vertically, intermediate consumption plus value added should equal to industry output as shown in Figure 5-11.

Table 5-10 Tourism gross domestic product of tourism industries and other industries, 1992.

Industry	Industry output	Intermediate consumption	Value added	Tourism industry ratio *1			Tourism output			Tourism industry			Tourism industry value		
				Method 1	Method 2	Method 3	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3	Method 1	Method 2	Method 3
Hotels and lodging places	84 243	32 449	51 794	0.8	0.81	0.82	67 603	68 326	69 457	26 039	26 318	26 754	41 563	42 008	42 704
Eating and drinking places	236 124	124 678	111 446	0.16	0.17	0.2	37 403	40 082	48 149	19 749	21 164	25 424	17 653	18 918	22 726
Railroads and related services	33 842	12 934	20 908	0.04	0.04	0.04	1226	1226	1226	469	469	469	757	757	757
Local and suburban transit and interurban highway passenger transportation, except taxicabs	15 878	10 222	5656	0.21	0.25	0.31	3367	3934	4898	2168	2533	3153	1199	1401	1745
Taxicabs	6614	2853	3761	0.22	0.45	0.7	1478	3002	4624	638	1295	1995	840	1707	2629
Air transportation	87 828	50 188	37 640	0.81	0.81	0.81	70 877	70 877	70 877	40 426	40 426	40 426	30 451	30 451	30 451
Water transportation	26 681	17 108	9573	0.14	0.14	0.14	3860	3860	3860	2475	2475	2475	1385	1385	1385
Automotive rental and leasing, without drivers	21 410	10 669	10 741	0.54	0.55	0.57	11 626	11 704	12 322	5793	5832	6096	5832	5871	6137
Arrangement of passenger transportation	13 108	4781	8327	0.22	0.22	0.22	2919	2919	2919	1065	1065	1065	1854	1854	1854
Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing including track operation; marinas; and libraries and museums, art galleries, and botanical and zoological gardens	35 800	13 788	22 012	0.18	0.19	0.24	6465	6963	8738	2490	2682	3365	3975	4281	5372
Membership sports and recreation clubs	11 920	5026	6894	0.31	0.32	0.4	3686	3810	4821	1 554	1606	2033	2132	2203	2788
Motion picture theaters; dance studios, schools, and halls; theatrical producers (except motion pictures), bands, orchestras, and entertainers	23 646	13 252	10 394	0.17	0.2	0.27	3932	4625	6408	2204	2592	3591	1729	2033	2817
Professional sports clubs and promoters	6444	1844	4600	0.13	0.12	0.16	828	783	1018	237	224	291	591	559	727
Gasoline service stations	31 157	9307	21 850	0.07	0.07	0.11	2199	2328	3285	657	695	981	1542	1632	2304
Retail excluding eating and drinking places and gasoline services stations	560 108	185 152	374 956	0.02	0.03	0.03	13 376	14 140	16 916	4422	4674	5592	8954	9466	11 324
Total tourism industries	1 270 477	529 045	741 432	-	-	-	230 844	238 578	259 517	110 384	114 049	123 708	120 460	124 528	135 720
Total all other industries	9 552 170	4 059 697	5 492 473	-	-	-	-	-	-	-	-	-	-	-	-
Total	10 822 647	4 588 742	6 233 905	-	-	-	-	-	-	-	-	-	-	-	-

Original notes: *1, The tourism commodity ratio is total tourism demand divided by total demand. *2, The industry tourist output is derived from Tables 5 and 7. The tourism commodity ratio (Table 7) is multiplied by the tourism commodities produced by industries (Table 5) and summed by industry. For example, the air industry produces \$48 449 million domestic passenger air fares of which 100% is tourism, it also produces \$22 605 million international air fares of which 99% is tourism. The total tourism output of the industry is \$70 877 million. See section 'Methodological overview' for a discussion of the three methods.

Source: Shortened by the author based on Okubo and Planting, 1998, Table 8, p. 17; reproduced with permission.



Table 5-11 Tourism gross domestic product of tourism industries and other industries, (shortened version), 1992.

Industry	Industry output	Intermediate consumption	Value added	Tourism industry ratio *1	Tourism output	Tourism industry intermediate consumption	Tourism industry value added
				Method 1	Method 1	Method 1	Method 1
Hotels and lodging places	84 243	32 449	51 794	0.8	67 603	26 039	41 563
Eating and drinking places	236 124	124 678	111 446	0.16	37 403	19 749	17 653
Railroads and related services	33 842	12 934	20 908	0.04	1226	469	757
Local and suburban transit and interurban highway passenger transportation, except taxicabs	15 878	10 222	5656	0.21	3367	2168	1199
Taxicabs	6614	2853	3761	0.22	1478	638	840
Air transportation	87 828	50 188	37 640	0.81	70 877	40 426	30 451
Water transportation	26 681	17 108	9573	0.14	3860	2475	1385
Automotive rental and leasing, without drivers	21 410	10 669	10 741	0.54	11 626	5793	5832
Arrangement of passenger transportation	13 108	4781	8327	0.22	2919	1065	1854
Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing including track operation; marinas; and libraries and museums, art galleries, and botanical and zoological gardens	35 800	13 788	22 012	0.18	6465	2490	3975
Membership sports and recreation clubs	11 920	5026	6894	0.31	3686	1 554	2132
Motion picture theaters; dance studios, schools, and halls; theatrical producers (except motion pictures), bands, orchestras, and entertainers	23 646	13 252	10 394	0.17	3932	2 204	1729
Professional sports clubs and promoters	6444	1844	4600	0.13	828	237	591
Gasoline service stations	31 157	9307	21 850	0.07	2199	657	1542
Retail excluding eating and drinking places and gasoline services stations	560 108	185 152	374 956	0.02	13 376	4422	8954
Total tourism industries	1 270 477	529 045	741 432	–	230 844	110 384	120 460
Total all other industries	9 552 170	4 059 697	5 492 473	–	–	–	–
Total	10 822 647	4 588 742	6 233 905	–	–	–	–

Original notes: *1, The industry tourism ratio is equal to tourism output divided by industry output. *2, The industry tourist output is derived from Tables 5 and 7. The tourism commodity ratio (Table 7) is multiplied by the tourism commodities produced by industries (Table 5) and summed by industry. For example, the air industry produces \$48 449 million domestic passenger air fares of which 100% is tourism, it also produces \$22 605 million international air fares of which 99% is tourism. The total tourism output of the industry is \$70 877 million. See section 'Methodological overview' for a discussion of the three methods.

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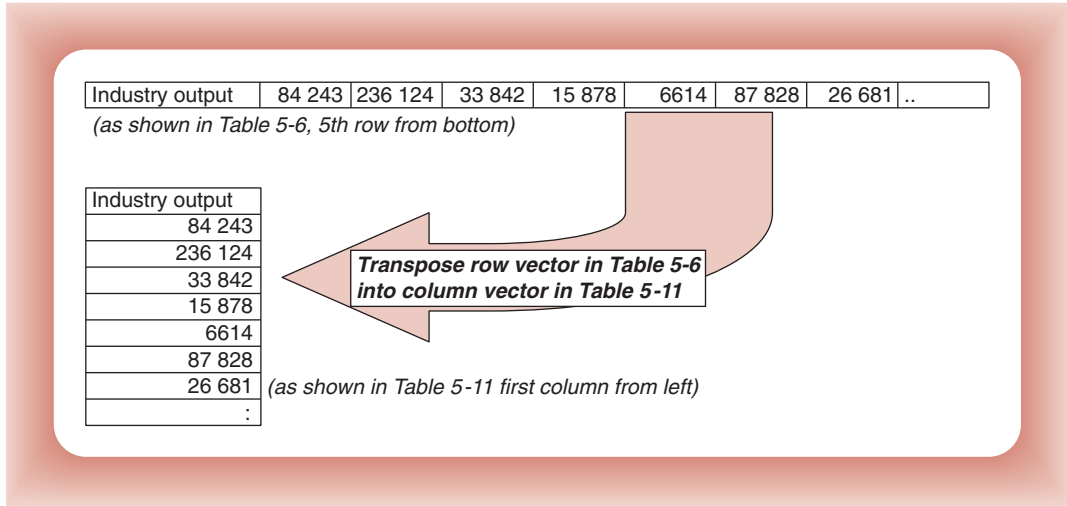


Figure 5-8 Industry output connections.

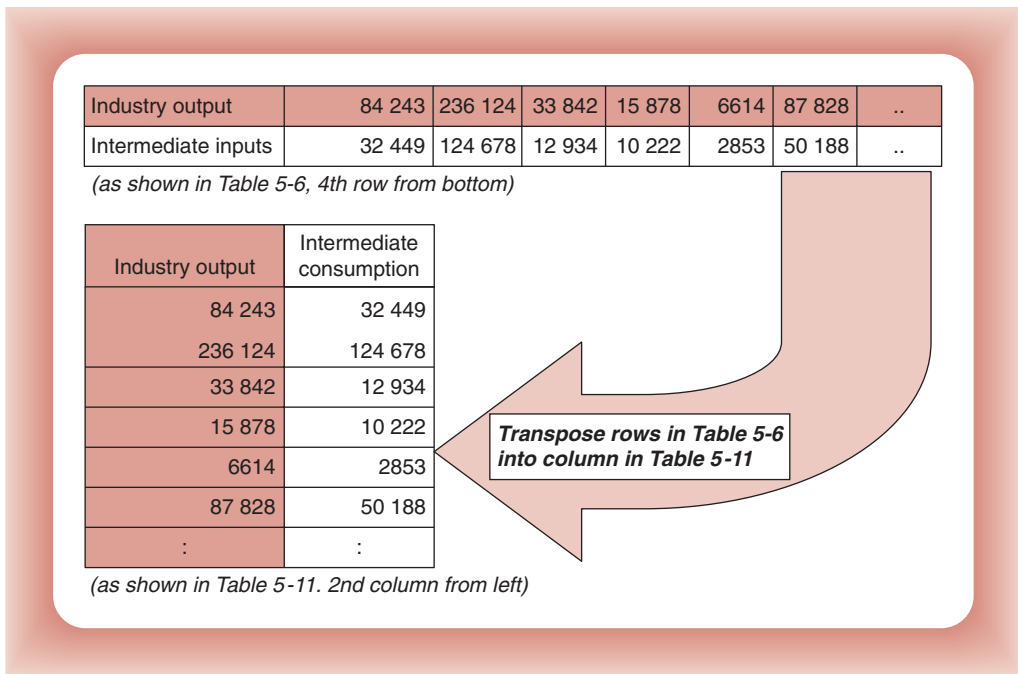


Figure 5-9 Intermediate inputs and intermediate consumption.

Thus, the value added should match the number of total input (= total output) minus (intermediate transactions), i.e. $84\,243 - 32\,449 = 51\,794$.

Based on this author’s teaching experience, we are now entering into a section that can be challenging, not only for hospitality and tourism students, but also for other students with quantitative majors such as engineering or applied economics. In order to discuss the tourism industry ratio, we have to understand how we calculate the tourism industry output.

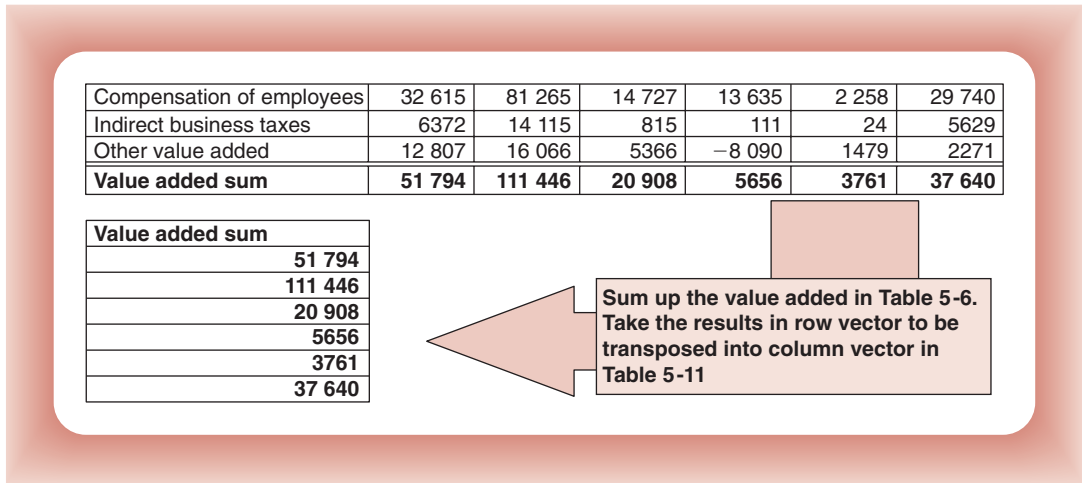


Figure 5-10 Value added calculations in Tables 5-6 and 5-11.

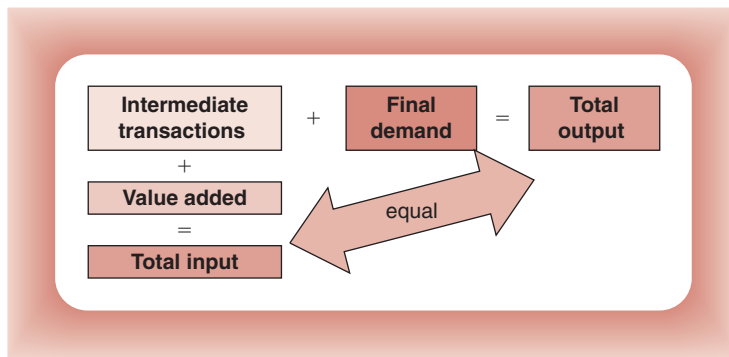


Figure 5-11 Review of the basic structure of the input-output table.

5.4.1.16 Tourism industry output

Estimation of tourism industry output can be performed by multiplying the respective tourism commodities produced by industries (Table 5-6) by the corresponding tourism commodity ratio (Table 5-9). After that, results have to be summed up by industry. The following are examples to show the processes of these calculations.

Taxicabs (with one commodity):

- There is only one commodity that taxicabs industry produce – taxicabs as a commodity.
- The amount of this commodity produced and consumed was \$6614 million (intersection between taxicab industry column and taxicab commodity row in Table 5-6).
- Then take that number (\$6614 million) and identify the corresponding tourism commodity ratio for the taxicab commodity, in this case 0.2234653 (rounded to 0.22 in Table 5-9).
- Total amount of commodity produced shall be multiplied by its tourism commodity ratio, in this case 0.2234653 (rounded to 0.22 in table).



- \$6614 million \times 0.2234653 = \$1478 million. Because there is only one commodity that Taxicabs industry produces, this is the taxicab industry's tourism output.

Air transportation (with two commodities):

- There are two commodities that Air transportation industry produces – domestic passenger air fares and international air fares.
- The amount of first commodity produced and consumed was \$48 449 million (intersection between air transportation industry column and domestic passenger air fares commodity row in Table 5-6).
- The amount of the second commodity produced and consumed was \$22 605 million (intersection between air transportation industry column and international air fares commodity row in Table 5-6).
- Then take those two numbers (\$48 449 million and \$22 605 million) and identify the corresponding tourism commodity ratio for the domestic passenger air fares commodity, in this case 1.00, and the ratio for the international air fares commodity, in this case 0.992167 (rounded to 0.99 in Table 5-9).
- Total amount of commodity produced shall be multiplied by its tourism commodity ratio, in this case 1.00 and 0.992167 (rounded to 0.99 in table). (Since the exact tourism commodity ratios are not displayed but rounded ones are shown in the Table, we may encounter rounding errors with multiple commodities under one industry. In this case, the exact ratio can be traced back because one of the two tourism commodity ratios is 1.00.)
- Because there are two commodities that air transportation industry produces, summation of those numbers will be the air transportation industry's tourism output. Thus, (\$48 449 million \times 1.00) + (\$22 605 million \times 0.992167) = \$70 877 million.

Eating and drinking places (with three commodities):

- There are three commodities that eating and drinking places industry produce – eating and drinking places, petroleum retail margins, and other retail margins.
- The amount of first commodity produced and consumed was \$220 685 million (intersection between eating and drinking places industry column and eating and drinking places commodity row in Table 5-6).
- The amount of the second commodity produced and consumed was \$13 million (intersection between eating and drinking places industry column and petroleum retail margins commodity row in Table 5-6).
- The amount of the third commodity produced and consumed was \$579 million (intersection between eating and drinking places industry column and other retail margins commodity row in Table 5-6).
- Then take those three numbers (\$220 685 million, \$13 million, and \$579 million) and identify the corresponding tourism commodity ratio in Table 5-9 (we use only method 1 for



display purposes), i.e. eating and drinking places = 0.17, gasoline and oil = 0.05, and other retail margins = 0.02.

- Each three of the total amount of commodity produced shall be multiplied by their respective tourism commodity ratio, in this case 0.17, 0.05, and 0.02. (rounding errors may exist).
- Because there are three commodities, summation of those numbers will be the eating and drinking places industry's tourism output. Thus, $\$220\,685\text{ million} \times 0.17) + (\$13\text{ million} \times 0.05) + (\$579\text{ million} \times 0.02) = \$37\,403\text{ million}$.

Hotels and lodging places (with four commodities):

- There are four commodities that hotels and lodging places industry produce – hotels and lodging places, eating and drinking places, recreation and entertainment, and other retail margins.
- The amount of first commodity produced and consumed was \$55 913 million (intersection between hotels and lodging places industry column and hotels and lodging places commodity row in Table 5-6).
- The amount of the second commodity produced and consumed was \$16 613 million (intersection between hotels and lodging places industry column and eating and drinking places commodity row in Table 5-6).
- The amount of the third commodity produced and consumed was \$10 428 million (intersection between hotels and lodging places industry column and recreation and entertainment commodity row in Table 5-6).
- The amount of the fourth commodity produced and consumed was \$531 million (intersection between hotels and lodging places industry column and other retail margins commodity row in Table 5-6).
- Then take those four numbers (\$55 913 million, \$16 613 million, \$10 428 million, and \$531 million) and identify the corresponding tourism commodity ratio in Table 5-9 (we use only method 1 for display purposes), i.e. hotels and lodging places = 1.00, eating and drinking places = 0.17, recreation and entertainment = 0.33, and other retail margins = 0.02.
- Each four of the total amount of commodity produced shall be multiplied by their respective tourism commodity ratio, in this case 1.00, 0.17, 0.33, and 0.02.
- Because there are four commodities that hotels and lodging places industry produce, summation of those numbers will be the hotel and lodging places industry's tourism output. Thus, $(\$55\,913\text{ million} \times 1.00) + (\$16\,613\text{ million} \times 0.17) + (\$10\,428\text{ million} \times 0.33) + (\$531\text{ million} \times 0.02) = \$67\,603\text{ million}$.

5.4.1.17 Tourism industry ratio

We learned that tourism-affiliated industrial sectors can produce tourism commodities, such as a hotel's production of 'a comfortable place to stay for one night'. We also learned in Table 5-9 that those tourism-affiliated industrial sectors production of tourism commodities are not

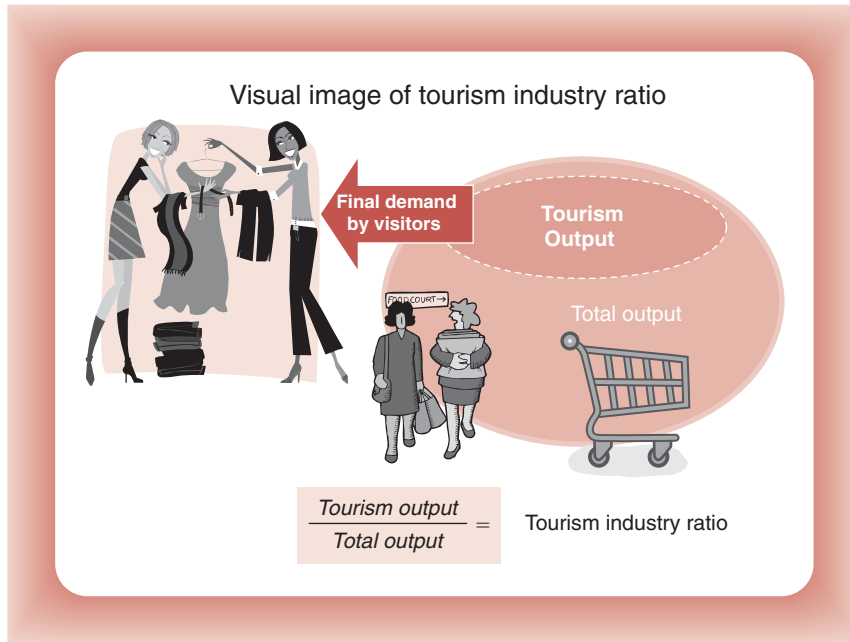


Figure 5-12 Visual image of tourism industry ratio.

always 100% (i.e. 1.00), even though four commodities, namely hotel and lodging places, passenger rail, domestic passenger air fares, travel by US resident abroad are considered to be 100% consumed by tourism demand. It is the tourism commodity ratio that shows the size of tourism demand in the total demand (see Figure 5-6).

The tourism industry ratio is to show the share of visitors' purchases of tourism-affiliated industrial sectors' output, which may include purchases by nonvisitors. In other words, tourism output, to be purchased by visitors, is hidden within the total output. What we try to do here is to extract the portion of output purchased by visitors, and that can be defined as tourism output. This is shown on the left half of Table 5-10.

Tourism industry ratio can be calculated by taking the ratio of tourism output to the total output as shown in Figure 5-12.

5.4.1.18 Tourism industry intermediate consumption

Tourism output (right side of Table 5-10) is divided into two components: tourism industry intermediate consumption and tourism industry value added (as with an I-O table). To calculate the tourism industry intermediate consumption, the intermediate consumption (second column from left) is multiplied by the corresponding tourism industry ratio.

For example, for the hotel and lodging places:

$$\$32\,449 \text{ million} \times 0.80247 \text{ (rounded to 0.80 in table)} = \$26\,039 \text{ million}$$

For the eating and drinking places:

$$\$124\,678 \text{ million} \times 0.15840 \text{ (rounded to 0.16 in table)} = \$19\,749 \text{ million}$$



5.4.1.19 Tourism industry value added

The second component of tourism output is tourism industry value added. This is calculated by multiplying value added (third column from left of Table 5-10) by the corresponding tourism industry ratio.

For example, for the hotel and lodging places:

$$\$51\,794 \text{ million} \times 0.80247 \text{ (rounded to 0.80 in table)} = \$41\,563 \text{ million}$$

For the eating and drinking places:

$$\$111\,446 \text{ million} \times 0.15840 \text{ (rounded to 0.16 in table)} = \$17\,653 \text{ million}$$

5.4.1.20 Tourism industry's output and gross domestic product – how to use this table

Having covered the technical elements of Table 5-11, you may wonder what to do with the complete table. If we look at the bottom rows of the table, you see total tourism industries, total all other industries, and total rows.

5.4.1.20.1 Total tourism industries row

Tourism-affiliated industry's total output is \$1 270 477 million. Of the total output, \$529 045 million (41%) is used as intermediate consumption, which means they are used by other industrial sectors to produce their final products. A total of \$741 432 million (59%) is used to satisfy the final consumption. However, as noted with the retail excluding eating and drinking places and gasoline service stations industry, there are numerous industry outputs that are used for nontourism-related consumptions. For example, even though the retail excluding eating and drinking places and gasoline service stations industry produced a total output of \$560 108 million, only a very small fraction of it, \$13 376 million (0.02388 (rounded to 0.02 in table), i.e. 2.388%), can be attributed to tourism output or output to be consumed by either tourism industry intermediate consumption or tourism industry value added.

Tourism output (\$230 844 million) can be divided into tourism industry intermediate consumption of \$110 384 million and Tourism industry value added of \$120 460 million.

5.4.1.20.2 Total all other industries row and total row

It is very important to have the total all other industries and total row numbers so that we can put tourism as an industry in broader perspective in the society.

The total of \$10 822 647 million (\$10.8 trillion) is the total output of the US economy in the study year of 1992. With the knowledge of total size of economy, tourism output of \$230 844 million (method 1), \$238 578 million (method 2), and \$259 517 million (method 3) can be put in perspective.

- Relative size of tourism output to the total US output
 - \$230 844 million (method 1)/\$10 822 647 million = 2.13%
 - \$238 578 million (method 1)/\$10 822 647 million = 2.20%
 - \$259 517 million (method 1)/\$10 822 647 million = 2.39%



Next, let us consider the size of value added, which is basically the GDP, namely total market value of goods and services produced in the nation in 1 year. Total US GDP was \$6 233 905 million in the study year of 1992. With the knowledge of total size of the economy, tourism value added of \$120 460 million (method 1), \$124 528 million (method 2), and \$135 720 million (method 3) can be put in perspective.

- Relative size of tourism GDP contribution to the total US GDP
 - \$120 460 million (method 1)/\$6 233 905 million = 1.93%
 - \$124 528 million (method 1)/\$6 233 905 million = 2.00%
 - \$135 720 million (method 1)/\$6 233 905 million = 2.17%

By having the size and significance of economic power of tourism as an industry, you can ask for legislative support for the industry, budget allocations, and local community support more effectively than just a mere emotional appeal of tourism without the figures. But there is one more important set of data that will make your argument even more convincing – tourism employment and compensation of employees.

5.4.1.21 Tourism employment and compensation of employees

In a democratic society, or most of the nation where the national/regional leaders take responsibility for their leadership, any industrial policy has to be explained to the taxpayers/voters to seek their support, approval of budget, allocation of funding, or positive benefits of certain policies to put those policies in perspective with negative rumors. This is because those governments are dependent on tax revenues that are generated from taxpayers/voters/residents. People want to know how their tax revenues are allocated and what the returns on those allocations of funds are. One of the weaknesses of tourism as an industry has been the lack of hard numbers as a comparable industry in the national/regional economy. As a result of TSA, we are trying to overcome the weakness.

The last table is a very important table for the purpose of proving validity of tourism as an industry by showing how many jobs are attributable to tourism as an industry and how much the workers receive as average annual salaries in different industrial sectors that produce tourism commodities.

5.4.1.22 Tourism employment and compensation

For the explanations purposes, Table 5-13 is the shortened version of Table 5-12 as the table only presents data based on method 1.

Employment and compensation data are not a formal part of the I-O/SAM tables though they are calculable as long as you have both access to good labor-related data of your study region and a basic knowledge of structural components of the I-O/SAM tables.

As the base data for TSA are derived from those of the I-O, TSA data carries some, if not all, of the same characteristics of the data in the I-O table:

- employment does not distinguish a full- and a part-time employee. Either would be counted as one employee;

Table 5-12 Tourism employment and compensation of employees, 1992.

Industry	Total employment (thousands of employees)	Tourism industry ratio			Tourism employment (thousands of employees)			Compensation (millions of dollars)	Tourism compensation (millions of dollars)			Average compensation per tourism employee (dollars) *1
		Method 1	Method 2	Method 3	Method 1	Method 2	Method 3		Method 1	Method 2	Method 3	
Hotels and lodging places *2	1661	0.80	0.81	0.82	1329	1347	1362	32 615	26 092	26 453	26 744	19 636
Eating and drinking places *3	6819	0.16	0.17	0.20	1091	1158	1364	81 265	13 002	13 795	16 253	11 917
Railroads and related services	243	0.04	0.04	0.04	10	9	9	14 727	589	534	534	60 605
Local and suburban transit and interurban highway passenger transportation, except taxicabs *4	416	0.21	0.25	0.31	87	103	128	13 635	2863	3378	4206	32 776
Taxicabs *5	32	0.22	0.45	0.70	7	15	22	1088	239	494	761	34 000
Air transportation	625	0.81	0.81	0.81	506	506	506	29 740	24 089	24 060	24 060	47 584
Water transportation	100	0.14	0.14	0.14	14	14	14	4650	651	673	673	46 500
Automotive rental and leasing, without drivers	178	0.54	0.55	0.57	96	97	101	3733	2016	2041	2128	20 972
Arrangement of passenger transportation *6	191	0.22	0.22	0.22	43	43	43	5037	1122	1122	1122	26 372
Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing including track operation; marinas; and libraries and museums, art galleries, and botanical and zoological gardens	633	0.18	0.19	0.24	114	120	152	10 973	1975	2085	2634	17 335
Membership sports and recreation clubs	297	0.31	0.32	0.40	92	95	119	5348	1658	1711	2139	18 007
Motion picture theaters; dance studios, schools, and halls; theatrical producers (except motion pictures), bands, orchestras, and entertainers	282	0.17	0.20	0.27	48	56	76	6042	1027	1208	1631	21 426
Professional sports clubs and promoters	46	0.13	0.12	0.16	6	6	7	3716	483	446	595	80 783
Gasoline service stations	632	0.07	0.07	0.11	44	47	67	10 038	703	750	1064	15 883
Retail excluding eating and drinking places and gasoline services stations	12 572	0.02	0.03	0.03	262	318	383	228 000	4750	5762	6941	18 136
Total tourism industries	–	–	–	–	3749	3933	4353	–	81 260	84 511	91 483	21 393
Total all other industries	–	–	–	–	117 998	117 998	117 998	–	3 645 042	3 645 042	3 645 042	30 891
Total Share (percent)	–	–	–	–	3.2	3.3	3.7	–	2.2	2.3	2.5	–

Original notes: *1 Average compensation per tourism employee was calculated as the arithmetic mean of the average compensation per tourism employee for methods 1, 2 and 3. *2 Self-employment for SIC 70 (Hotels and lodging) for 1992 is estimated at 56,000. (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *3 Self employment for SIC 58 (Eating and drinking places) for 1992 is estimated at 490,000. (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *4 Employment for this category includes 206,000 State and local government 'transit' employees. (Source: Table estimate for compensation.*5 Self employment for SIC 41 for 1992 is estimated at 54,000, all of which is assumed to occur in SIC 4120 (Taxicabs). (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *6 Self-employment for SIC 47 for 1992 is estimated at 27,000, all of which is assumed to occur in SIC 4720 (Arrangement of Passenger Transportation). *7 – Employment and Payrolls of State and Local Governments by Type of Government and Function: October 1992, 1992 Census of Governments, Compendium of Public Employment). Compensation for the State and local government "transit" employees is estimated at \$9,804,000,000, which is added to the national income and product account.

NOTE.—See the section 'Methodological Overview' for a discussion of the three methods. Sources: Bureau of Labor Statistics, US Department of Labor, Employment and Wage Annual Averages, 1992; Bureau of the Census, US Department of Commerce, 1992 Census of Governments, Compendium of Public Employment; and Bureau of Labor Statistics, US Department of Labor, Current Population Survey, 1992.

Source: Table 9, p17, 'US Travel and Tourism Satellite Accounts for 1992', Sumiye Okubo and Mark A. Planting, Survey of Current Business July 1998. Bureau of Economic Analysis, Reproduced with the Permission obtained by the author.

Table 5-13 Tourism employment and compensation of employees (shortened version), 1992.

Industry	Total employment (thousands of employees)	Tourism industry ratio	Tourism employment (thousands of employees)		Compensation (millions of dollars)	Tourism compensation (millions of dollars)	Average compensation per tourism employee (dollars) *1
			Method 1	Method 1			
Hotels and lodging places *2	1661	0.80	1329		32 615	26 092	19 636
Eating and drinking places *3	6819	0.16	1091		81 265	13 002	11 917
Railroads and related services	243	0.04	10		14 727	589	60 605
Local and suburban transit and interurban highway passenger transportation, except taxicabs *4	416	0.21	87		13 635	2863	32 776
Taxicabs *5	32	0.22	7		1088	239	34 000
Air transportation	625	0.81	506		29 740	24 089	47 584
Water transportation	100	0.14	14		4650	651	46 500
Automotive rental and leasing, without drivers	178	0.54	96		3733	2016	20 972
Arrangement of passenger transportation *6	191	0.22	43		5037	1122	26 372
Miscellaneous amusement and recreation services (except membership sports and recreation clubs); racing including track operation; marinas; and libraries and museums, art galleries, and botanical and zoological gardens	633	0.18	114		10 973	1975	17 335
Membership sports and recreation clubs	297	0.31	92		5348	1658	18 007
Motion picture theaters; dance studios, schools, and halls; theatrical producers (except motion pictures), bands, orchestras, and entertainers	282	0.17	48		6042	1027	21 426
Professional sports clubs and promoters	46	0.13	6		3716	483	80 783
Gasoline service stations	632	0.07	44		10 038	703	15 883
Retail excluding eating and drinking places and gasoline services stations	12 572	0.02	262		228 000	4750	18 136
Total tourism industries	—	—	3749		—	81 260	21 393
Total all other industries	—	—	117 998		—	3 645 042	30 891
Total Share (percent)	—	—	3.2		—	2.2	—

Original notes: *1 Average compensation per tourism employee was calculated as the arithmetic mean of the average compensation per tourism employee for methods 1, 2 and 3. *2 Self-employment for SIC 70 (Hotels and lodging) for 1992 is estimated at 56,000. (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *3 Self employment for SIC 58 (Eating and drinking places) for 1992 is estimated at 490,000. (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *4 Employment for this category includes 206,000 State and local government 'transit' employees. (Source: Table estimate for compensation. *5 Self employment for SIC 41 for 1992 is estimated at 54,000, all of which is assumed to occur in SIC 4120 (Taxicabs). (Source: Derived from Bureau of Labor Statistics, Current Population Survey, 1992.). *6 Self-employment for SIC 47 for 1992 is estimated at 27,000, all of which is assumed to occur in SIC 4720 (Arrangement of Passenger Transportation). *7 – Employment and Payrolls of State and Local Governments by Type of Government and Function: October 1992, 1992 Census of Governments, Compendium of Public Employment). Compensation for the State and local government 'transit' employees is estimated at \$9,804,000,000, which is added to the national income and product account.

NOTE.—See the section 'Methodological Overview' for a discussion of the three methods. Sources: Bureau of Labor Statistics, US Department of Labor, Employment and Wage Annual Averages, 1992; Bureau of the Census, US Department of Commerce, 1992 Census of Governments, Compendium of Public Employment; and Bureau of Labor Statistics, US Department of Labor, Current Population Survey, 1992.

Source: Table 9, p17, 'US Travel and Tourism Satellite Accounts for 1992', Sumiye Okubo and Mark A. Planting, Survey of Current Business July 1998. Bureau of Economic Analysis, Reproduced with the Permission obtained by the author.



- compensation of employees includes not only the direct wages and salaries but also supplementary welfare benefits such as social security (national retirement funding in the US), fringe benefits, and employer contribution to retirement fund;
- all data are shown on an annual basis.

5.4.1.22.1 Total employment

Total employment (expressed as thousands of employees) data are obtained from public offices that compile labor-related statistics. In the US, it is the Bureau of Labor Statistics that estimates average monthly employment by industry at very detailed levels using the North American Industrial Classification System (NAICS) (which replaced the Standard Industrial Code (SIC) system). Total employments are basically quoting relevant data from appropriate labor statistics.

5.4.1.22.2 Tourism industry ratio

The tourism industry ratios are already calculated in Table 5-10.

5.4.1.22.3 Tourism employment

We learned that tourism industry consists of many tourism-affiliated industrial sectors that cater to visitors in varying degrees. Counting all the employees working in those industrial sectors serving tourism demand will lead to an overestimation of numbers of employment in the tourism industry. Thus, we have to extract only the numbers of those whose employments are attributed to tourism demand. This is where the tourism industry ratios are required to filter out the tourism employment out of total employment in tourism-related industrial sectors. To calculate tourism employment (expressed as thousands of employees), multiply the total employment (first column from left) by the corresponding tourism industry ratio.

For example, for the hotel and lodging places:

$$1661 \text{ (thousands)} \times 0.80 = 1329 \text{ (thousands)}$$

For the eating and drinking places:

$$6819 \text{ (thousands)} \times 0.16 = 1091 \text{ (thousands)}$$

This calculation highlights the danger of overestimation of employment unless you have solid tourism industry ratio to filter out the nontourism demands.

5.4.1.22.4 Compensation

Figures in the compensation (expressed in millions of dollars) column are difficult to source unless you have good basic knowledge on the structure and components of the I-O/SAM tables. Aggregate amounts of annual compensation per industrial sector are displayed in the I-O/SAM transaction table and this is where you can obtain these data. Recall that those figures include not only the direct wages and salaries but also the related fringe benefits. These figures include all the compensation for each sector.

5.4.1.22.5 Tourism compensation

We learned that tourism industry consists of many tourism-affiliated industrial sectors that cater to visitors in varying degrees. Counting all the compensations paid to employees working



in those industrial sectors serving tourism demand will lead to overestimation of compensations paid for those engaged in the tourism industry. Thus we have to extract only the compensation of those whose employments are attributed to tourism demand. This is where the tourism industry ratios are required. To calculate the tourism compensation (expressed in millions of dollars) the (total) Compensation (the column approximately located in the middle) is multiplied by the corresponding Tourism industry ratio (the second column from left).

For example, for hotel and lodging places:

$$\$32\,615 \text{ million} \times 0.80 = \$26\,092 \text{ million}$$

For eating and drinking places:

$$\$81\,265 \text{ million} \times 0.16 = \$13\,002 \text{ million}$$

This calculation for eating and drinking places highlights the danger of overestimation of employment unless you have a solid tourism industry ratio to filter out the nontourism demands.

5.4.1.22.6 Average compensation per tourism employee

Having calculated the number of employees and total amount of annual compensation paid to them, we can calculate the Average compensation per tourism employee by dividing the tourism compensation (annual total amount expressed in millions dollars) by tourism employment (annual average expressed in thousands of employees).

For example, for hotel and lodging places:

$$\$26\,092 \text{ million} \div 1\,328\,783 \text{ (rounded to } 1\,329\,000 \text{ in table)} = \$19\,636$$

For eating and drinking places:

$$\$13\,002 \text{ million} \div 1\,091\,046 \text{ (rounded to } 1\,091\,000 \text{ in table)} = \$11\,917$$

5.4.1.23 Data requirements for creation of tourism satellite accounts tables

The basic data that you need to create TSA tables are the I-O/SAM data for the study region of interest. Other data requirements may differ slightly from those of US but an overview of US data requirements may be useful.

5.4.1.23.1 Input-output/social accounting matrix data of the study region

These data are definitely required to create TSA.

5.4.1.23.2 Consumer demand – personal consumption expenditure

For this study, five different sources were used to collect required data for TSA:

- US, CES, prepared and disseminated by the Bureau of Labor Statistics;
- The In-Flight Survey, prepared and disseminated by the International Trade Administration, US Department of Commerce;
- The American Travel Survey, prepared and disseminated by Bureau of Transportation Statistics, US Department of Transportation;



- The National Travel Survey, prepared by the Travel Industry Association;
- Surveys prepared by D.K. Shifflet and Associates (a consulting company).

While the total PCE consists of all expenditures by US residents, including expenditures made during overseas trips and excluding expenditures made in the US by nonresidents, PCEs for selected commodities include all purchases by resident and nonresident visitors in the US, excluding purchases made abroad by US residents.

Expenditures in the US by nonresident visitors, including and typically represented by tourists, can be classified into either nontravel expenditures or travel expenditures. Only the travel expenditures portion should be included in tourism demand.

You may want to be very specific about inclusion and exclusion of certain expenditures in your collection of tourism demand. For example, in this case for the US TSA, the following are excluded from the tourism demand:

- nonresident student expenditures,
- medical expenses by nonresidents,
- expenditures by nonresidents in the US working for foreign governments and international organizations,
- expenditures by Mexican, West Indian, and Puerto Rican workers in the US,
- expenditures by foreign ocean and air crews in the US.

There would be many 'gray' areas where researchers have to make reasonable but huge assumptions, such as estimating resident households' personal expenditure consumptions on nondurable commodities other than gasoline and oil. The D.K. Shifflet and Associates estimates were made on monthly surveys of 25 000 samples and conclude that the ratio of visitor shopping to the sum of other expenditures for hotels, meals, and recreation was 0.35, while the In-Flight Survey calculated the same ratio to be 0.57.

5.4.1.23.3 *Business and government demand*

For pure-tourism commodities, the estimates were taken from the I-O tables directly, while you need more assumptions and related works for the mixed-use commodities. Business and government expenditures on tourism commodities were estimated differently from those for consumers. Here are some examples.

- Expenditures on eating and drinking places – These are estimated by applying the ratio of meals and beverage expenditures to hotel expenditures based on ratios from American Express Survey of Business Travel Management (proprietary data) and apply them to purchases of this tourism commodity in the I-O data.
- Expenditures on local transportation, taxicabs, and gasoline and oil – Those expenditures by business and government segments were estimated by using the same ratio of resident households' tourism purchases to the total PCE.



- Expenditures on participant sports, movie, theater, ballet, and musical events and on sports events – business expenditures on those commodities were estimated from data in the I-O accounts on their expenditures for business travel and entertainment.

5.4.1.23.4 International demand

Due to globalization, we have many people who travel to and live in nations other than their native country. Some adjustments have to be made to reflect those realities.

- **Expenditures made by US residents traveling abroad and expenditures made by foreigners in the US** – The expenditures made by US residents traveling abroad will stimulate the host nation's economy as the money moves out of the US and will be spent in the host nation. If a person who is a resident in the US travels to France, the money that had been earned in the US will be spent in France, stimulating French economy. The expenditures made by the foreign visitors, for example, Koreans, in the US will stimulate the US economy as the money moves out of South Korea and will be spent in the US. Both cases are largely recorded by the balance of payment data made by the BEA.
- **Disaggregating expenditures made by foreigners in the US** – Foreigners' expenditures while in the US will be categorized into five different groups based on the In-Flight Survey data. Those are hotels and lodging places, eating and drinking places, transportation within the US, recreation and entertainment, and shopping.
- **Further disaggregation of expenditures for transportation, recreation, and entertainment** – Expenditures for transportation, recreation, and entertainment were disaggregated into TSA tourism commodities by using weights calculated from resident household tourism expenditures.

5.4.2 Tourism satellite accounts: updates on the US travel and tourism satellite accounts

The BEA, US Commerce Department has a website where the monthly journal of the *Survey of Current Business* can be downloaded free of charge. This is something that sets a standard for governmental offices in all over world, and access to such solid research reports on the TSA will facilitate tourism researchers.

The following documents are downloadable from <http://www.bea.gov/industry/iedguide.htm#TTSA> (last accessed 10 February 2008).

- *US Travel and Tourism Satellite Accounts for 1992* by Sumiye Okubo and Mark A. Planting, Survey of Current Business, July 1998.

This is the paper that we reviewed in detail in Section 5.4.1.

- *US Travel and Tourism Satellite Accounts for 1996 and 1997* (PDF – 312KB) by David Kass and Sumiye Okubo, Survey of Current Business, July 2000.

The paper displays detailed methods of estimating the output of TTSA industries (Table 7), of estimating PCE (Table 8), and of estimating demand for TTSA commodities (Table 9) before showing the series of TTSA tables for 1996 and 1997 side by side.



- *US Travel and Tourism Satellite Accounts for 1998–2003* (PDF – 235KB) by Peter D. Kuhbach, Mark A. Planting, and Erich H. Strassner, Survey of Current Business, September 2004.

Purchases by tourists not included in previous reports are included from this study, such as automotive repair services purchased by travelers, thus resulting in an increase of \$120 billion, or one-third of tourism output.

The report only includes one estimate for each component of tourism demand, tourism output, and tourism employment due to the improvement of source data.

BEA changed the treatment of commissions paid for travel arrangement and reservation services and they are treated as a component of tourism demand, making it in compliance with a suggestion by an international working group on TSA (detailed in *Tourism Satellite Account: Recommended Methodological Framework*, by OECD, World Trade Organization, United Nations Statistics Division, Luxembourg, Madrid, New York, and Paris, 2001).

- *US Travel and Tourism Satellite Accounts for 2001–2004* (PDF – 181 KB) by Peter D. Kuhbach and Bradlee A. Herauf, Survey of Current Business, June 2005.

From this report, estimates of total (direct and indirect) tourism employment are available.

Two new tables are added. One shows direct and total tourism-related output by commodity (Table 5), and the other shows total tourism-related employment by industry.

- *US Travel and Tourism Satellite Accounts for 2002–2005* (PDF – 652 KB) by Peter D. Kuhbach and Bradlee A. Herauf, Survey of Current Business, June 2006.

Methodology section has very clear presentation on the required eight steps to create eight core tables. While the basic structures did not change to a great degree, these descriptions will be useful for students and researchers to follow the logics and also data sources.

- *US Travel and Tourism Satellite Accounts for 1998–2006* (PDF – 2050 KB) by Paul V. Kern and Edward A. Kocis, Survey of Current Business, June 2007.

Traveler accommodations have been broadened to include the value of vacation home rentals, which resulted in an increase of total tourism output by \$14.5 billion.

Estimation of consumption of gasoline by tourism activities is improved, resulting in increase an in travel and tourism expenditures of \$39.9 billion.

Treatment of commissions on inbound travel and tourism is now consistent with those of outbound travel and tourism, resulting in decrease of total tourism output by \$4.1 billion. Demand for commodities by type of visitor table has now two displays, one with adjustment of commissions, and the other without the adjustment.

- *A Proposal To Include Motor Vehicle Services in the US Travel and Tourism Satellite Accounts* (PDF – 427 KB) by Sumiye Okubo, Barbara M. Fraumeni, and Mahnaz Fahim-Nader, Survey of Current Business, June 2007.

An exploratory research paper with very valid reasons to propose including motor vehicle services in a nation in which 90.4% of leisure travelers in the nation used personal vehicles in 2001 (highlights of the 2001 National Household Travel Survey).

Having the imputed motor vehicle services treated in the I-O accounts as final consumption for household and as intermediate inputs for business and government, it adds \$54.8 billion to tourism industry value added, which raises tourism industries' GDP share from 3.0% to 3.4%.



The study underscores the continued importance of discussion of treatments of the capital investment related to tourism.

5.4.3 Tourism satellite accounts: case for other nations

Several nations have developed and disseminated their work on TSA. As we briefly reviewed the history of TSA, several nations, including but not limited to, Canada, have been leaders in developing and sharing the concept with researchers from other nations. Table 5-14 provides some of those reports on TSA that are currently available to the public via internet sites. It is by no means intended to be an exhaustive list of all the available studies on TSA worldwide.

Table 5-14 List of global tourism satellite accounts that are freely available on the internet.

Full or close-to-full reporting on national TSA made by national, governmental, or government-affiliated nonprofit organizations

- Australia:** Tourism Satellite Account – Australian National Accounts 2003–2004, Australian Bureau of Statistics, April 2005, 40 pages. [http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/DF3BF47866A81C55CA256FE0007D174B/\\$File/52490_2003-04.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/DF3BF47866A81C55CA256FE0007D174B/$File/52490_2003-04.pdf)
- Austria:** A Tourism Satellite Account for Austria Methodology and results, Peter Laimer, Statistics Austria, 58 pages. <http://www.mg.gov.pl/NR/rdonlyres/6561E963-81E6-40F8-9078-8EF965A879FD/25054/PeterLaimer.pdf>
- Canada:** The Tourism Satellite Account, by Jocelyn Lapierre and Duane Hayes, Statistics Canada, National Income and Expenditure Accounts, Second Quarter 1994. http://www.wto.org/english/tratop_e/serv_e/tsa_tech_series_31.pdf or http://www.world-tourism.org/statistics/committee/7th_meeting/ctsa00e.pdf
- Finland:** Final Report of the Tourism Satellite Account Project, Statistics Finland, December 2004, 50 pages. http://www.ktm.fi/files/14663/TSA_final_report.pdf
- India:** Tourism Satellite Account for India 2002–2003, National Council of Applied Economic Research, Commissioned by Ministry of Tourism, January 2006, 56 pages. http://www.world-tourism.org/estadisticas/committee/7th_meeting/tsa_india.pdf
- Israel:** Central Bureau of Statistics web page let you access directly to TSA-related tables. http://www.cbs.gov.il/publications/tourism_account01/tourism_account_e.htm
- New Zealand:** Tourism Satellite Account 1995, National Accounts Division, the Publishing and Community Information Division of Statistics New Zealand, June 1999, 63 pages. <http://www.stats.govt.nz/NR/rdonlyres/24C78BF9-201F-4437-A987-8E3EDC55BBC0/0/TSA95.pdf>
Tourism Satellite Account 2006, National Accounts business unit, the Product Development and Publishing Services business unit of Statistics New Zealand, June 2007, 63 pages. <http://www.stats.govt.nz/NR/rdonlyres/80E354AA-8C4E-4122-9C78-ECB10DF760C8/0/tourismsatelliteaccountreport2006.pdf>
- Norway:** Statistics Norway's web page let you have straight access to TSA-related tables. http://www.ssb.no/turimesat_en/
- Scotland:** Development of a Tourism Satellite Account for Scotland, Catriana Hayes and Claire Boag, Scottish Executive, 17 pages. <http://www.scotland.gov.uk/Resource/Doc/933/0007934.pdf>

(Continued)

**Table 5-14** Continued**Others: including work in progress on national TSA or regional TSA efforts made by national, regional governments, or those commissioned to outside profit organizations**

Alaska, US:	http://www.dced.state.ak.us/oed/toubus/pub/AK_TSA_april.pdf
Czech:	PowerPoint presentation. http://mdgs.un.org/unsd/newsletter/unsd_workshops/tourism/IWTS/Invited%20presentations/IWTS and http://unstats.un.org/unsd/newsletter/unsd_workshops/tourism/IWTS/Invited%20presentations/IWTS_Item18(Czech%20Rep).ppt
Denmark:	Academic paper in process. http://www.iioa.at/pdf/15th%20Conf/jie_zhang.pdf
Eurostat:	Very comprehensive manual for TSA creation. http://ec.europa.eu/enterprise/services/tourism/doc/tsa/tsa_200202.pdf
Florida, US:	Not yet processed. http://www.floridataxwatch.org/resources/pdf/TourismSatelliteAccountRelease030807.pdf
Germany:	15 pages. http://www.gws-os.de/Downloads/gws-paper04-4.pdf
Ireland:	Statement that they are working: 13 pages. http://www.failteireland.ie/getdoc/c885c078-85f4-43c1-a19b-d835388fe974/First-Steps-Tourism-Satellite-Account-Project-Summ.aspx
Italy:	In process. http://www.sis-statistica.it/files/pdf/atti/RSMi0602p223-226.pdf
Japan:	http://www.jtb.or.jp/themes/content/img/invest/kenkyu/ThefirstTSAinJapan.pdf
Louisiana, US:	http://www.crt.state.la.us/impactreport/download/2004%20Tourism%20Satellite%20Account.pdf
Macao, PR of China:	In process. http://www.amcm.gov.mo/publication/quarterly/July2006/TSA_en.pdf
Namibia:	http://www.met.gov.na/publications/research/rdp_0044.pdf
New Jersey, US:	http://www.nj.gov/travel/pdf/NJTourismEconomy2003.pdf
North Carolina, US:	Global insight. http://www.nccommerce.com/NR/rdonlyres/D5542FE5-19DF-4FF9-A4A6-1451A2F47883/820/TSA_05.pdf
Poland:	http://www.mg.gov.pl/NR/rdonlyres/E3A9FC82-3570-4697-806B-2677092C2121/27898/RachSat2002_summary2.pdf
Portugal:	In process. http://www.ine.es/forumtur/abstracts/abstracts_employment/abs_The%20portuguese%20experience%20in%20compiling%20TSA.pdf
Regional TSA Wales, UK:	http://www.cababstractsplus.org/google/abstract.asp?AcNo=20043206432
Spain:	7 pages. http://www.ine.es/en/revistas/cifraine/cifrasine_satelit_en.pdf 16 pages. http://www.tourismforum.scb.se/papers/PapersSelected/TSA/Paper2SPAIN/Paper6_SpanishTSA.doc
Thailand:	http://www.unescap.org/Stat/meet/tsa/tsa-thailand.pdf
UK:	33 pages. http://www.culture.gov.uk/NR/rdonlyres/261C1D71-BFEA-499D-8A45-B4F5C7DC1B9C/0/tsafirststepprojectappendices.pdf

Since this list is neither comprehensive nor based on the existence of research papers but rather on the ease of finding the details free of charge from the internet, the author would appreciate the readers' input on any other available free data by sending the information to Thara@mail.ucf.edu. The author wishes to acknowledge the assistance of Mr. Hideo Shioya,



Figure 5-13 *Nachi-Taisha UNESCO world heritage site in Wakayama and Mie area, Japan.*

Source: Photograph taken by the author with the travel assistance from Wakayama University, June 2007. (Plate 5)

senior researcher at JTB-Foundation, Japan in finding some of the internet links available for TSA-related free research papers.

5.5 Discussions from students

During the multiple semesters of teaching the subject, I have accumulated not only students' questions and my answers, but also my questions and students' answers.

Using the internet-based course management systems such as Blackboard or WEB-COURSES (formerly WEBCT), students and instructors can exchange discussions often more openly than in the traditional face-to-face classroom settings. Here are the examples of my questions and students' subsequent discussions about TSA. I believe it would be informative for readers to be aware of typical discussions of graduate students in hospitality and tourism programs, including those studying for both masters and doctoral degrees. They are not edited except when mentioning names, which are omitted to maintain anonymity. Discussion board postings are not be censored, so students are free to write anything they want to say, whether it is correct or incorrect, relevant or irrelevant, without prior or post intervention of instructors.

For those whose backgrounds are in the economics area, it may be refreshing to note what the hospitality and tourism students say about TSA.

...Posted question by Tad Hara

Tourism satellite accounts (TSA) is surely becoming a global standard for measurement of tourism-related activities. World Bank, IMF [International Monetary Fund], OECD, Bureau of Economic Analysis of US Commerce Department, and many nations in the world endorsed it as the common measurement for tourism as an industry.



However, as far as I know, you are the only graduate students not only in the US but most likely in the world to learn this topic, because no hospitality–tourism schools teach this topic (Cornell Hotel School used to teach this, that is what I surely know)...

- 1 How would you market TSA to hospitality-tourism students to study?
- 2 What do you think would increase the awareness and interests of people in learning the TSA?

...Discussion postings from students

Student 1

'We talk about the importance of travel and tourism in an economy in text books and classes. We show students some statistics on how big the industry is and its huge economic impact. However, these text books (including Intro books) do not give an accurate measurement of the impact of travel and tourism. These books do not introduce TSA. As Dr. Hara showed us, tourism market share is bigger than other industries. In courses such as Intro to Hospitality and Tourism Management or Tourism Management, (after mentioning the impact of the hospitality and tourism industry in an economy) we should introduce TSA. We should teach students why it was created, how it is used to measure economic activities of tourism, and why it is important. TSA is in its infancy. By introducing it, we could also provide interested students with more opportunities for the future, in terms of jobs or research. It is interesting to me that TSA is not widely taught in schools. I feel that we should try to teach TSA in one of the required courses, at least at the master's degree level. I understand that it will not be easy because I-O model will have to be taught first. It is difficult but I am sure that we will get there. It is important that all of us in the industry grasp it first in order to spread it out.

TSA finally presents us with a credible national number for the impact of the tourism industry in an economy. For hospitality and tourism people looking for support, TSA could provide the industry with the political muscle it has been lacking. TSA can help policy makers get an understanding of the size of the industry. It could be used for marketing travel and tourism services. Also, TSA could be used to show potential investors and developers the importance of the industry. We could increase awareness of TSA to industry people and all the aforementioned benefits through general publications or associations (i.e. meetings, publications, websites, and workshops). I feel that once people are aware of TSA and how they can use it; their interest in learning should follow.'

Student 2

'In order to market TSA to hospitality students to study, I would definitely agree with a previous posting of introducing the topic in introduction courses or somehow bring the topic into a required course. It seems as though by what Dr. Hara has been stating that this topic is not readily available to students in graduate programs. Without it being a required course I believe that most students would be standoff-ish of it since it deals with the economy and numbers. However, it has turned out to be quite interesting and valuable to anyone in the hospitality industry. With an introduction of the information, students may see how valuable learning the information could be for their future within the hospitality industry. Another



thought to help promote or market this course would be to include what the knowledge gained from taking it could do for your understanding of the industry and how it could help in the long run.

Obviously, I think it would depend on if the person has any sort of input into the hospitality industry- which as shown by TSA involves such a vast group of people and industries. Another person stated natural disasters- that will definitely create interest in how the economy of the industry works. Also, those that are proactive will want to learn more about TSA to better themselves or their company in understanding. And as in most cases, word of mouth will always create awareness to a topic. When people in this or other similar classes see that learning this information is beneficial, they will be more likely to talk up the subject and peak people's interest.'

Student 3

'Students want to succeed in their careers and desire the tools and resources needed to do so. Without exposure to how valuable TSA can be to their careers, it is no loss to them if they are unaware of what it is or how it can possess value. I agree with some of my classmates that through other hospitality and tourism courses, professors should familiarize their students with what exactly TSA is and make it out to be a desired tool to assist them with success in their current/future careers.

I think it is best to be proactive about educating students and opening their eyes to the awareness of TSA prior to waiting that it takes a bad situation to open their eyes to the reality of it. If a student knows this useful concept when employed by an organization, they have the leading edge and can share this valuable information with their co-workers and superiors. On the flip side, if employed by a company who faces hardship and needs to analyze the situation, that is when an individual may be faced with the pressure of having to assess the situation without the proper tools. Hypothetical situations using realistic examples (such as September 11th) may assist with increasing a student's interest in wanting to learn TSA.

Demonstrating the credibility of TSA can increase the interests of individuals wanting to learn more about the topic. Again, similar to marketing TSA to students, a good route would be to utilize real-world global examples that people are familiar with and show how TSA played a role in assisting organizations through a hard time. As someone else mentioned, negative impacts on the economy create a rude awakening for people. That is an instance of an unfortunate way of increasing interest, but by educating people about those kind of issues may encourage people to be proactive in learning TSA.'

Student 4

'The best way to market the TSA to students who are interested in the hospitality/tourism industry is to show them what it can do for their future careers. Since TSA is not taught to many people, knowing what it is and how to use it to your advantage would assist in obtaining a higher level job in the hospitality/tourism industry. You could also point out the fact that TSA is a very global concept. As such, having a good grasp on a global concept would also allow for more job opportunities in other countries.



If the general public understood how the tourism industry influenced other industries in their area they would be more likely to want to learn more about it. They would then be able to see how the TSA would assist them in making other decisions that would affect their community. Also, the best way to encourage people to learn about TSA is to provide them with information written in a way they can easily understand. If the only articles about TSA are written like a peer reviewed research article, many people will not understand what they are saying. In turn, if they can not understand what is being said, they are likely to ignore the topic all together.'

Student 5

'I was thinking about how to market this type of subject to hospitality students, and I think what would be most helpful is to be able to show the students how the skill we learn in this class can be utilized in the job markets. For example, showing them what specific jobs would utilize this specialty like consultants or politicians.

Showing the power of what that knowledge is useful for and how the students could harness the skills and make a good living at using these models and concepts to help the hospitality industry would be a good marketing tool. I think currently it appears more of an academic area of study that is called upon randomly to assist with programs in a local market but if you could show the job market uses as well I think it would help. Also, I found some other schools abroad that are teaching similar things to our class. Their benefit is that they actually get to travel to some of the local developing countries who are using tourism to help their economy. Enclosed are some of the class descriptions. I've attached the entire school tourism studies program as well.

Tourism issues in developing countries

This subject examines the challenges and opportunities for tourism in developing nations. It mainly focuses on the social, cultural, economic and environmental impacts of tourism in Third World and developing countries. It combines and synthesizes topics previously covered in the tourism program, including tourism and the environment, tourist behavior, tourism marketing and international tourism. Additional topics include ecotourism and wildlife tourism, arts and crafts, Indigenous tourism and women's involvement in tourism in developing countries. The subject consists of lectures, readings, and an essay on the impacts of tourism and project work on key tourism issues in developing countries. A field trip to examine first-hand some key tourism issues in a developing country may also be included as part of this subject. Note: Cost of any international travel is additional to subject fees and is the responsibility of the student. Destination to be advised early in the second semester.

Tourism policy and planning

The subject will explore the role of government in the development and control of tourism. Relationships within and between different levels of government and between government and private enterprise. In particular the subject will analyze the effects of government policy on regional tourism development and international marketing.



Figure 5-14 Hospitality students in action.

Source: Photograph taken by the author at Hospitality Gala held at Sea World, Orlando, Florida, USA. (Plate 6)

Tourism analysis

This subject provides a sophisticated introduction to tourism as a complex economic socio-cultural and environmental system. It considers the nature of employment and human resource development in tourism including concepts of leadership and information based decision making. Tourism intelligence, tourism information communication systems and the role of research in management are considered. Styles of tourism research including a succinct treatment of core methods and statistical approaches as well as project management in tourism are reviewed. Students are required to undertake a study of a select facet of tourism producing a substantial review paper outlining contemporary issues and analytical needs.

Student 6

‘Marketing of TSA to hospitality students is a rather daunting task without prior familiarity with I/O. Some earlier postings suggested introducing this concept in fundamental tourism courses. This subject matter, however, is too complex, in my opinion, for those just entering the graduate program. First off, I would add a component of I/O and SAM to our graduate economic and financial course. As previous person pointed out from course contents of other programs, without the brief descriptions including the mention of I/O, SAM and TSA, students will have no idea what the concepts refer to. Based on what I have learned in our class, I feel that students need to spend more time working with I/O data and models. The economics course could provide the baseline for these concepts, and perhaps be a requirement preceding the Tourism Analysis course. As well, I feel it would be beneficial to introduce I/O and SAM in the financial course. In that way, students would be provided with only an overview of I/O and SAM in the Tourism Analysis, and could spend more time in understanding TSA.



As many of us have alluded to in previous comments, it is essential that students be exposed to these models in a hands-on approach manner. It would have been helpful (yet somewhat painful!) if we had been assigned a full semester project to make application of these models in our interest areas (cruise lines, restaurants, etc.). Discussion of additional SAM/TSA articles may also be beneficial for laying the ground work and providing a clear understanding of the basics. Students will be unable to truly appreciate the value of TSA unless they have a sound basis, can operationalize it, and can visually assimilate it to their area of focus.

In conjunction with my comments above, people will only be able to appreciate and have an interest in a concept they are knowledgeable about. Even after taking this course, I cannot say I personally have a strong grasp of TSA. I do feel, however, much more comfortable with I/O, and can make clear associations with articles I read with regard to both local and global economics. Reinforcement is typically the best way individuals will be aware of a concept and thereby take an interest in it. Articles in business journals (nonscholarly) and newspapers that appeal to the mass audience would provide the forum to introduce the use of these models. Although TSA is in its infancy, students, especially those at the Ph.D. level, can lay the foundations for graduate students, and hold forums to discuss its importance.'

Student 7

'TSA is focused on a much larger part of the economy than traditional Hospitality Management. When most people think of hospitality management they think of hotels, restaurants, and other industries that deal with people. TSA goes into what impact tourism has on all industries of a country including those that have nothing to do with people from other countries. I would market TSA as a big concept that can impact a lot more than people generally think. I would teach students that the biggest impact from tourism really comes from other countries that are depending on Tourism to bring money into the country. These smaller countries are the best places to analyze the effects tourism can have on other industries, including helping other industries to develop.

I think if more people knew the global impact that tourism has, by spreading money around to other nations, people would be more interested to learn. I think that it is going to be tougher to teach people about TSA and other Tourism related issues, since people in the US do not think of it as being an important topic. Other countries think highly of these things because it affects a good portion of their economy and can help them become more profitable in the future. People in the US are more concerned about going to other countries and having a good time, instead of improving their economy by getting people from other countries to come here to spend their money. I think you could probably get more people interested by telling them that the more people that come to the US as tourists, the more money comes into our economy.'

Student 8

'Well, now that my head is spinning because I have finished reading everyone's posts, I'd like to make my comments, and I think that I'll be playing something of the devil's advocate.



While I think the many lines of discussion bring up a myriad of interesting points, it seems that we are taking a rather simple approach to a complex (perhaps convoluted?) topic. As Dr. Hara pointed out repeatedly in class, the TSA (even after building on our understanding of I-O and SAM which took over half the semester to develop) is a difficult concept to grasp and by extension, to utilize. So, for marketing this topic to hospitality-tourism students and then to others, it is going to take a lot more than some of the ideas we've come up with so far. Talking about it and thinking that disseminating information will garner interest is not enough. However, it is true that we have to start somewhere and this discussion is a good jumping off point to get us thinking about what we really can do.

Therefore, I lean towards agreeing with those postings that stress the complexity of the TSA and of the tourism industry as a whole. Why tourism is not considered an industry? Why does it not have its own classification in the accounts? We have learned from history and our own discussions, that no one can agree how to define tourism, its components, nor its scope. Someone brought up a point about a new language, and one of the earliest things I learned when studying the development of language is that language and words are power, and we don't have that yet in our industry. Our language is still evolving, so how can we teach others the concepts of our industry when we haven't nailed everything down yet for ourselves? We pull from other established industries and traditions and we give to others as well, but we don't have a unique identity to stand on. The numbers and the language prove this. This can work in our favor and against us.

We must start within our industry and our classes, but it is not enough just to learn and make up tables, we must build bridges to those we affect who don't even realize it. And I'll stand with those who confessed they are not experts in this field yet, and say that I walk away from this class with a good idea of I-O and SAM, but I'm not confident in what I know of TSA yet and how it will be useful in my own life and work or how I can introduce it to others. For me and for others out in the real world (our old theoretical versus pragmatic argument), we don't have the time and the skills yet to deal with the complexities of TSA no matter how much we in the industry may claim about its benefits for all. Therefore, in answer to our postings and the original questions about marketing to students and others, I think we need to forget marketing TSA right now. Maybe we should start in our classes with where we are and where we need to get to and think about ways to simplify TSA, if at all possible. We should strive for improvement, not just dissemination.

Of course, I'll end by saying that my argument could all be born of wishing that we had had more time with TSA. I certainly agree that case studies would have been great to work with to really understand the process. I don't think this topic is fit for introductory classes. I lean towards developing it more within graduate level classes, then working with professors and consultants to start moving it into the front lines of the industry.

To end, I have a question and a note: First, I'm just wondering how many of the professors at our university have a great knowledge of and experience with TSA? How many could teach our class the way Dr. Hara has? Even one faculty started out in our class at the beginning of the semester to learn about it with the rest of us! Also, the puzzle of the ratio that Dr. Hara



presented to us from Table 8 of the TSA paper is what really started me thinking about the complexity of this topic. According to the text, the reason it is hard to determine where their numbers came from is because it depends on how you define the segments they present. The ratio is a combination of calculations predicated upon a determination of what segments the hotel segment is involved with. You have to calculate a ratio for the hotel segment, the restaurant segment, the entertainment segment, and the retail segment first in order to determine the final ratio of the hotel segment, and it still is not an exact calculation!

Student 9

'I also wonder how many professors know and actually understand TSA. I have taught Intro to Hospitality and Tourism courses as a Graduate Teaching Associate but to be honest with you I did not have knowledge of TSA. Of course, I am still a student with a long road ahead of me in becoming a professor. None of the courses that I have taken at the master's level and Ph.D. level ever mentioned it and when I looked through the tourism textbooks that I have, they do not mention TSA. They talk about economic impacts of tourism and such but not TSA. When I mentioned that TSA should be introduced in intro books or classes, I didn't mean that it should be covered in detail because it is complex and there is already enough to teach in an Intro class (as we all know the tourism industry is made of many other industries). Actually, I never finished teaching the whole book! We would probably need a whole semester to learn TSA. Also, prior knowledge of I-O/SAM is necessary. I think the existence of TSA should at least be mentioned in our books. Maybe a short description such as why it was created and why it is important to our industry could give students the opportunity to learn that it exists. I also agree that it should be taught at the graduate level as I suggested in my previous posting. We sure need to find a more simple way to teach it.'

5.6 Chapter 5 problems

Q5-1 Explain why we have to develop TSA even though we already have established a System of National Accounts (SNA)?

Q5-2 Answer the following questions about TSA.

- (a) Explain the difference between 'visitors' and 'tourists'.
- (b) Explain why we do not use the word 'tourists' in the TSAs?
- (c) Explain the difference between 'supply-based concept' and 'demand-based concept'. To which concept does tourism belong?
- (d) Explain the difference between 'commodities' and 'industry'. Explain any relationship, if there is one, between this topic and the topic of 'make-use table' in the I-O modeling.
- (e) Based on Table 5-6, which statement is true? Choose one.
 - a. hotels and lodging places sector as an industry produces both hotels and lodging places commodity and eating and drinking places commodity.



- b. eating and drinking places sector as an industry produces both hotels and lodging places commodity and eating and drinking places commodity.
 - (f) Name one of the commodities classified as 'nontourism commodities' even though tourists tend to purchase it.
 - (g) What would be the possible scenarios for 'imports' and 'exports' of international air fares commodity? If the Northwest Airlines (US) carry Japanese passenger from Tokyo (Japan) to Shanghai (China), is it an 'import' or 'export' for the US economy?
 - (h) How do you obtain the tourism commodity ratio?
- Q5-3** The following questions can be answered by visiting the web link to each paper, which, to the best of the author's knowledge, should be available free of charge for researchers.
- (a) Visit the Tourism Satellite Account for India report (http://www.world-tourism.org/estadisticas/committee/7th_meeting/tsa_india.pdf; last accessed 10 February 2008).
 - a. In Indian economy, what would the rank of tourism as an industry in terms of relative share in GDP? (Table D500)
 - b. What is the share of tourism employment among the total employment in India? (Figure 3)
 - (b) Visit the Tourism Satellite Account 1995 of New Zealand web link (<http://www.stats.govt.nz/NR/rdonlyres/24C78BF9-201F-4437-A987-8E3EDC55BBC0/0/TSA95.pdf>; last accessed 10 February 2008).
 - a. How large is the tourism expenditure as a percentage of total GDP (appendix B)? In comparison with Canada, Norway, and the US, is it larger or smaller?
 - b. How large is the international travel expenditure as a percentage of total travel expenditure? In comparison with Canada, Norway, and the US, is it larger or smaller?
 - c. What is the rank of tourism as an export industry in comparison with other industrial sectors? (Hint: P12)
 - (c) Visit the First TSA in Japan uploaded by Mr. Shioya at JTB-Foundation. (<http://www.jtb.or.jp/themes/content/img/invest/kenkyu/ThefirstTSAinJapan.pdf>; last accessed 10 February 2008).
 - a. According to the table, which nation has the highest ratio of foreign visitors' expenditures among total tourism consumptions? And the lowest?
 - b. According to the table, what is the share of tourism's contribution to Japanese GDP?
 - c. According to the table, what is the employment share of tourism as an industry in Japan?

5.7 References and further reading

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Chapter **6**

Future Directions and Explorations





Admitting that there are many other researchers in the field of tourism economic impact studies using I-O/SAM and TSA, at the last chapter, I feel rather reluctant to predict future directions or development research areas of tourism analysis using I-O/SAM and TSA.

While I will not try to forecast the comprehensive picture of future quantitative tourism research, I would rather feel passionate about one aspect, that we should use the economic power of tourism as an industry to try to mitigate problems in a broader society. In this chapter, I will first deal with poverty issues with the economic power of tourism. First, an international case of Nicaragua and second, a US domestic case of American Indians are briefly introduced, followed by excerpts of opinions from students about how to use the power of tourism as an industry to alleviate poverty issues in the world. I will conclude by mentioning possible areas of research – quantifying environmental impacts of tourism as an industry – using the structure that we have learned.

6.1 Poverty alleviation effects of tourism as an industry

We learned of several research methods, starting from the I-O. SAM clearly shows how the wages are passed to the households by way of exchange market for labor. Extended I-O framework also shows simplified distribution effects of income to households. Once the households are disaggregated (separated) into different groups, it would show the comparative effects of different income distributions to different household groups.

Looking at broader society in which tourism as an industry resides, poverty is still a huge problem in many parts of the world a job creation is one of the major concerns of national and local governments. As we learned in Chapter 1, tourism may be less of a serious contributor in the developed nations where academic studies on tourism are advanced, and developing nations/regions with more dire needs to pull people out of poverty may not have as much accumulation of knowledge on academic tourism studies.

Thus, as stimulation for imagination, I will introduce two papers which deal with poverty alleviation through economic impact of tourism as an industry, followed by the students' answers to my final exam.

6.1.1 Case study: Nicaragua and the poverty alleviation policy analysis

In order to put our technical discussions in perspective, with the permission of the co-author Manuel Rivera, a PhD student, and Dr. Robertico Croes, I will quote part of our working paper that Manuel Rivera and I presented at the Second Congress of Tourism: Economic Development and Fight against Poverty (25 September 2007, Managua, Nicaragua). The body of this study was created by Manuel Rivera, who also translated Spanish text into English.

Nicaragua is located in Central America and has access to both the Pacific Ocean on the West and the Caribbean Sea, neighboring Honduras on the North and Costa Rica on the South (Figure 6-2). It has the territory area of 129494km² and a population of about 5.5 million.



Figure 6-1 Meat market in Managua, Nicaragua.

Source: Photograph taken by author, September 2007. (Plate 7)

The local currency Cordobas (NC\$) is about 18 Cordobas per one US dollar (NC\$18 = \$1). While the soil is fertile with rich landscape, with the GDP per capita of \$1100, it is categorized as one of the poorest nations in the region. According to the United Nations Children's Fund (UNICEF), in the South America region, 40% of the population is living below the poverty line of \$1 per day. In Nicaragua this figure is about 45%.

6.1.1.1 Goal of the study

Our goal was to verify how the development of tourism can alleviate the current poverty situation in comparison with other traditional industries. We are particularly interested in knowing how the different industrial development policies would affect the income distribution in Nicaragua, with emphasis on the change in income for the poorer households.

6.1.1.2 Methodology

Based on the public data of an I-O table in Spanish that were posted on the Central Bank of Nicaragua website, we translated them into comparable English words and aggregated them into a smaller numbers of sectors. With the transaction table, we have conducted a series of procedures that were basically demonstrated in the explanation of I-O-based impact analysis. We also utilized data from Encuesta Nacional de Hogares Sobre Medicion de **Vida** (National Household Survey by Nicaraguan Ministry of Statistics), and proprietary visitor expenditure statistics from CANATUR (Nicaraguan National Chamber of Tourism). It is basically the I-O table, and for the purposes of estimating wages payment to household, we have added the household as another industrial sector at the bottom of interindustry transactions table and disaggregated it into four different groups in accordance with income data.



Figure 6-2 Map of Nicaragua.

Source: CIA World Factbook: Nicaragua <https://www.cia.gov/library/publications/the-world-factbook/geos/nu.html> (last accessed 10 February 2008).

6.1.1.3 Initial analysis: type I output multipliers

As you recall, the sum of each column vectors of the Leontief inverse matrix will display the type-I output multipliers for each industrial sector. This is the first result that you can display before you start to calculate impact analyses.

Among the type-I output multipliers, the services/hotels/restaurants sector has higher multipliers than any other sectors in Nicaragua (Figure 6-3). In developing nations, tourism-related sectors tend to have higher multipliers than comparable ones in developed nations. In Nicaragua’s case, tourism-related sectors have higher multipliers than other traditional

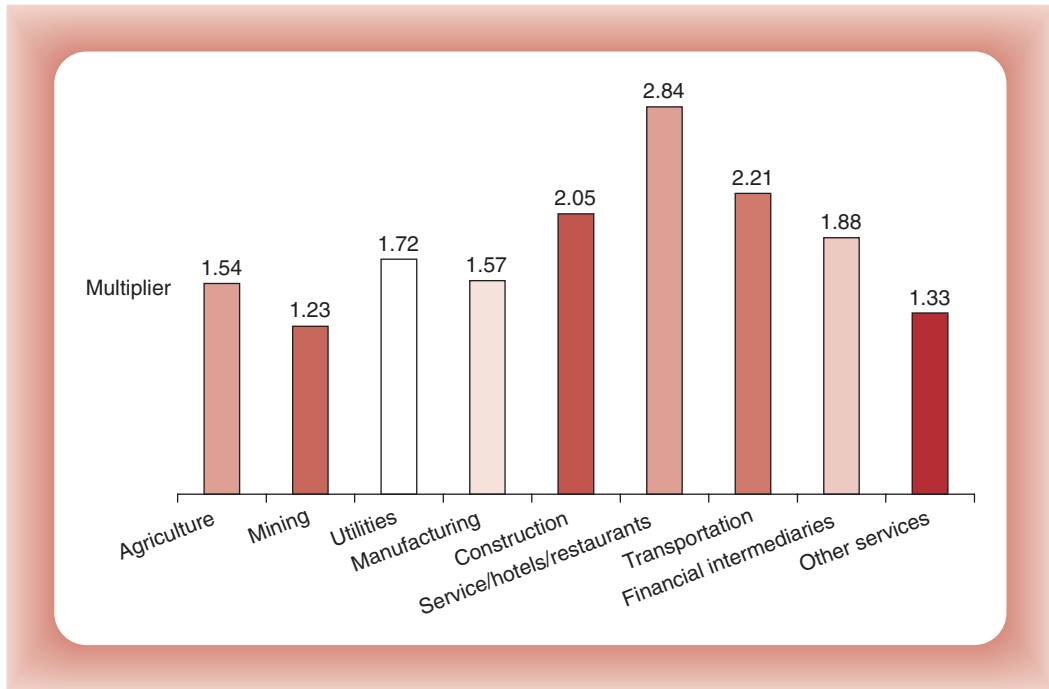


Figure 6-3 Type-I input-output multipliers for Nicaragua.

Source: Authors' calculations from an IO/SAM model based on the Central Bank of Nicaragua's National Accounts (2000) *Tourism and Income Distribution: The Case of Nicaragua* presented at The Second Congress of Tourism: Economic Development and Fight against Poverty (25 September 2007 at Holiday Inn Managua, Nicaragua).

sectors such as agriculture, mining, and constructions. This is the sector that can utilize substantial quantities of domestically produced goods and services as well as local labor force as inputs for their production. Before we talk about impact on labors, we should first consider the current situation in Nicaragua.

6.1.1.4 Labor force and income distribution for Nicaragua

As we disaggregate Nicaragua's labor force into four income categories, the results indicate that at the national level, 14% of the labor population have annual incomes of NC\$5000 or less; another 25% earns between NC\$5001 and NC\$10 000; 31% earns between NC\$10 001 and NC\$20 000; and the remaining 30% have incomes higher than NC\$20 001. The complete distribution is presented in Table 6-1.

When considering the composition of the labor force, only two sectors have at least 70% of their employees with salaries of NC\$20 001 or higher, i.e. financial intermediaries and utilities. On the contrary, the agriculture sector has the highest share of the labor force (87%) with salaries under NC\$20 000. This creates an interesting dilemma. Nicaragua produces high-quality coffee as an export product, while financial intermediaries and utilities are not known for their competitiveness of their product in the export market. In order for the Nicaraguan



Table 6-1 Labor force and their annual income distribution in Nicaragua.

	Wage distribution (%)			
	NC\$5000 or less	NC\$5001–10 000	NC\$10 001–20 000	More than NC\$20 001
Agriculture	25	39	23	13
Mining	12	16	47	26
Utilities	0	6	24	70
Manufacturing	11	20	40	30
Construction	2	12	46	41
Service/hotels/ restaurants	12	21	32	35
Transportation	4	9	30	57
Financial intermediaries	0	2	24	74
Other services	6	13	35	45
Column share of total labor force	14	25	31	30

Source: Authors' calculations from an I-O/SAM model based on the Central Bank of Nicaragua's National (2000) and the 2001 Living Standards Measurement Survey from the Instituto Nacional de Información de Desarrollo (INIDE).

government to fight poverty, they have to put limited resources into the optimal industrial policy to alleviate poverty in poorer households. Does it mean that resources will be concentrated in the agriculture sector because of an apparent concentration of lower-income laborers? Next we consider the direct impact of tourism, namely how much visitors are actually spending during their visit to Nicaragua.

6.1.1.5 Estimating visitors' expenditure in Nicaragua

Once you identified the existence of an I-O table (or SAM table) for the study region (in this case, Nicaragua), the next important process is to identify the data for visitors' expenditure. This step will be very important, as a final demand column vector for forthcoming impact studies for tourism as an industry may be created based on this task. These data are not often available in the Central Bank or Statistical Office's data, unless they are engaged in the creation of TSAs.

What does it mean to have these data? Thanks to CARATUR, we know that once an average visitor comes to visit Nicaragua, they will spend a total of \$365.70 and \$93 (25.5%) will be spent on accommodation. If Nicaragua receives additional 1000 foreign visitors, that would generate \$365 700 of expenditure or receipts by Nicaragua. By having the final demand column vector (ΔY), now we can treat tourism as if it were another industrial sector, consisting of those subsectors, as if it were the tourism industrial complex consisting of different industrial sectors that produce tourism products (such as rooms, food, bus tickets, tours of famous landmarks; see Table 6-2).



Table 6-2 Composition of visitor expenditure distribution.

Visitor expenditures distribution	
Expenditure category	Proportion (%)
Lodging	25.5
Bars and restaurants	19.9
Food and beverages	10.3
Transportation services	6.9
Rental car services	6.5
Recreation	5.7
Arts and gifts	5.4
Other expenses	19.9
Total	100.0
Total expenses per person	\$365.70
Total expenses per day	\$39.70

Source: Calculated by the author based on the Visitor's Survey Results provided by CANATUR (2005).

6.1.1.6 Comparison of impact analyses on agriculture, manufacturing, construction, and tourism

Now that we have a framework to treat tourism-related activities as an industry, we can conduct comparative analyses in which we give the same amount of exogenous shock (e.g. increase in final demand from foreign consumers). We use the positive shock amount of \$10 million, which is equivalent to NC\$163.7 million, and the same amount are given to the agriculture, manufacturing, construction, and tourism sectors to compare the response of Nicaraguan economy to each shock.

... Agriculture sector

- **Direct impacts and indirect impacts** – For the agricultural sector, an increase in demand of NC\$163.7 million will have an indirect impact of NC\$65.6 million. The economic sector that benefits the most with regards to indirect revenues is the manufacturing sector with NC\$39.6 million. This indicates that the agriculture sector depends on inputs from manufacturing sectors such as fertilizers and equipment. The complete distribution of direct and indirect revenues is presented in Table 6-3.
- **Income distribution and agriculture** – When it comes to income distribution across the four different household categories, the direct and indirect impact of NC\$229.4 million in agriculture provides the most benefits to those who earn NC\$5000 or less. This particular household group will experience a 0.33% increase in wages. This increase is relatively higher than that for those households that earn NC\$10 000 or more; an average of 0.20% more. The second household category that receives the most benefits is those that earn



Table 6-3 Direct and indirect impact of NC\$163.7 million in agriculture-related activities.

Economic sector	Direct impact (NC\$ million)	Indirect impact (NC\$ million)	Type-I total impact (NC\$ million)
Agriculture	163.70	15.39	179.10
Mining	–	1.90	1.90
Utilities	–	1.13	1.13
Manufacturing	–	39.60	39.60
Construction	–	0.72	0.72
Service/hotels/restaurants	–	2.53	2.53
Transportation	–	0.83	0.83
Financial intermediaries	–	2.66	2.66
Other services	–	0.84	0.84
Totals – direct and indirect	163.70	65.65	229.36

Source: Authors’ calculations based on extended I-O methodology and a change in demand of NC\$163.7 million (\$10 million).

Table 6-4 Change in income distribution as a result of NC\$163 million in impact on agriculture-related activities.

Income classification (NC\$)	Change (%)
5000 or less	0.33
5001–10 000	0.30
10 001–20 000	0.13
20 001 or more	0.11

Source: Authors’ calculation based on an extended I-O methodology for Nicaragua.

NC\$5001–10 000 with an increase of 0.30%. The complete distribution of income that results from a change in demand for agriculture is presented in Table 6-4.

- **Job creation as a result of a change in demand for agriculture** – Overall, an increase of NC\$163.7 million in the agricultural sector will create 7135 direct jobs. In total, this change in demand will generate 8141 jobs from which only 30% are indirect jobs (1008 indirect jobs). The economic sector that indirectly benefits the most as a result of such an increase in demand is the service/hotels/restaurants sector with an impact of 165 indirect jobs, followed by the manufacturing sector with 99 indirect jobs. The complete distribution of direct and indirect jobs is presented in Table 6-5.
- **Decrease in unemployment as a result of a change in demand for agriculture** – The total jobs created across the sectors as result of an increase in demand for agricultural products can help reduce unemployment by 3.99% (see Table 6-6; note: change in unemployment = ((number of unemployed – total jobs created)/labor force) – unemployment rate).



Table 6-5 Total direct and indirect employment from impact on agriculture.

Economic sector	Direct jobs	Indirect jobs
Agriculture	7135	671
Mining	–	6
Utilities	–	3
Manufacturing	–	99
Construction	–	10
Service/hotels/restaurants	–	165
Transportation	–	8
Financial intermediaries	–	20
Other services	–	26
Total	7135	1008

Source: Authors' calculations based on an extended I-O methodology, data from employment statistics reported by Central Bank of Nicaragua Annual Report and an active labor force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB: Nicaraguan Ministry of Labor).

Table 6-6 Decrease in unemployment rate.

	Δ in unemployment rate as a result of an increase of NC\$163 million (%)
Agriculture	–3.99

Source: Authors' Calculations Using Unemployment Statistics of 10.7% from the Central Bank of Nicaragua Annual Report and Active Labor Force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).

...Manufacturing sector

- **Direct and indirect output impact** – In the manufacturing sector, an increase in final demand of NC\$163 million will generate an indirect impact of NC\$75.82 million. About 32% of the total indirect revenues occurred in the agriculture sector. This is a rather unusual indication that the manufacturing sector requires a substantial input from the agriculture sector's output. If we consider the economic structure of Nicaragua, however, we understand that this is possibly due to food-processing operations in Nicaragua, including the coffee-processing sector. The complete distribution of direct and indirect revenues is presented in Table 6-7.
- **Income distribution and manufacturing** – The distribution of income among the four household categories, measured by the net increase, is almost identical for all groups. This means that all household groups will receive an equal increase in income as a result of the NC\$163 million impact, which contrasts greatly to the first case of agriculture sector. Indeed the change in annual income in manufacturing sector shows that all the expected



Figure 6-4 Vegetable and fruit market in Managua, Nicaragua.

Source: Photograph taken by author, September 2007. (Plate 8)

Table 6-7 Direct and indirect impact of NC\$163.7 million in manufacturing-related activities.

Economic sector	Direct impact (NC\$ million)	Indirect impact (NC\$ million)	Total impact (NC\$ million)
Agriculture	–	24.96	24.96
Mining	–	9.10	9.10
Utilities	–	1.86	1.86
Manufacturing	163.70	27.98	191.69
Construction	–	0.46	0.46
Service/hotels/restaurants	–	0.98	0.98
Transportation	–	1.62	1.62
Financial intermediaries	–	7.58	7.58
Other services	–	1.26	1.26
Totals direct and indirect	163.70	75.82	239.53

Source: Authors' calculations based on extended I-O methodology and a change in demand of NC\$163.7 million (\$10 million).

changes are not larger than any of the comparable changes in the agriculture case. The complete distribution of income that results from a change in demand for manufacturing is presented in Table 6-8.

- **Job creation as a result of a change in demand for manufacturing** – For the manufacturing sector, a direct impact of NC\$163.7 and a high per employee output only generates a



Table 6-8 Change in income distribution as a result of NC\$163 million in impact on manufacturing-related activities.

Income classification (NC\$)	Change (%)
5000 or less	0.10
5001–10 000	0.10
10 001–20 000	0.09
20 001 or more	0.10

Source: Authors' calculation based on an extended I-O methodology for Nicaragua.

Table 6-9 Total direct and indirect employment from impact on manufacturing.

Economic sector	Direct jobs	Indirect jobs
Agriculture	–	1088
Mining	–	27
Utilities	–	4
Manufacturing	411	70
Construction	–	6
Service/hotels/restaurants	–	64
Transportation	–	15
Financial intermediaries	–	56
Other services	–	38
Total	411	1370

Source: Authors' calculations based on an extended I-O methodology, data from employment statistics reported by Central Bank of Nicaragua Annual Report and an active labor force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).

total of 411 and 1370 direct and indirect job, respectively. Interestingly enough, close to 80% of the total indirect jobs are related to the agriculture activities (1088). This further underscores the fact that the manufacturing sector depends on a significant input of intermediate goods from the agricultural sector in Nicaragua. On average, the remaining sectors will create fewer than 100 indirect jobs each. The complete distribution of direct and indirect jobs is presented in Table 6-9.

- **Decrease in unemployment as a result of a change in demand for manufacturing** – The high per employee output in the manufacturing sector may be a good indication that the sector is efficient enough to avoid a heavy reliance on labor input. However, less dependency on labor input clearly influences the magnitude of change in unemployment as a result of a change in demand for the manufacturing sector. Total unemployment will decrease by less than 1% (see Table 6-10; note: change in unemployment = ((number of unemployed – total jobs created)/labor force) – unemployment rate).

**Table 6-10** Decrease in unemployment rate.

	Δ in unemployment rate as a result of an increase of NC\$163 million (%)
Manufacturing	-0.87

Source: Authors' Calculations Using Unemployment Statistics of 10.7% from the Central Bank of Nicaragua Annual Report and Active Labor Force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).

Table 6-11 Direct and indirect impact of NC\$163.7 million in construction-related activities.

Economic sector	Direct impact (NC\$ million)	Indirect impact (NC\$ million)	Total impact (NC\$ million)
Agriculture	–	13.72	13.72
Mining	–	10.94	10.94
Utilities	–	1.26	1.26
Manufacturing	–	90.51	90.51
Construction	163.70	0.79	164.50
Service/hotels/restaurants	–	2.46	2.46
Transportation	–	2.41	2.41
Financial intermediaries	–	3.77	3.77
Other services	–	1.06	1.06
Totals direct and indirect	163.70	126.96	290.67

Source: Authors' calculations based on extended I-O methodology and a change in demand of NC\$163.7 million (\$10 million).

This may not be an obvious result from what we think. Many nations that once suffered from poverty, including many in East Asia such as Japan, South Korea, moved out of poverty successfully with heavy allocation of internal resources into manufacturing sectors. Such manufacturing-sector-driven industrial development or East Asian style success may not be a panacea for all the other nations in the world due to difference in national economic structure.

... Construction sector

- **Direct and indirect output impact** – The economic sector that benefits the most from an increase in the construction is manufacturing. This particular sector will receive more than half of the total indirect impact generated. Another indirect impact goes to the agriculture and mining sectors, while the other sectors will enjoy small indirect impacts. Substantial indirect impact in the manufacturing sector indicates that the construction sector depends on the output of the manufacturing sector. The complete distribution of direct and indirect revenues is presented in Table 6-11.



Table 6-12 Change in income distribution as a result of NC\$163 million in impact on construction-related activities.

Income classification (NC\$)	Change (%)
5000 or less	0.08
5001–10 000	0.15
10 001–20 000	0.27
20 001 or more	0.30

Source: Authors' calculation based on an extended I-O methodology for Nicaragua.

Table 6-13 Total direct and indirect employment from impact on construction.

Economic sector	Direct jobs	Indirect jobs
Agriculture	–	598
Mining	–	33
Utilities	–	3
Manufacturing	–	227
Construction	2157	10
Service/hotels/restaurants	–	160
Transportation	–	23
Financial intermediaries	–	28
Other services	–	32
Total	2157	1115

Source: Authors' calculations based on an extended I-O methodology, data from employment statistics reported by Central Bank of Nicaragua Annual Report and an active labor force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).

- **Income distribution and construction** – A direct impact of NC\$163.7 million in construction will generate highly interesting income distribution effects, which may not be revealed unless you dissect the income distribution effects. The households who belong to the highest income group will receive the highest change in income (0.30%), while the lowest income households receive less than one-third of the impact for the highest income group.

The complete distribution of income is presented in Table 6-12.

- **Job creation as a result of a change in demand for construction** – An increase in demand of NC\$163.7 million in the construction sector will create a total of 3273 jobs, from which 34% are direct jobs. The largest beneficiary of the indirect impacts is the agriculture sector. The complete distribution of direct and indirect jobs is presented in Table 6-13.

**Table 6-14** Decrease in unemployment rate.

Δ in unemployment rate as a result of an increase of NC\$163 million (%)	
Construction	- 1.60

Source: Authors' Calculations Using Unemployment Statistics of 10.7% from the Central Bank of Nicaragua Annual Report and Active Labor Force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).

- **Decrease in unemployment as a result of a change in demand for construction** – The total of 3273 direct and indirect jobs from an increase in the construction sector will reduce unemployment by less than 2% (see Table 6-14; note: change in unemployment = ((number of unemployed – total jobs created)/labor force) – unemployment rate).

In comparison with effects of two other exogenous stimulations to agriculture and manufacturing, the construction sector's ability to reduce unemployment by 1.6% is between agriculture (3.99%) and manufacturing (0.87%).

... Tourism sector

- **Direct and indirect output impact** – Based on the same I-O-based model, an increase of NC\$163.7 million in tourism demand will have an indirect impact of NC\$167.8 million across the industrial sectors in Nicaragua, generating a total (direct plus indirect) impact of NC\$331.5 million. The sectors benefiting the most from an increase in demand from tourism products are: manufacturing (NC\$84.7 million) and agriculture (NC\$27.8 million). Approximately two-thirds of the indirect impact is distributed between the agriculture and service/hotel/restaurant sectors. The remaining one-third is almost equally distributed among the remaining sectors. The complete distribution of direct and indirect revenues is presented in Table 6-15. Note that this is the only scenario that the direct shock of NC\$163.70 is divided into more than two sectors due to the specific characteristic of tourism as an industry.
- **Income distribution and tourism** – When it comes to income, the direct and indirect impact of NC\$331.5 million in tourism provides the most benefits to those who earn NC\$20 001 or more. This particular group will experience a 0.50% increase in wages. However, the other income groups also see relatively substantial positive impact over their income as shown in Table 6-16. For the lowest income group, the stimulation given to tourism is just as good as one given to the agricultural sector. There can be several plausible reasons for this relative superiority of tourism as an industry over other industrial sectors to stimulate the poorer-income households. The tourism industry has flexibility to absorb labor provided by the wider income groups from top to bottom, and in the typical economy of a developing nation, the opportunity that the tourism industry provides to poorer household groups would be very important, while the industry also enables richer households to make their life even better as shown in Table 6-16.



Table 6-15 Direct and indirect impact of NC\$163.7 million in tourism-related activities.

Economic sector	Direct impact (NC\$ million)	Indirect impact (NC\$ million)	Type-I total impact (NC\$ million)
Agriculture	–	27.88	27.88
Mining	–	4.90	4.90
Utilities	–	10.17	10.17
Manufacturing	16.37	84.68	101.05
Construction	–	2.79	2.79
Service/hotels/restaurants	109.35	6.88	116.24
Transportation	21.93	6.03	27.97
Financial intermediaries	–	13.02	13.02
Other services	16.04	11.37	27.42
Totals	163.70	167.77	331.48

Source: Authors' calculations based on extended I-O methodology and a change in demand of NC\$163.7 million (\$10 million).

Table 6-16 Change in income distribution as a result of NC\$163.7 million increase on tourism demand.

Income classification (NC\$)	Change (%)
5000 or less	0.33
5001–10 000	0.30
10 001–20 000	0.30
20 001 or more	0.50

Source: Authors' calculation based on an extended I-O methodology for Nicaragua.

- **Job creation as a result of a change in demand for tourism** – The Nicaraguan economy is stimulated by the consumption of tourism products by visitors, and such an impact can be verified well in terms of numbers of jobs created to meet the increased final demand. Increase in tourism receipts for NC\$163.7 million would generate 10 299 jobs (7850 direct and 2449 indirect jobs). Tourism as an industry requires many intermediate goods and services to produce the tourism products that are consumed by visitors. An increase in demand for tourism products will stimulate other local industrial sectors to meet the new level of demand from tourism-related sectors, as shown in Table 6-17.
- **Decrease in unemployment as a result of a change in demand for tourism** – Creation of over 10 000 jobs across the industrial sector in Nicaragua will result in a substantial decrease in the unemployment rate by 5% (see Table 6-18; note: change in unemployment = ((number of unemployed – total jobs created)/labor force) – unemployment rate). Since a good



Figure 6-5 Hospitality industry as a labor-intensive industry.

Source: Photograph taken by author at Managua, Nicaragua, September 2007. (Plate 9)

Table 6-17 Total direct and indirect employment from impact on tourism.

Economic sector	Direct jobs	Indirect jobs
Agriculture	–	1215
Mining	–	15
Utilities	–	24
Manufacturing	41	213
Construction	–	37
Service/hotels/restaurants	7117	448
Transportation	209	57
Financial intermediaries	–	97
Other services	483	343
Total	7850	2449

Source: Authors' calculations based on extended I-O methodology and a change in demand of NC\$163.7 million (\$10 million).

Table 6-18 Decrease in unemployment rate.

	Δ in unemployment rate as a result of an increase of NC\$163.7 million (%)
Tourism	–5.04

Source: Authors' Calculations Using Unemployment Statistics of 10.7% from the Central Bank of Nicaragua Annual Report and Active Labor Force of 1.703 million workers Reported from the Ministerio del Trabajo (MITRAB).



Figure 6-6 Scene from one of the National Parks in Nicaragua.
Source: Photograph taken by author, September 2007. (Plate 10)

portion of jobs can absorb labor typically provided by the poorer households, this is expected to generate a more noticeable impact on the poorer household groups.

6.1.1.7 Overall preliminary findings

Even though we gave the same amount of shock to the Nicaraguan economy, the responses to the shocks were different due to its economic structure. We do not have enough information to generalize, but at least we detected that the tourism as an industry can have higher economic impact as well as wider effects of income distribution over different income-level households groups.

We did not have households' expenditure patterns data so the framework is a step short of the full SAM per se, but a framework such as this would be able to depict how the tourism as an industry can be used as a vehicle to develop national economy with emphasis on wide-spread income distributions.

Some industries such as construction or manufacturing may not have international competitiveness over comparable products, but in terms of tourism, a nation with rich natural endowment such as Nicaragua can develop and maintain reasonable international competitiveness of tourism as an industry to earn foreign currency.

6.1.2 American Indian and impact of gaming towards poverty alleviation

Among the numerous impact study reports available for downloading free of charge, an issue of poverty among American Indians and the effect of recent developments of Indian gaming (gambling casino operation) may be of interest. This is an example of using the economic power of tourism (gaming) to alleviate broader social problems in society.



The National Indian Gaming Association (NIGA) published a summary report entitled *The Economic Impact of Indian Gaming in 2006* that can be downloaded from the internet (http://www.indiangaming.org/info/pr/press-releases-2007/NIGA_econ_impact_2006.pdf; last accessed 10 February 2008). With permission from the NIGA, below I would like to quote some parts of the report, which is an excellent summary of how the economic impact of gaming has been helping the American Indian community to develop.

[Historical Background]

'Genocidal government policies in the 1800s devastated Indian tribes. General Sherman expressed his deep disappointment over the fact that, if it were not for 'civilian interference', his army would have 'gotten rid of them all' and killed every last Indian in the U.S. The Indian population in the United States plunged from more than 110 million before Columbus to only 250 000 by the end of the Indian wars at the close of the 19th Century. Despite U.S. treaty pledges to protect Indian reservations, from 1886 to 1934 Indian tribes lost more than 90 million acres of land. By the beginning of the 20th Century, Indian tribes held only 48 million acres in the lower 48 states, much of it unproductive desert or arid land. During the 19th Century, the United States destroyed traditional Indian economies through war, removal, land theft and destruction of Native species.

With little or no economy or tax base, Indian tribes in the late 1960s and early 1970s turned to Indian gaming to generate government revenue. The Supreme Court in *California v. Cabazon* ruled that Indian gaming was crucial to tribal self-determination and self-governance because it provided Indian tribes with the means to generate government revenue needed to fund essential services and provide employment for tribal members. In 1988, Congress enacted the Indian Gaming Regulatory Act, 25 U.S.C. secs. 2701 et seq, affirming tribal government authority to use Indian gaming 'to promote tribal economic development, tribal self-sufficiency and strong tribal government.' Across the country, 223 tribes in the lower 48 and two Alaska Native villages operate 423 Indian gaming facilities, including 294 casino operations and 129 bingo halls, travel plazas and pull tab operations.⁷ (As a comparison, 78 percent of the 50 states and the District of Columbia use state lotteries to generate government revenue.)'

[Economic Development Summary]

'Americans understand that Indian tribes are making important gains through Indian gaming. A recent national poll commissioned by NIGA found that more than 75 percent of Americans agree that Indian tribes benefit from having casinos; Indian gaming provides jobs for Indians; and that Indian gaming generates essential revenues that tribes can use to provide essential services to tribal members. That's not surprising because more than 24.5 million Americans visited Indian gaming facilities in 2006, and they saw first hand the progress that Indian tribes are making through Indian gaming. In this report, NIGA releases its fourth economic impact study. The report documents the impact gaming had in Indian Country, as well as our neighboring communities, during 2006. The numbers, compiled from tribes across the country, tell an exciting story of successful, responsible growth and promise.'

[The Economic Impact of Indian Gaming]

'Nationwide, 225 Indian tribes in 28 states use Indian gaming to create new jobs, fund essential government services and rebuild communities. In 2006, tribal governments generated:

- \$25.7 billion in gross revenue from Indian gaming (before wages, operating expenses, cost of goods and services, capital costs, etc. are paid)
- \$3.2 billion in gross revenue from related hospitality and entertainment services (resorts, hotels, restaurants, golf, entertainment complexes, and travel centers, etc.)
- 670 000 jobs nationwide for American Indians and our neighbors (direct and indirect jobs created by Indian gaming's economic multiplier effect)



Figure 6-7 Indian casino located in California.

Source: Photograph taken by author at the Gold Country Casino, Oroville, CA, US, 2007. (Plate 11)



Figure 6-8 Line of people waiting for buffet at an Indian casino, Upstate New York.

Source: Photograph taken by author, 2005. (Plate 12)

- \$8.6 billion in federal taxes and revenue savings (including employer and employee social security taxes, income taxes, excise taxes, and savings on unemployment and welfare payments)
- \$2.4 billion in state taxes, revenue sharing, and regulatory payments (including state income, sales and excise taxes, regulatory payments and revenue sharing pursuant to Tribal-State compacts)
- More than \$100 million in payments to local governments.'



Poverty is a serious issue, not only for some nations in the world, but also for some groups within a rich nation. If we see tourism as an industry, we can plan to use its economic power to help alleviate the problem in the society. We need a hard head, a soft heart, and a creative mind to use tourism as an industry to solve social problems in the region, nation, and the world.

6.1.3 Poverty alleviation and international conflicts

Despite the collapse of the Cold War structure in the early 1990s, numerous regional conflicts persisted around the world. The trouble areas includes, but not limited to: Afghanistan, Chechnya, Columbia, Congo, Eritrea, Israel-Palestine, Kashmir, Kosovo, Kurdistan, Myanmar, Nepal, Nigeria, North Korea, Pakistan, Sri Lanka, and Sudan (Darfur).

The majority, if not all, of those conflicts appear to be located in the developing areas and regions of the world. Without attempting to explain any cause of regional conflicts in terms of history, culture, or religion, it is interesting to note that many of those regions are poverty-stricken, and without competitive manufacturing industrial bases. If poverty has anything to do with occurrence of regional conflicts, mitigating the root cause of poverty may help reduce the likelihood of continued conflicts.

How do you plan to bring continuous cash flow into the poverty region? One is obviously the continuous amount of donors' assistance, which is not a sustainable model in the current international environment, which is more lenient towards emergency-based funding. The other is to let the region develop their own means of earning export revenues. Once you ponder how you can create a plan for the poverty-stricken region without solid industrial base to generate export earning, you start to see the potential of tourism as an industry as an intriguing industrial sector.

6.1.4 Students' ideas on poverty alleviation through tourism as an industry

In the senior and graduate level course entitled *Tourism Industry Analysis*, which became the basis of this textbook, I conduct a final exam at the end of the semester. The exam consists of some multiple choice questions, matching, and essays, all through the proctored environment in the computer laboratory.

The following are the essay questions and answers from students. There are no correct single answers and students can express their opinions freely, thus I do not either endorse or refute their contents. Students are predominantly graduate students on the Hospitality management program, who did not have prior formal education on I-O/SAM or TSA. Opinions vary in focus but some may be of interest as candid observations of students learning the highly complicated topics for hospitality and tourism students.

6.1.4.1 Final exam essay questions

The following final exam questions were set:

Please tell me your logical opinions on how to use the power of tourism as an industry to solve problems in the society, nation, or the world. Here is what I would like you as a graduate student to do.



1. Identify the problem that you want to address in a society, a nation, or the world.
2. Describe the current situation.
3. Discuss how tourism as an industry can make any difference for the better.

I am interested in determining your understanding of what we learned in class (I-O/SAM, TSA). Please make logical arguments and substantiate your answers.

Entrants were encouraged to provide in-depth answers reflecting discussions held in the classroom and on discussion board postings rather than give personal ideas on marketing, sales, culture, human resources, etc., to demonstrate that they had understood and read around the subject. The answers are presented in Box 6-1–6-11.

Box 6-1 Answer for final exam essay questions for student 1

The issues that I would like to address that I believe tourism as an industry can serve as a benefit for are poverty and unemployment. I will be focusing primarily on the US due to the available data at hand. As we have discussed in class, there is no 'one thing' that can be determined as the tourism industry. The tourism industry is unique in the fact that it is comprised of many industries which work together to make what we know as tourism. For instance, the agriculture industry, such as demonstrated in both I-O and SAM is fairly cut and dry. While there are many types of agriculture and many different roles played within the industry, they for the most part, clearly fall under the umbrella of the 'agriculture industry'. Due to its' diversity, the tourism industry has large potential in contributing to the solution of both poverty and thus, unemployment. From what we learned in class, SAM makes us realize that you have to put your labor into the market and then the money moves from the exchange market to you. As we know, if you don't work, the only source of income is inter-industrial transactions. Through the jobs provided by the tourism industry, the social accounting matrix can show us how the factors of each household segment are required by industrial sectors. SAM can show how much labor is needed by those of the households closer to poverty (lower income and perhaps even in a less-exclusive region or lower education level). The tourism industry provides many opportunities for individuals who do not know how to write or even have fluency in the language of the native country all the way to individuals who have the highest levels of education. With so many different areas, there is opportunity for just about anybody. Tourism satellite accounts provide a nice structure of the basic opportunities that individuals employed by the tourism industry can experience. While here at Rosen we focus mainly on hotels, restaurants and theme parks, TSA allows us to see that there is much more to tourism than those three primary areas. TSA illustrates potential job markets all the way from taxicabs movie theaters, gasoline stations and up to what we are familiar with: hotels and restaurants.

Beginning with the area that I am most familiar with, hotels, a lodging establishment alone can provide job opportunities to those who do not have many skills nor much education. For instance, one has the opportunity to be employed by a lodging establishment in a position such as a house-keeper, dishwasher, bus boy, etc. which are positions that can provide on-the-job training and do not



require previous skills or knowledge of the subject. Furthermore, once occupying one of these positions, one can learn more about the establishment and learn and grow within the very same hotel and move upwards in a position if desired. Drawing reference to TSA, one can see that there is far more beyond simply being a housekeeper in a hotel. The tourism industry consists of so many different industries that opportunities are that much greater. For instance, table 9 of the Okubo paper shows how many thousands of employees are provided work opportunities in each different sector of the tourism industry. With the three methods used, the range of employed individuals in the US in 1992 ranged from 3.7 to 4.3 million people. The tourism industry has certainly grown since 1992 and more jobs are being created. Since 1992, visitors (both leisure and non-leisure travelers) have gained many tools to make travelling easier and thus increase the usage of the industries' outputs that are demonstrated in TSA. For instance, since the early 1990's, the internet has become a very valuable resource to tourists. The internet has made it easier for travelling plans to be made and has helped increase the awareness of many destinations. This statement is not meant to shift from the focus of the paper (I'm not trying to gear towards the marketing end of things here), but rather provide a solid example of how tourism commodities may have substantially increased since the tables in Okubo's paper were composed. In our SAM homework assignment, we learned how to analyze which type of spending may be the most beneficial to different household segments (household disaggregation). We can use this tool to determine where money should be spent to assist in the alleviation of poverty and how tourism can play a role in this. For instance, one of the options on the homework assignment was investing in education. In an article that we read in class, 'Poverty in Latin America: Not always with us', The Economist stated that a good way to break the cycle of poverty was by giving children a better chance to escape it. In this article, the idea was presented of offering programs that give cash to poor families on the condition that they keep their children in school and take them for regular health check-ups. While this does not directly tie into the tourism industry, through the use of SAM we can calculate the induced and indirect impacts created by such an investment to each household segment. By investing in the future, the tourism industry can then provide many jobs that provide advancement opportunities to those children who are provided with the opportunity to succeed within the industry. Also, another option in the SAM assignment was investing in tourism. This had different impacts on different household segments; however, SAM allows us to see which households it would benefit most. By being able to analyse this information, a community can determine if this would be the best route to alleviate the poverty in the area. Through the aforementioned topics, tourism can certainly be used to alleviate the issue of poverty. Tourism creates great opportunities for those who are experiencing unemployment or poverty to some degree.

Box 6-2 Answer for final exam essay questions for student 2

The most pressing problem at large in the world today is that of poverty. Unfortunately, most people approach this problem emotionally and therefore offer solutions that have no real foundations in the business world. As we have discussed in class and on-line, and indeed as people throughout this



nation discuss unconsciously in their workplaces everyday, no action can really be taken without solid numbers. And our numbers show, from the use of SAM especially, tourism can have a phenomenal positive effect on the reduction of poverty worldwide. As our world becomes more and more of a global marketplace in the 21st century, the one industry that can always be counted on to bring money into a region and keep it there is tourism. As we first discussed in class, tourism is a unique export in that consumers come to the source in order to consume the product. Instead of physical products leaving the country, tourism brings physical buyers to the local marketplace. And here is where the multiplier effect is immediately evident because once you have buyers in the marketplace they will tend to buy more than they initially came to the marketplace to purchase. In bringing a tourist to a region to buy and experience a day at a theme park, that tourist then must buy other products while in the region, such as a hotel room to stay if they have come far enough from home and then food even while not in the theme park and then perhaps souvenirs and other entertainment for as long as they remain in the area. The point is that some piece of tourism initially brought the consumer/tourist into the local marketplace and immediately other businesses beyond that of the initial purchase are benefiting. Further, looking at the SAM table and at tourism satellite accounts, tourism is an industry that pulls from every other industry and fits in many other industries to make its product consumable. Tourism does not fit in one box, like a tire that takes inputs from and provides outputs to only the manufacturing sector. Instead, tourism requires input from many sectors in order to provide the product that tourists expect. This is evident in that tourism does not easily fit into a single category on the input-output table, nor is it even easily defined within academic and practitioners' circles. Therefore, when a restaurant or hotel is built, the manufacturing industry inputs building materials to construct the physical buildings, the agricultural industry inputs produce for food, the retail trades may input products to sell as souvenirs to tourists, the transportation industry will need to input means of transportation to get tourists to the physical buildings, and the entertainment industry will input its specialties to help provide a unique experience. The list could go on and on. Each of these industries then benefit from the moneys that flow back to them (as per the input-output table) from the multiple inter-industries exchanges created by the building of a hotel or restaurant. However, for the alleviation of poverty, we must then turn to underlying benefits created by the tourism industry and its multiplier effect as discussed above. These benefits that I speak of are created by, again, the money coming into the local economy and the multiplier effect in evidence in the disaggregation of households as Stone proposed for the SAM table.

For those in poverty, it is not enough that money flow into the economy if this money only flows into the hands of those already wealthy, and then we end up with the old adage – 'the rich get richer, and the poor get poorer.' Instead, with tourism in the SAM table, we find that by investing in the tourism industry, the rich get richer and the poor get a little richer as well. This works to the benefit of the poor in several ways. From the numbers, we see that tourism provides jobs for all income levels. Unlike other industries that can find cheaper labor in other countries and thereby create leakages in the local economy as wages find their way into households in other countries, the tourism experience depends on local laborers and laborers from all skill levels. For the better, tourism is not an industry in which you have to have a degree and have mastered many skills in order to get a job. Tourism can benefit those lesser skilled or less educated from the local workforce who would not be able to find a job elsewhere, say in the technology industry. Anyone can start somewhere in the tourism industry and work their way up from the bottom. On the other hand, those at the top of



the income brackets cannot complain about investing in the tourism industry either as jobs are created from the industry for those highly skilled and educated as well. Again, according the SAM table and the disaggregation of the households, we get evidence from hard numbers that investment in the tourism industry provides jobs for all levels. No one is left out. Finally, one last note on the benefits for the poor to be derived from the tourism industry – jobs are not the only thing that tourism can provide for the lower income brackets. Education must also be considered and obliquely, tourism can help in that area as well. Like we have read about the casinos on Native American reservations that bring money into the economy and benefit the local population by building schools and giving money to government programs, tourism in any area works much the same way. As more and more find jobs in the local tourism industry and at all skill levels, a lower unemployment rate means the government is paying out less money in unemployment benefits, and conversely, as more and more are employed, they are paying more taxes. Therefore, there is more money in the government budget which can then be allocated to education, one of the best solutions for stopping the cycle of poverty. On SAM, this would be shown as less money circulating within the ‘institutions’ category and more money flowing from ‘institutions’ to ‘production activities’ to ‘factors’ and back to ‘institutions’.

To conclude, as mentioned at the beginning of this essay, we must keep in mind that poverty is a world-wide dilemma. There are many countries poorer than that of the USA who need to benefit from the tourism industry and what it can do to bring in and circulate money in local economies. Perhaps, this can start at home with our knowledge of and development of the input-output table, SAM table, and TSA in the USA. As we help alleviate poverty in our own backyard through disseminating this information, we can then turn to our neighbors to help them calculate the numbers and push agendas with a firm background in how to show that boosting tourism in each nation can work to alleviate poverty. As we can show that tourism benefits everyone, there is no reason why all should not push to invest in this industry and help everyone, poor and rich alike.

Box 6-3 Answer for final exam essay questions for student 3

Today, there are many issues surfacing the world. The Millennium Declaration of the United Nations identified poverty alleviation as one of the most compelling challenges the world is facing in the 21st century (WTO, 2002). Poverty is a problem in every society. Each society has ways of dealing with this issue. Promoting tourism can be used as a method of alleviating poverty in a society, especially in developing countries. According to the World Tourism Organization (WTO, 2002), in many poor and developing countries, tourism is already one of the most important sources of foreign exchange earnings and job creation. Tourism as an industry can make a positive change in a society’s poverty alleviation. First of all, there are low barriers of entry in terms of capital requirements compared to other industries, such as petrochemical projects. As long as a geographic area has natural resources such as beautiful scenery, culture, and people, the place has potential for development of tourism. Of course, infrastructure will have to be built. Investments in tourism infrastructure is known to



yield benefits ('Investment in', 2007). Also, Dr. Aldret Musisi mentioned that investments in infrastructure can have a significant contribution to poverty alleviation. Secondly, tourism industry is perceived as having lower paying jobs than other industries. Also, the industry typically does not require high level education. It is not difficult for these people to place themselves into the labor market as long as they have the willingness to work. Once people place themselves into the labor market they become valuable assets to the economy. Tourism industry is able to employ people from lower income groups, train them in order for them to provide goods and services to visitors and in return receive income. The social accounting matrix (SAM) shows the income distribution of sectors in an economy. Assignment 2's policy simulations, using the SAM matrix, demonstrated that compared to agriculture and machinery industry, boosting tourism for \$100 billion generates the highest positive change in personal income over all income groups. It is the most effective promotion policy than any other sector in alleviating poverty issues in a nation. This is also demonstrated by comparing the lower income groups across different industries. By utilizing local resources and local people from a nation or society as much as we can, it stimulates the local economy. It keeps the money flow within the nation. Importing goods and services (including importing labor) could result in considerable leakages as is seen in some nations, such as Aruba. Tourism promotion does have its negative impacts to a society, socially and environmentally; however, positive impacts to a destination is considerable. TSA shows the size of the impact of the tourism industry in the economy. It demonstrates not only the direct, indirect effects but also the induced effects in the economy in terms of generation of value-added employment, personal income, and so on. In the case of alleviating poverty, stimulating economic growth by lowering the unemployment rate, increasing the income distribution, and bringing in many visitors to increase consumption of goods and services is important. After studying I-O/SAM and TSA, it shows that tourism is the industry that can provide all of the aforementioned to a destination. Once tourism is established as an industry in a destination, eventually TSA could be built to identify how successful the country is doing. It is our job to use our knowledge with evidence to show from I-O/SAM and TSA to talk to policy makers in making a difference in the world. Hopefully, TSA will provide more substance ('political muscle') to the industry overall. References Investment in infrastructure gets Uganda up and running. (2007). Retrieved from Discussion posting Social Accounting Matrix Issues. World Tourism Organization (WTO). (2002). Tourism and poverty alleviation. WTO. Class notes.

Box 6-4 Answer for final exam essay questions for student 4

(1) The problem I would like to focus on is how tourism can alleviate the relationship with labor shortages or oversupply, and how this can help alleviate poverty issues around the world. Focusing on 'the world' might be too abstract at this time, so I would like to focus on the Caribbean islands, where we both labor and poverty issues are experienced (for example Haiti). There is another particular issue that I would like to comment on, but my limited knowledge on this subject might put me on a disadvantage right now, but issues with the negative effect of tourism on the environment could be another interesting subject to discuss. LABOR ISSUES: The Caribbean has been known to



be highly dependent on tourism, so most of the island's policy makers are focusing on increasing the demand for the reason to report positive effects which are limited to tourism arrivals only. While many Caribbean islands have witnessed a tremendous growth in tourism for the last few decades (from 25 million in 1950 to 673 million in 2000), limited consideration has been put on the demand for labor in general. Ironically, the latter statement does not apply for all Caribbean islands. Haiti for example, because of their previous political turmoil, still faces a tremendous challenge on how to get the island out of their poverty dilemma. So this section will highlight the labor issues in the Caribbean, and how this can relate in solving some poverty issues for countries like Haiti and Cuba, and to some extent, Jamaica. (2) CURRENT SITUATION: The hotel industry has a multiplier of about 2.3, so with every hotel room build, 2-3 workers are needed. For the case of Aruba for example, out of those 3 workers, 2 must be imported from abroad. And other Caribbean islands are following the same pursuit. Many developed countries also faced similar phenomenon, and issues like illegal immigration, monetary leakages, crime, infrastructure and education are just a few of the serious negative side effects that resulted from the growth of tourism. How the Caribbean islands are facing with this tremendous challenges, still remains a puzzle to be solved. It is sad enough to still hear from policy makers that the more hotels an island has, the better it is for the economy. Studies that would analyze the islands density, tourism receipts, GDP, export are in direct needs. But according to the WTTC (Simulation of the TSA for the Caribbean), the Caribbean islands are loaded with many strategic and tourism sustainable plans, but no one is making the first step in implementing some of these strategic suggestions. Perhaps, one of the reason is that policy makers doesn't have a consistent tool to measure either the positive or negative effect of tourism activities in the region. (3) For the last two semesters I have been very eager to learn the concept of TSA (tourism satellite accounts), as it was reported by international tourism organizations, such as the World Tourism Organizations/World Tourism and Travel Council/The World Bank/Organization for Economic Cooperation and Development, that TSA will be THE method to help measure the impact of tourism activities, and at the same time, provide policy makers with the necessary tools to help alleviate some of the issues related to the growth of tourism in the region. Before trying to understand the concept of TSA, the foundation of this concept needs to be understood. I'm directly referring to the models of input-output (I-O) and social accounting matrix (SAM). The I-O model can be a tedious task for small islands to implement, but since the inter-industry activities in these island destinations, constructing the I-O model might be less stressful than anticipated. For example, Aruba has been able to construct both the I-O model and the SAM, and is in the process of creating their own tourism satellite account. Once this is accomplished, these data will be extremely valuable for policy makers to use and execute their strategic plans. Only once these data are obtained, one can put in words (based on the results) how tourism can or cannot alleviate some of the above mentioned issues. Employment multipliers can then be calculated and leakages can then be identified. This will allow policy makers to make better strategic decisions for the future instead of staying in their myopic nutshell of bigger is always better. If the outlier of Haiti is of main concern in the Caribbean, while many other islands are facing the challenge of obtaining the right type of people to work in the industry, why not create a long term strategic plan to use Haitian labors to fill in the gaps in the Caribbean. Diversity in the workforce is not a new phenomenon, and if major cruise lines can effectively use their human resources by training, motivating and promote empowerment, why can't policy makers adapt to the same approach as these major cruise lines.



Box 6-5 Answer for final exam essay questions for student 5

According to World Tourism Organization, 'sustainable tourism can be one of the few development opportunities for the poor.' Policy makers should know this. In current world, people are more aware of what's good for society. Innovative technology had contributed a great deal to communicate and network for the best in tourism. The problem is that the rich is getting richer and the poor is getting poorer. Many countries poverty level is less than a (\$1) dollar a day to live on. Countries like Nicaragua and Guatemala lies not far from North America and are still lacking the source of potential income (in other words – Tourism). Continent like Africa is another example of poor nations. Even regions such as US Indian reservation something can be done to bring money in. In some US states such as Minnesota Casino were build in Indian reservation to alleviate people income and labor. So, again the problem is – people has not much income/labor and tourism can alleviate that problem. Because tourism is labor intensive and does not require much education skills, many people can find jobs in the tourism industry. Also, tourism has a multiplying effect. In other words, let's say a country like Nicaragua built a five star hotel with casino close to attractions and events for tourism – that hotel will use other industries/commodities as well during and after it is built. Data for input-output (–use for prediction of effect of changes on one industry on others), SAM (– see the flows of economic transactions), and especially TSA (– an extension of I-O accounts that measure travel and tourism visitors/demand) do demonstrate how money and goods and services flows. So, building lodging in a poor destination will bring extra income to restaurants, shopping, recreation, etc. The GDP of a country will tell the story later.... Sometimes policy makers or the government of countries just think about building more hotels and that's good for a country.

Most of the times they do not do an economic impact study. This is why I like I-O/SAM/ TSA models. People should not just talk about more construction and without any facts (numbers) – what really matters is after (long term) the hotel is build. Question to ask: Do we have to import labor from abroad and do we encounter leakages? Government should think and understand that it is not just about 'show off' how good they are by bringing investors. If poor nations want to start implementing tourism and another source of income; it is important not to be corrupt and analyze the production activities, factors, institutions, etc. It will be nice to get some statistical data for the models/tables. What is nice about the tables is you could put for example households into segments (high income, low income, male, female, education level, etc.). It all come to final demand/ direct and indirect impact. Another problem is that these models IO/SAM/ TSA are not thought all over the USA. Consultancies do most works for governments/policy makers on tourism (and other industries). Dr. Hara class did help me great to learn about these models – important for the economic impact. I think part of the solution is that more students must learn about this great 'tool' (the models), than more research can be done and at a young age people could understand the importance of calculating/forecasting etc. the economic impact of a destination/region. I already see many regions and countries are trying to look at the bigger picture what tourism can bring to people; still it is all in its infancy. So, in short – I will use the models latter a lot for the economic impact of a destination; especially when IO/SAM/TSA brings facts to the table. Thanks Dr. Hara.



Box 6-6 Answer for final exam essay questions for student 6

Much of what we covered in this course focused around three core competencies in I-O, SAM, and TSA. This brief essay explores a local issue in the implementation of taxation and economic impact issues with regard to the application of derived funds to support the hospitality/tourism industry, while not balancing that application via impact across all TSA identified industry segments uniformly. In general, a unifying theme can be drawn in that all three ties to the relationship derived from the exchange, and examination thereof, of goods, services, labor, and capital across multiple segments and industries. That being said the SAM model broke this down to the most basic level, in institutions, factors, and industry. However, at the core of this model was laid the foundation for the true 'use' of all three combined, the power to point out the overall impact that these combined can have in forecasting and demonstrating the overall economic impact of the hospitality/tourism industry. For instance, via our examination in this course, it was pointed out on more than one occasion that tourism is often a great development tool for developing countries seeking to establish their economy in the global economic community. To that end, the tourism industry often offers not only entry level jobs with low barriers to entry via lower levels of training needed and an abundance of opportunities often geared off natural resources, such as lakes and oceans, but also by this development a means of enriching local economies via corporate philanthropy and responsibility. Though not examined fully in this course, it was implied that via examination of industry economic data it could be shown that through tourism development not only did the tourism industry prosper, but related industries in textiles and manufacturing as well due to the increase in resources needed to maintain expanding businesses. Can this solely be attributed to low barrier, entry level jobs for local employment? As discussed by our class, potentially no. What factors, therefore, complete the industrial cycle that sustains business in these developing sectors while also feeding the machine of tourism development? They are importing and exporting of goods, services, labor, and capital. The cyclical models presented also take into account, related to imports/exports, governmental involvement via the institutions piece of SAM. This, though a small piece of the overall model, also again serves to demonstrate an owner of labor and capital, as well as an influence on the overall model itself. Furthermore one of the primary driving factors, households, points out the vast impact of the working community, and the importance of the community contributing earned wages back into the cycle in which they reside. However, do all households contribute? No. Though this is also encompassed via the Government in the form of Social Security, Welfare programs, and so on. Though a small piece of the overall puzzle, it is still a large economic influencer when considered against the U.S. GDP as an economic measure.

Explored late in this course, through our discussions on TSA, we delved into the sprawling reach of the overall TSA concept when comparing that against such local issues as the hotel tax. For instance, we institute a tax, impacting hotel guests visiting all the attractions of Orlando, contributing directly back into the tourism industry infrastructure here, while yet only hotels are charging this tax? This ties into TSA because, as a generalization, our city/county have decided to blanket this tax to aide the overall industry here, while through TSA we realize that other such related segments as airports, railroads, auto transportation firms, event planning organizations, food and beverage suppliers and distributors, and so on all benefit but don't all contribute via the tax. Perhaps in this sense the



TSA model would be the ideal tool for which to demonstrate to the political structure locally that the benefit is great to the overall industry, while the impact directly is resting on the shoulders of hoteliers locally. With all these in mind, what other impacts could be presented or explored utilizing these tools? What uses could be found for these modeling techniques? One such issue that could be readily explored is the development of tourism in third world countries, such as those in Central America, where infrastructures do not yet exist, but elements of the hospitality industry are taking up residence and doing business. The social outliers such as corporate responsibility cannot be fully explored using these methods, as mentioned before, economic impacts on the increase of imports, exports, labor, and financing can easily be modeled, as well as the comparison to relative increases in other domestic industries such as manufacturing and such. One such case, that of Nicaragua shows that though the country is shown to be one of the two most underdeveloped and poorest countries in our hemisphere, prospered greatly via the influx in tourism. Direct impact was felt via the development of roadways, power, sewage, education systems for employees and their families, etc. But also indirect impacts were felt as well via the sales of local products to businesses and visitors, as well as exports also. Another such case could be made for parts of Africa as well. Via the institution of many development projects and parks to capture the natural beauty of their lands, local profits from the sale of goods have increased, trade has increased between neighboring countries, and the influx of foreign dollars has increased to develop and, in some ways, lay claim to a thriving business on the verge of major development. Relating to the last, much the same could be said for China as it prepares for the upcoming Olympics. With many organizations moving in to set up shop for the upcoming Olympic Games, China has prospered via increases in trade, revitalization projects to both physical and economic characteristics of their country, and the sale of domestic goods as well.

All this, across Central America, Africa, and China all ties to what we learned in this course through the examination of impacts, the cross influence of multiple industries on final consumption and demand, and the cyclical nature of business and its relationships across factor, industry, and institutional subsets. In closing, With the I-O model as an economic analysis tool, the SAM model as a tool to encompass the multiple variables, and the TSA model to focus in on our industry and its many parts, it is an easy concept in hindsight to see the overall impact these tools together can have when forecasting, planning, analyzing, and developing our industry, both locally and abroad. However, it is VERY important to point out that all research must be balanced, and as pointed out previously throughout the course, there are loop holes that exist with these models from a forecasting standpoint. Therefore, in the future should I venture into research regarding the industry, I will be sure to consult these tools as a point of reference, but will balance them with alternative methods so as to garner a complete, encompassed snapshot of the hospitality/tourism industry.

Box 6-7 Answer for final exam essay questions for student 7

An article discussed in class, 'Poverty in Latin America Not Always with Us', which was published in 'The Economist' on September 17, 2005 spoke of how poverty levels are high within Latin American



countries. According to the article about 43% of the total population is below the poverty line, with about 18% living in extreme poverty conditions (The Economist 2005). These high levels of poverty need relief and aid, and this could happen through an economic boost within a particular industry. Countries such as Nicaragua, Haiti, Mexico, and Columbia are developing ways to relieve their poor citizens through social programs, although they should also look to the tourism industry as it can add an economic boost within the country, decrease the poverty rate, and develop itself as a growing nation. These countries are benefited with both historic and scenic sites that have potential to drive tourism. They currently are not positioned as popular tourist destinations but instead as poverty stricken countries. The social accounting matrix discussed in class speaks about how production activities, factors of production, and institutions are all interrelated and can benefit one another through a steady flow of money. Factors of production, which is known to be an exchange market for labor and capital, will be very active through tourism development. The tourism industry is widely known for employing large amounts of people as hotels, restaurants, and theme parks require much man power in order to operate. Also, these positions do not require employees to be highly skilled, which is something you will not find within the poverty class. In order to build hotels, restaurants, and other tourist sites much employment is needed in the construction and development stages. The tourism industry will employ many people of the poverty class which can lead a boost in the economy through an exchange of wages for labor. Another aspect as to how the tourism industry would boost Latin American economies is through production activities. The organizations within the hospitality industry can purchase goods and services from each other in order to meet inter-industry needs. For example, a Hilton Hotel may purchase linens and cleaning supplies from local textile and chemical factories. Or local restaurants may purchase large amounts of seafood from the vast amount of fishing ports in Latin America. Inter-industry goods and services in exchange for money is another way for Latin American economies to grow. Governments, which are a component of institutions, will receive tax money from tourism revenue. This tax revenue can be used to develop social programs for citizens of the poor class, develop the local environment in order to be attractive for incoming tourists, or provide capital for tourism just as Orange County has done here in Orlando by building the Orange County Convention Center. Another component of institutions are firms, where outside investors could invest money into Latin American tourism. Latin American economies will experience growth by having this stream of money enter the flow of the social accounting matrix. Analysts can begin studying the economic growth after the tourism industry has been developed in Latin America; this is completed by utilizing tourism satellite accounts (TSA). TSA will allow policy makers to understand how much revenue is generated from hotel and lodging places, eating and drinking places, local transportation, and various other commodities and industries that are measured within TSA. Aside from the production revenue, policy makers will also be able to measure the supply and consumption of tourism commodities, tourism demand by segmented visitors, tourism's contribution to GDP, and employment and compensation of the tourism industry. TSA will be measurable on many levels and will provide data in order to show how valuable it is to Latin American Economy. If TSA can prove how tourism boosted the national economy policy makers may then allow for more hotels to be built, expansion of airports and highways, or development of more scenic sites. Another aspect of developing tourism is the idea of preventing leakages. Many of the wealthy class in these Latin American countries often import goods and services from other countries. Resident households can



experience vacation opportunities without leaving their countries if they have developed tourism locations, this will then prevent a leakage of money from leaving the national economy. Tourism as an industry can make a difference for the better by growing and expanding the economy. Overall GDP can increase, employment will increase, less leakages may occur, and poverty class will decrease. SAM and TSA will be able to provide a clear picture on how the tourism industry is able to aid the economy and Latin American countries can experience economic growth.

Box 6-8 Answer for final exam essay questions for student 8

Tourism, as an industry, holds the key on many levels to provide basic sustenance and a better quality of life. As noted in numerous research studies, newspaper articles, and business journals, tourism is now positioned as one of the fastest growing industries world wide. While we, as Rosen students living in a tourist-generating destination, have learned throughout our studies, tourism has an impact not only to our area, but also has a much greater impact to developing countries, to improvised societies, and to communities where education and skill sets are lacking. This essay will touch upon all three segments; communities (cities), societies, and at the highest level, nations, in discussing of tourism's pivotal role as a driving force in the empowerment and sustenance amongst all peoples. Living in the Orlando area, many would agree that tourism has had its mainstay within our community, and certainly has added to the lure of our presence with the millions of tourists' dollars generated yearly. Economically, Orlando has transformed itself from a 'sleepy' little within close proximity to beautiful beaches, to the thriving entertainment capital of the world. As a result, our area continues to flourish and offer many residents a comfortable life style. With every new attraction that is erected, other related hospitality businesses are built in anticipation of future revenues. Hotels, restaurants, car rentals, cruise lines and timeshare companies, just to name a few, have now established their presence, if not their home base, in the Orlando area. Companies in other industries, as well, have been the benefactors of Orlando's healthy tourism market. Those are other industries, such as printing, retail (toiletries and bedding) or food products, share in the 'pot of gold' of tourism flows. Even in our tough housing market, tourism expansion has, and continues to create jobs for those in the construction industry, those in the real estate market, and those in the financial markets. A question to be asked; what would Orlando be like if tourism was not the main contributor of economic inflows? Would Rosen College exit? Probably not! Would Orlando be faced with the problem of transportation infrastructure challenges that now taunts them? Perhaps Orlando would have greater concerns with the support of the elderly, or governmental support to those seeking employment with no viable industry? In an event, Orlando stands the winner primarily due to the tourism industry. However, Orlando may not be the best example since we are fortunate enough to also have beautiful weather and natural settings as our backdrop. Examples, domestically, of communities and cities that continue to be dependent, at least to some extent, on tourism include Minneapolis, MN (Mall of America), New York City, and Las Vegas, NV. No one can argue that these locations are inviting, weather wise.



Nor would they necessarily have a strong draw if not for the lure offered in these areas with various aspects of tourism. As can be witnessed with the terrorist bombing of 9/11, New York City took a direct hit to tourism. While financial stability is achieved through diversification of many industries in NYC, especially those related to the financial markets, they nevertheless suffered economically due to the decrease in tourism flows, especially from visitors abroad. Minneapolis and Las Vegas, as well, depend on tourism to generate jobs, add new construction projects, and provide for a better quality of living. One segment of the tourism industry, gambling, has been quite successful in fueling economic growth for both communities/cities and societies. Las Vegas, once considered an undesirable desert area, now finds its place as one of the predominant places to live in the U.S. In other gambling-centric areas, perhaps those off the beaten path and not as well-known, this segment has enabled its people to now have basic necessities.

As studied in our course this semester, the Indian society has for years struggled with issues of underemployment, lack of education, poverty and a sub-standard life style. Robbed of their land and resources in years gone past, Indians across the globe now must succumb to the everyday challenges of feeding their families, working for low wages (that is to say if they are fortunate enough to find employment), and living with the realities of higher depression and suicidal rates. Concerns also abound for their children, and providing a healthier lifestyle, one that allows them to be empowered with educational and vocational talents thereby enabling them to become economically-independent members of the existing societal tribe, as well as to society in the grander scope. Since the advent of gaming casinos on lands owned by tribal societies, Indians have garnered much financial stability. Health centers educational programs/schools, community centers, and housing has resulted from inflows of gaming revenue. Tourism has most certainly aided Indians in empowering them with employment opportunities, which thereby enables them to derive income to support for their families. This brings flows of monies back into their communities for further improvements. The cyclical nature of this process also brings non-intrinsic, psychological benefits that help build up confidences, thereby offsetting, in part, depression. For the younger generation, tourism provides monies for long-term education pursuits. No longer dependant on their parent's handed-down trades/crafts for their livelihood, they are now able to pursue other career opportunities offering higher paychecks and health benefits. For the older generations, they have opportunities to sell their homemade crafts and goods in nearby areas of the gaming establishments, thereby preserving, as we sharing, an element of their Indian culture and heritage. An often over-looked component directly linked to tourism's employment, is the freedom for those previously forced to rely on government services and allowing for the provision to now be financially independent. As studied in class, those who are unable to provide for themselves, must be sustained through government subsidies (referred to as government transfers in the SAM), and are not considered as part of the available pool of labor in creating products and services. This, by the SAM definition, places them outside of institutions, neither contributing to inflows labor or outflows of capital for production activities. Education and training is a key component that could offset those relying on these governments transfers and enable them to actively participate in the money flows from institutions to factors of productions. Today, Indian societies now have many educational and vocational training programs set up, schools that have been established, and educational scholarships have being offered; all as result from revenues received from gaming. Education and training, in essence, lead to higher employability of younger generations to break the cycle of



government dependence. As illustrated above, the tourism industry, specifically the gaming sector has helped secure a higher quality of life for Indian societies.

In other areas of the world, as well, these conditions not only prevail, but affect many more individuals. Developing countries, such as those within Africa, India, China, Ethiopia, and Bangladesh, struggle to find the balance for those living in despair for those with little to no education or training, no employment opportunities, no means of supporting themselves or their families, and little hope of living a lifestyle that every human being deserves. In fact, one article stated that there currently exist over 49 least developed countries (LDC), many of which have abundant natural resources, but few industries outside of tourism, to sustain their residents' employability. Especially for those nations with high unemployment but yet natural resources, tourism is the answer, and has helped, to varying degrees, provide solutions to poverty alleviation. In Cuba, a nation ridden with stringent communistic political unrest and high unemployment, tourism has become one of the main industries by which individuals are able to provide employment options for their livelihoods. Although they are a socialistic country and condone practices of unregulated haciendas (homes with restaurants) and prostitution, it provides much needed monies to residents for basic staples. Unable to generate much revenue within the country, Cuba must depend on international tourists to support one of its only exports, tourism. As with many island nations, especially those in the Caribbean, tourism provides the livelihood for many of its residents. As brought out in class discussions, Aruba is another good example of an island nation heavily dependant on tourism as its main export. Numerous beautiful beaches, inexpensive goods, and comfortable temperatures, Aruba offers much to those traveling from other countries. On the other hand, however, Aruba must rely on many imports to support its overall economy. While some may argue to the point that cruise ships do not have the economic impact stated in executive reports, cruise passenger spending does contribute to the islands economic inflows from goods and services. The fact that island countries, such as Puerto Rico and Aruba, provide educational support to aspiring tourism scholars and leaders in programs such as that offered by Rosen College shows their dedication to encouraging tourism growth, leadership, and advanced education. Tourism continues to be a vital industry that stimulates employment, production of additional goods and services, and bring dollars of inflows for economic rejuvenation. While there exists a fine line between environmental and economic balances, tourism should benefit the mass amount of people, especially those living in deplorable conditions.

As I mentioned in one of our classes, poverty is everyone's problem, but yet no one's problem. Tourism is one mechanism that can be instituted for the betterment of many, yet, so often is under-utilized due to political ignorance or greed. The importance of tourism on a world-wide basis is evidenced by the presence of the World Tourism Organization (WTO), governmental agencies, and others set on working in a collaborative effort to alleviate poverty through employment and educational opportunities created from the tourism industry. Tourism's impact can be felt at the local level, such as the example of Orlando, at the societal level, as with the case of the Indian nations, and on a much larger scale, within countries comprised of many natural resources and high unemployment. At the highest level, the macro-economic pinnacle, tourism helps to provide employment, which ensures the purchase of goods and services and flows of economic resources back into the system. It is not only the responsibility of politicians, economists, or hospitality leaders and scholars to highlight the importance of tourism, it is also the responsibility of each and every one of us to rid these inequities,



be cognizant of those with greater needs, and most importantly, help stimulate economic growth of tourism throughout the world. As students, we are tasked with the challenge of reaching out to understand how various theoretical and economical models affect the very existence of tourism, the very existence of our planet, and pull together with those influential leaders and politicians who understand the very necessity of our mission. With courses, such as tourism industry analysis, new concepts/models are presented, such as SAM and TSA, that will assist in further development of our industry.

Box 6-9 Answer for final exam essay questions for student 9

Much of Africa is plagued with poverty problem. Much of this poverty is created through a lack of jobs within the countries and individual communities. For example, in Madagascar 63% of the population lives on less than \$1.00 a day. In 2000, developing countries, such as Madagascar, saw up to 42% of the global tourists visit their communities. One way tourism can help to alleviate this is through pro-poor tourism, which is tourism that generates net benefits for the poor. A contributing factor to Madagascar's high poverty rate is the fact that the country is a relatively small island. Since it is an island they are much more restricted with the amount and size of factories they would be able to build in order to create a manufacturing sector and export goods to other countries. Traditionally, manufacturing is a very common industry. However, in small island countries, including Aruba and the Maldives, the sheer size of the country prohibits any major activity in this industry. Not only are these countries unable to build large factories, they are also unable to export goods in enough quantity to make a positive impact on the economy. Tourism provides these small island countries an opportunity to develop an industry in which the consumer comes to the country, spends money and then leaves. The tourism industry requires that the consumer come to the product, where in other industries the product has to come to the consumer. In addition, the citizens of these developing nations are easily able to find jobs within the Tourism industry. The tourism industry has very low barriers of entry for potential workers and provides an employment opportunity for a very diverse group of people. Most people are not required to have any significant skills or education to find an entry level job. It is also easy for many people in poor nations to start up their own small business. When tourists come to poor or developing nations, they often want to buy things that are authentic or made by locals. As a result, it is very easy for locals to sell their goods, such as pottery or blankets, to tourists. The employment of these poor people, who many not otherwise have a way to earn money, are then able to put their wages back into the community by purchasing things like food, clothing and shelter. An effective way to show people how tourism can help stimulate the economy of poor or developing countries around the world is by showing them how industries interact with each other. This can easily be seen by creating an input/output table. This table will show how each industry in the economy uses other industries to create their products and services. It also shows how each industry contributes to the other industries within the nation in the same way. The development of tourism in poor countries



will help to stimulate other, seemingly unrelated, industries. For example, when the tourist comes to Madagascar and stays at a hotel, they are very likely to want something to eat. Since this is a small, developing country, this need of the tourist will help to create a need within the agriculture sector. The more people that visit the country and want to eat the local food, the more food the agriculture industry will have to produce. In return, the agriculture sector will be able to see much more of their goods than before and also hire more locals to produce more products in a timely fashion. The SAM model also provides a way to see how the tourism industry will affect these nations. This model looks at how production activities (the input/output table), factors (labor and capital) and institutions (households, firms and government) interact with each other. For example, the production activities provides to the households goods and services for final demand, the households in return provide the production activities with money. This model can show how people who work within the tourism industry can earn money and in return spend the money in the local economy. Tourism has many benefits for poor and developing countries around the world. It provides them with an opportunity to bring the consumer to the nation without having to actually export any goods. Tourism provides jobs for those who are unskilled or educated and many are not otherwise employable. The effect this industry has on other sectors also helps to create a need for more products and services, which in turn creates additional jobs in other industries.

Box 6-10 Answer for final exam essay questions for student 10

One of the problems facing the United States at this current time is the decrease in international travel to the United States since 2001. According to an article by the Associated Press on July 6th of this year, international travel globally has increased, but international travel to the United States has decreased. Senator Byron Dorgan, a democrat, is now trying to pass a bill to help promote international tourism within the US. This problem is very relevant to what we have studied in this class because it brings up the four things that need to be reviewed by the senate when this bill gets presented: the strength of the US economy (input, output), the social accounting matrix, the tourism satellite account of the country, and an impact analysis of how this bill will effect the economy. These items needed for the presentation will show how the tourism industry will assist in bringing back a more boisterous tourism economy through promotion of the United States international tourism market. The first data that this senator would need to gain and analyze is the input, output model of the US economy. This model will show the strengths of the United States economy based on specific industries selected in the early 1900s. This data can be used to compare and contrast economic strength from country to country and it also shows the interdependency the industries have on each other in our economy. He would explain that the model is used to show how much money each industry is spending on needed goods and what each industry utilizes the most by other industries in the country. This relationship will come up again later in his presentation of how all of the industries are interrelated.

The second data he would need to present would be the social accounting matrix. The purpose of this model is show how the increase of the international tourism market can create more jobs,



which in turn creates a more sustainable economy. If he could show the senate how much the tourism industry is reliant on the international travelers to the country in numbers of jobs, by showing the difference in the tourism job market between 2001 and now, it would present a solid argument of why promoting international tourism would be imperative to the economy. In this presentation to the senate, the senator should also reflect on the fact that because tourism is a service industry, it does not require any hard materials to be exported. For example, if an international person bought a US car, in exchange for their money being received in the US, the US Company would then export the car to the person. However, if an international traveler purchases a hotel stay in the US, the tourism company does not export any material goods to the traveler. So when the international travelers come to America to spend their money, nothing leaves the country. Because of this, tourism increases jobs because of the domestic services needed are in the local market and the money that the international traveler spends stays in our economy helping boost domestic job need and salaries.

The third piece of data he would need to present is the tourism satellite account. From the input output model, the senator would need to siphon all the industry data from the input, output model that creates the tourism satellite account, such as hotel and lodging or eating and drinking. Since tourism satellite account is used to measure economic activity undertaken by only a subset of visitors and involving only tourism demand, this more specified model will show exact amounts of commodities that have been adversely impacted by the international tourism decrease. Again this data will help support the senator's persuasion that the promotion of international tourism bill is the right thing to pass to help increase the sale of tourism commodities.

The last part of the senator's presentation should be the impact study. This should show the effect of the bill and how that will increase the economic stability and how the increase in international tourism will effect other industries who are also reliant on the tourism industry as a by product. For example, if the international tourism promotion bill passes, and the international travelers increase substantially over the next five years, it will lead to an increase in revenue and demand for the tourism industry within the US. This increase of revenue and demand will increase jobs needed to help sustain the demand and increase business to business demand in the US. The increase in jobs will help local households or institutions provide better lives for their families and in turn they will have more expendable income to use in other industries in America. That expendable income could help bolster the other industries as well creating a trickle boosting effect in our economy. With these numbers presented to the senate that not only show how the tourism industry will benefit but also how that will in turn positively affect other industries in our economy, I'm sure that the senators would be persuaded to vote positively for investing in the international travel promotion bill. And if not, they would at least have as much quantifiable information needed to make an educated decision on what would be best for our economy as a whole. That being said, I would suggest that the senator end his presentation with some facts regarding the current situation. Such as, according to the Associated Press article, the United States has lost 200 000 jobs since 2001 and over \$100 billion dollars was lost in visitor spending because of the decrease of international travel to the US. With data like that, the senators hopefully will listen to Senator Byron Dorgan's bill and give thought to how promoting international tourism travel will not only help the country's economy, but more specifically how this bill could create more opportunities for their constituents, who are the ones who voted for the senators in the first place.



Box 6-11 Answer for final exam essay questions for student 11

Though Tourism industry was not a sector in any of I-O/SAM, or TSA model, it still has huge economic impact to a nation. According to one of the articles (*Pro-poor Tourism: Harnessing the World's Largest Industry for the World's Poor*) that we read this industry is one of the largest industries in this world and it was estimated contributing 11% of GDP and transporting around 700 million international travellers every year. It seems this industry is so big, we should be able to use it as a very powerful tool to help or change certain groups/people/areas, pro-poor tourism has been created and its purpose was to growth which benefits the poor, but after the policies were made or implement, those groups/people/areas did not receive the benefits, the money generates from Tourism were not going back to the areas where the money should go, instead the money went to only the top level. The good examples would be Indian Gambling and also the Eco-Tourism. As the articles that we had in the classes about the Indian Gambling, US governments has tried a lot of ways to help Indian people's economic situation. The most 'benefiting' one and the most well known one is creating the Indian Gambling. The article, 'The Economic Impact of Indian Gaming', provides numbers saying how much money going into education, creating numerous job opportunities, and huge increase on revenues etc. but does that money really go to those people's pockets? The definition of pro-poor tourism (PPT) is 'tourism that generates net benefits for the poor'. The benefits could be social, environmental, or cultural. If the government is using PPT and trying to help Indian people, why most Indian people still remains in poor in the US society? How much does gambling benefits the poor Indian people directly? And does this really help any of their social status or culture? These Indian people indeed, as the SAM model, they put their 'labor' and 'capital' into the market, because if they are not involved in the triangle-game (SAM: production activities, institutions, and factors), they will never have the chance to change their situation. However, look back, though government creates this policy looks so wonderful, most Indians remain on the same level in the social economic status. As we discussed in the class, the Indian Gambling seems only benefits the very top Indian people who have the 'power' and made the policies. Another one would be the eco-tourism (Kenya Zoo and Tribe) video that we watched in the 2nd week. The animals were bothered by the tourists, the natural environment was destroyed, the pollution and garbage, the tour buses drove anyways they want in order to please the tourists and they're able to take more pictures of the animals etc. Kenya government does generate the admission fee from tourists entering the zoo, however, as the video indicated that this zoo is getting worse is because the government did not put any money down to maintain the zoo or has any regulation/policy for it. The money goes to government's pocket, either never comes out again or the government uses it in other aspects. Orlando City and Orange Country have just passed the downtown venue project, using the tourism tax to other aspects, isn't it the same thing as the Kenyan government doing? We should put the money to that area where it generates from. From what I learned in this class, I think the major problem is not only the 'political muscle' issue but also the policy makers do not really using SAM to exam their policies or maybe they are not aware of this. Government should have exam their every possibility in order to choose the best one to benefits the area or people or whichever part they would like to benefit. Because each policy would affect different level of people (just as HW 2 the 5 policy that have different effects on each income level),



and each city/nation has different backgrounds, so if they just do what they 'think' would benefit the most, the result may not be any better than before and it could be worse, Rich is richer and poor will be poorer. I think have people aware of SAM and TSA is crucial, so that people can really understand the economic impacts that tourism industry has made to this country and also have people know how to utilize models such as SAM to examine the government's policies. I think tourism industry still has its power to change or help poor people/developing country etc., but the policy maker is the key. Maybe the leading tourism organization such as WTO can have certain agreement to either 'watch' or help the developing countries or 3rd world countries, of course, directly to those people who need help not through the government's hands again.

6.2 Modeling environmental effect of industrial activities

Another field of importance would be to quantify the impact of environmental effects of each industry, including tourism as an industry. Unfortunately, the default setting of each industrial sector is that increase in its output would cause increase in production of unwanted byproducts, which may be attributed to broader social problems such as global warming and change in climates. We, those working in the hospitality and tourism sectors, hope that tourism industry is not contributing more harm than other industrial sectors do, but we never know it unless we compare tourism as an industry with other industrial sectors squarely in each nation/region's cases.

Movement of goods and services requires predominantly fossil fuels, and accepting that basic structural constraints mean that we should not promote unnecessary movements of goods and services, however this is what we study and promote, i.e. tourism. Would it be possible for us to reverse the trend such that more consumption of tourism commodities by visitors would not lead to increase in production of carbon dioxide, industrial waste, and effluent?

Logically there can be three stages of environmental impact studies of tourism commodities. There should be first advocating processes of slowing down the production of those byproducts, second, stopping the production of unwanted byproducts, and third reversing the trend to create and promote certain tourism commodities whose increase in consumption by visitors would indeed lead to decrease in (clean up of) the existing byproducts. Such conceptual framework is shown in Figure 6-9.

If we set the consumption of tourism commodities and the amount of unwanted byproducts in x and y axis, respectively, the first stage is to reduce the positive slope of the line by introducing tourism commodities with more efficient (less) usage of energy (i.e. less production of unwanted byproducts).

The second stage is to identify/develop a combination of tourism commodities whose consumption does not generate any unwanted byproducts. This will be a minor feat, as the increase in consumption of tourism commodities will not cause an increase in unwanted

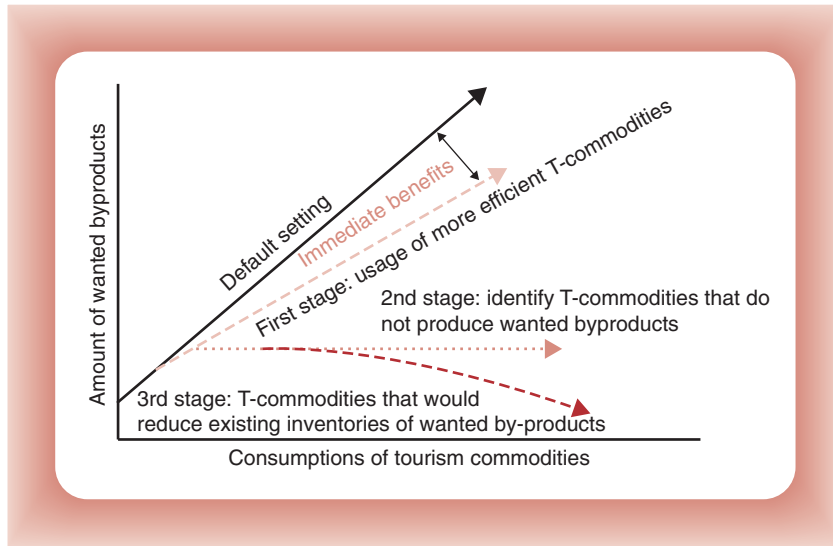


Figure 6-9 Three-stage environmental impact studies of tourism commodities: conceptual framework. Note: T-commodities, tourism commodities. Source: Author.

byproducts. Volume of consumption will become independent of generation of unwanted byproducts.

The third stage is to identify/develop a combination of tourism commodities that not only eliminate the positive slope but also turn the slope into a negative slope. In this case, the consumption of the specific combination of tourism commodities will help reduce the existing inventories of unwanted byproducts, helping the nation to achieve the goals pledged in Kyoto as the Kyoto Protocol signed in December 1997 and became effective in February 2005, to reduce the greenhouse effect under the United Nations Framework Convention on Climate Change (for full documents, please refer to <http://unfccc.int/resource/docs/convkp/kpeng.html>, last accessed 10 February 2008).

It would be beneficial to frame the analysis in a way that relative comparison of environmental costs and economical benefits are measured quantitatively. However, it should be noted that there are still mixed opinions and views about greenhouse effects and global warming discussions even among scholars in those fields.

6.2.1 Quantitative analysis of environmental impacts

While there are growing numbers of people advocating the correct attitudes about sustainability of development and eco-tourism, unless we are able to quantify them, it will be more difficult for the projects to get proper funding. Banks tend to finance on numbers, not on attitudes. Investors will invest on numbers and not solely on principle of morale without hard figures. Even though the concept of the Triple Bottom Line (financial, social, and

**Table 6-19** Basic structure of economic–ecologic models.

	Industries	Ecologic processes
Industries	Flows between economic sectors	Flows from the industry to ecosystem
Ecologic processes	Flows from the ecosystem to industry	Flows within the ecosystem

Source: Quoted by the author based on Isard, 1968, quoted in Miller and Blair, 1985.

environmental net figures after consideration for overall costs and benefits for the study region) has been advocated, banks and investors would prefer to see all the bottom lines shown in hard figures. So how do we represent environmental issues in hard figures?

It is important for researchers to have more than one tool available in the research toolbox. Time-series based or multivariate regression modeling would surely be useful to analyze the recent surge of various indicators on environment and climate in a historical perspective. That would help us identify the problems and perhaps indicate causes for such problems.

Leontief quantified such structure in *Environmental repercussions and the economic structure: an input-output approach* as early as 1970. Isard published a paper *On the linkage of socio-economic and ecological system* in 1968. Basic structure of his economic–ecologic models can be presented as 2×2 matrix structure, consisting of industries and ecologic processes (Table 6-19).

Just as we captured the activities of household, trades by expanding from the pure interindustry transactions table, we will expand the framework to incorporate activities in environmental areas. This is another reason for reviewing the importance of the I-O/SAM structure for emerging topics such as quantification of environmental effects.

6.2.2 Tourism satellite account and environmental impact simulations

Since the TSA is based on the I-O/SAM structure, incorporation of detailed measurement of each tourism-affiliated industry will lead you to highly disaggregated environmental impact analysis of various tourism commodities consumption by visitors. Given different tourism commodity consumption patterns by different segment of visitors, you may quantify that the similar duration of trips to the same destination may leave different environmental footprints. At this level of research in which you use TSA data for impact analyses, it is impossible to use TSA without a basic knowledge of how I-O works for impact analyses. One recent good example would be Jones (2007).

6.2.2.1 Shinkansen and airplane

One intriguing example would be found in Japan. When you move between Tokyo, the capital city, and Osaka, the second largest city in Japan, people tend to have two choices. One is to take air-service and the other is to take the Shinkansen (bullet train) system. The former



Figure 6-10 Visitors to a patting farm in Kissimmee, Osceola County, FL.
Source: Photograph taken by author, 2006. (Plate 13)

Japan National Railway developed the service in 1964, running at 210 km/hour (130 miles/hour). Currently it runs at 300 km/hour, and it takes 2 hours and 30 minutes to travel 552 km (345 miles) even though it stops at Nagoya and Kyoto. While the Shinkansen is not the fastest regular train in the world in terms of speed, as the French TGV (train à grande vitesse (high-speed train)) runs at the respectful speed of 320 km/hour, the Shinkansen is unique as the only high-speed mass transit system that carried over 4 billion passengers up to its fortieth anniversary in 2004. Shinkansen's history has seen no fatal accidents to date in any of the privatized railway companies (JR East, Central, West, and Kyusyu have Shinkansen system) with the exception of rare suicides.

According to JR-Central's data, a passenger from Tokyo to Osaka on Shinkansen generates 4.8 kg of carbon dioxide, while a passenger on the B777-200 airplane from Haneda (Tokyo) to Itami (Osaka) generates 48 kg of carbon dioxide. When a visitor moves from A to B, he/she generates carbon dioxide, no matter which mode of transport is chosen. In that regard, tourism still has a vector toward the generation of unwanted byproducts, or the positive slope in Figure 6-8. Choice of transportation mode, however, would decrease the impact of environmental footprints, such as for the case of Shinkansen over airplanes, by 90%.

Even among the airplanes, there is scope to reduce the carbon footprint. According to KLM webpage, the energy efficiency for B777-300 is 37% better than for the B747-200 (http://www.cdproject.net/responses/Air_France_Klm_Corporate_GHG_Emissions_Response_CDP5_2007/public.htm, last accessed 10 February 2008).

Automobiles are the most popular mode of transportation in a nation such as the US (Okubo, 2007). A hybrid car can reduce the carbon emissions considerably according to data from the US Environmental Protection Agency (e.g. the Toyoda Prius is quoted as the car with



Figure 6-11 Visitors and nonvisitors together walk together through the pedestrian precinct of Zenkoji-Temple, Nagano, Japan.

Source: Photograph taken by author, June 2007. (Plate 14)

the best consumption running 46 miles/gallon, with 4 tons of annual gas emission), and if the visitor segment insisted on using these cars, their environmental footprint would be considerably smaller than other segments.

Each tourism commodity's consumption generates different quantities of byproducts and each visitor segment will generate different environmental footprints due to different consumption patterns (i.e. tourism commodity's consumption expressed as final demand column vector would be different from one customer segment to another). Combined with knowledge on pioneering research on environmental I-O structures, researchers of the TSA may be able to contribute to the higher cause of the society, beyond a subject of tourism as a fun, pleasure, leisure topic to study.

6.3 Summary

This chapter presents unstructured expressions of future possibilities for tourism as an industry that would enable it to play similar roles as other traditional industries have, i.e. have a positive effect on human life and lead to improvement of our present activities to enable harmony and co-existence with others, and of particular importance, with the Earth.

6.4 Chapter 6 problems

Q6-1 If you are the leader of a nation/region, how would explain to your people the economic power of tourism as an industry? Unless you do a good job, people will continue



to think that tourism cannot be a serious industry, as they think it is too much of fun, pleasure, and leisure topic.

Q6-2 Among the conflicting regions of the current world, pick up one regional conflict and check if one of the involved parties (race, ethnic, or religious group) has less than \$5000 of GDP per capita per year (you can check with *CIA World Factbook*:<https://www.cia.gov/library/publications/the-world-factbook/index.html>, last accessed 10 February 2008). Do you think regional/national poverty have anything to do with the conflict? Propose an idea to mitigate poverty situation in the region/nation.

Q6-3 (1) First, study the Kyoto Protocol (<http://unfccc.int/resource/docs/convkp/kpeng.html>, last accessed 10 February 2008).

What do you counter-argue to a person who claims that tourism activities are polluting the environment and thus should be discouraged?

(2) Do companies (at least, the stock listed public hospitality- and tourism-related companies) talk about environment? Check the corporate reports (internet-based or annual reports) of the following global companies.

1. Hilton Hotels Corporation (http://hiltonworldwide1.hilton.com/en_US/ww/business/about.do, last accessed 10 February 2008).
2. McDonald Corp (Europe) (<http://www.refrigerantsnaturally.com>, last accessed 10 February 2008).
3. Japan Air Lines (<http://www.jal.com/en/environment/>, last accessed 10 February 2008).
4. Marriott (<http://www.marriott.com/marriott.mi?page=environmentalInitiatives>, last accessed 10 February 2008).

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Abbreviations

BEA	Bureau of Economic Analysis
CES	Consumer Expenditure Survey
CGE	computable general equilibrium
CVB	Convention and Visitors Bureau
GDP	gross domestic product
GNP	gross national product
I-matrix	Identity matrix
I-O	input-output
IRIO	inter-regional input-output
LDC	least developed countries
MPC	marginal propensity to consume
MPI	marginal propensity to import
MPS	marginal propensity to save
MRIO	multiregional input-output
NAICS	North American Industrial Classification System
NIGA	National Indian Gaming Association (US)
OECD	Organisation for Economic Co-operation and Development
OEF	Oxford Economic Forecasting
PCE	personal consumption expenditures
PhD	Doctor of philosophy
PPT	Pro-poor tourism
ROI	return on investment
RoW	rest of the world
RPC	regional purchase coefficient
RSAI	Regional Science Association International
SAM	social accounting matrix
SIC	Standard Industrial Code
TSA	tourism satellite account
TTSA	travel and tourism satellite account (US)
UAE	United Arab Emirates
UNICEF	United Nations Children's Fund
USSR	Union of Soviet Socialist Republics
WTO	World Tourism Organization
WTTC	World Travel & Tourism Council

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Plate 1 (Figure 3-1 on page 41)



Plate 2 (Figure 4-2 on page 119)



Plate 3 (Figure 5-4 on page 155)



Plate 4 (Figure 5-5 on page 164)



Plate 5 (Figure 5-13 on page 193)



Plate 6 (Figure 5-14 on page 197)



Plate 7 (Figure 6-1 on page 207)



Plate 8 (Figure 6-4 on page 214)



Plate 9 (Figure 6-5 on page 220)



Plate 10 (Figure 6-6 on page 221)



Plate 11 (Figure 6-7 on page 223)



Plate 12 (Figure 6-8 on page 223)



Plate 13 (Figure 6-10 on page 245)



Plate 14 (Figure 6-11 on page 246)