Evaluating short-term tourism economic impacts: Factors to consider under an Input-Output Model

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About myself

> Education

Ph.D., Department of Park, Recreation and Tourism Management at Michigan State University, USA

> Research area: Input-Output Analysis

- US National Park Service
- Taiwan National Tourism Policy “Doubling tourists arrivals plan”, “China-Taiwan ferry-cruise tourism policy”
- Mega sport event: 2009 World Games
Evaluating short-term tourism economic impacts: Factors to consider under an Input-Output Model

1. Introduction
   - Assumptions of Input-Output model
   - Characteristic of short-term events

2. Factors to consider for using an Input-Output model
   - Capacity utilization
   - Empirical data of Taiwan lodging sector

3. Case study: 2009 World Games
   - IO results
   - Business surveys

4. Conclusion
   - Recommendations
Input-Output Analysis

> Input-Output analysis (IO) is a frequently adopted method to address the regional economy-wide impacts by looking at direct, indirect and induced effects of tourism applications.

> Total impacts = demand changes * multipliers
  = (I-A)^{-1}Y = BY

Where (I-A)^{-1} or B matrix is the Leontief Inverse Matrix
Y is the final demand change

> Required parameters of an IO model are
  - Type I & type II multipliers
  - Economic ratios: jobs to sales ratio, personal income to sales ratio, value added to sales ratio
Standard assumptions of IO model

1. The output of each sector is produced with a unique set of inputs
2. The amount of input required is solely determined by the level of output
3. There are no capacity constraints in the production process

Implying⇒

- Constant IO technical coefficients
- Constant economic ratios: jobs to sales ratio, income to sales ratio, value added to sales ratio
- Constant price
- No technological changes
- No input substitution

\[ \Delta \text{Total jobs} = \Delta \text{visitor spending} \times \text{jobs to sales ratio} \times \text{sales multipliers} \]
# Tourism IO model

## Scenario A
1. Final demand of $10 million dollars on the lodging sector for Grand Canaria Island
2. Grand Canaria IO table
3. $10 million dollars were injected within a year

## Scenario B
1. Final demand of $10 million dollars on the lodging sector for Grand Canaria Island
2. Grand Canaria IO table
3. $10 million dollars were injected within a month during a mega sport event

Same economic impact results based on the IO model, but will they have the same impacts on the economy??
Evaluation of short-term tourism demand fluctuation

To accurately portrait the economic impacts for a short-term demand fluctuation, it rests on the resemblances between IO technical coefficients and a short-run production function of the business sectors (Porter & Fletcher, 2008).

- Tourism events: sporting events, festivals
- Tourism crisis: natural disasters, pandemic, or social instability

- Commonality
  - Short-term,
  - A dramatic demand peak or contraction
  - irregular or unexpected
Capacity utilization (CU) (Sun, 2007)

Capacity utilization rate (CU) = \frac{\text{sold units (services)}}{\text{total capacity}}

> Economies of utilization: the percentage change in output by one percent increase in all variable input by holding capital fixed
> Price adjustment
> Substitution between labor and capital inputs
> Capacity constraint from the regional suppliers (Import propensity adjustment)

(Chen & Soo, 2007; Lin & Liu, 2000; Perez-Rodriguez & Acosta-Gonzalez, 2007)
Input-output coefficients & CU

When capacity utilization changes, then

\[ \alpha_{ij} = \frac{\text{input material purchased from the sector } i}{\text{final sales of the sector } j} = \frac{\text{physical input } i \times \text{ price } i}{\text{physical output } j \times \text{ price } j} \]

- Price adjustment
- Wage adjustment

Economies of utilization
Changes in import propensity
Some observations in Taiwan (Sun, 2010)

A panel data set

- Subject: International tourist hotels (5-star equivalent)
- Contents: Yearly financial information
- Time: 2000-2008
- Number of units: 46 hotels (414 cases)
- Independent variables: occupancy rate (proxy for CU)

Dependent variables

1. **Intermediate input to sales ratio**: food, laundry, maintenance, utility, insurance, rent, promotion, and other items
2. **Primary input to sales ratio**: employee benefits, business profit and deprecation
3. **Room price**
Results - Descriptive

Intermediate input  0.483
 Employee compensation  0.335
 Depreciation  0.100
 Profit  0.081

Laundry cost  0.005
 Promotion  0.011
 Insurance  0.013
 Maintenance  0.019
 Rent  0.034
 Utility  0.044
 Other expenses  0.178
 Food cost  0.179

Avg. occupancy rate :  65%
Avg. room number : 314 per entity
Avg. room rate : NT$ 2,896 (US$ 91)
Avg. employee number : 336 staff per entity
## Results - Estimation by occupancy rates

<table>
<thead>
<tr>
<th></th>
<th>Occupancy rate</th>
<th>Difference from 65% to 75%</th>
<th>Pct change from 65% to 75%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55%</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td><strong>Intermediate input to sales ratio</strong></td>
<td>0.493</td>
<td>0.483</td>
<td>0.473</td>
</tr>
<tr>
<td><strong>Food cost to sales ratio</strong></td>
<td>0.188</td>
<td>0.179</td>
<td>0.170</td>
</tr>
<tr>
<td><strong>Utility cost to sales ratio</strong></td>
<td>0.047</td>
<td>0.040</td>
<td>0.034</td>
</tr>
<tr>
<td><strong>Insurance to sales ratio</strong></td>
<td>0.015</td>
<td>0.013</td>
<td>0.011</td>
</tr>
<tr>
<td><strong>Primary input to sales ratio</strong></td>
<td>0.507</td>
<td>0.517</td>
<td>0.527</td>
</tr>
<tr>
<td><strong>Income to sales ratio</strong></td>
<td>0.369</td>
<td>0.335</td>
<td>0.301</td>
</tr>
<tr>
<td><strong>Profit to sales ratio</strong></td>
<td>0.025</td>
<td>0.082</td>
<td>0.139</td>
</tr>
<tr>
<td><strong>Depreciation to sales ratio</strong></td>
<td>0.126</td>
<td>0.119</td>
<td>0.111</td>
</tr>
<tr>
<td><strong>Average room price</strong></td>
<td>$2,849</td>
<td>$2,896</td>
<td>$2,944</td>
</tr>
</tbody>
</table>
Hotel data summary

> When occupancy rate increases from 65% to 75% among Taiwan Tourism Hotels
  - Intermediate input coefficient decreases by 2%
  - Primary input coefficient increase by 2%
  - Income to sales ratio decrease by 10%
  - Profit to sales ratio increase by 70%
  - Jobs to sales ratio decrease by 15%

⇒ Type I sales multipliers should remain very stable
⇒ Type I jobs multipliers, type I income multipliers are inflated

Yearly nationwide data
Monthly nationwide data
IO & short-term tourism demand fluctuation

<table>
<thead>
<tr>
<th>From the standard IO model</th>
<th>Type I sales multipliers</th>
<th>Type II sales multipliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism events</td>
<td>Slight overestimated results</td>
<td>Substantially overestimated results</td>
</tr>
<tr>
<td>Tourism crisis</td>
<td>Slight underestimated results</td>
<td>Substantially underestimated results</td>
</tr>
</tbody>
</table>
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World Games 2009
The first international major sport event in Taiwan

- Host city: Kaohsiung City, Taiwan
- Date: July 16-26, 2009
- Competition categories: 26 official non-Olympic sports and 5 performance activities
- World Games participants: 5,994 (athletes, coaches, VIP's & media)
- World Games stadium and operation budget: US$224 million
- Tourism promotion budget: US$30 million in 2008 and 2009 for World Games and DeafOlympic
Approaches

1. IO study
   Conduct visitor survey + Regionalize national IO table

2. Secondary information
   Governmental business surveys on hotels

3. Hotel business interviews
   Interview 5 international tourist hotels and 15 small-scale hotels

Economic impacts of World Games
## 1. Standard IO estimates

<table>
<thead>
<tr>
<th>Visitor types</th>
<th>Resident</th>
<th>Domestic visitors</th>
<th>International visitors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day</td>
<td>hotel</td>
<td>VFR</td>
</tr>
<tr>
<td>Avg. tickets per party</td>
<td>6.8</td>
<td>5.4</td>
<td>5.4</td>
<td>6.3</td>
</tr>
<tr>
<td>LOS (nights)</td>
<td></td>
<td>1.9</td>
<td>2.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Party trips (000’s)</td>
<td>27.5</td>
<td>12.4</td>
<td>3.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Pct of party trips</td>
<td>57%</td>
<td>26%</td>
<td>8%</td>
<td>7%</td>
</tr>
<tr>
<td>Per party trip spending (NT$)</td>
<td>$3,147</td>
<td>$4,108</td>
<td>$18,499</td>
<td>$5,668</td>
</tr>
<tr>
<td>Per party trip spending (US$)</td>
<td>$98</td>
<td>$128</td>
<td>$578</td>
<td>$177</td>
</tr>
<tr>
<td>Total spending (US$ million's)</td>
<td>$2.7</td>
<td>$1.6</td>
<td>$2.3</td>
<td>$0.6</td>
</tr>
<tr>
<td>Pct</td>
<td>31%</td>
<td>18%</td>
<td>26%</td>
<td>7%</td>
</tr>
</tbody>
</table>
1. Standard IO estimates

Direct effects:
Sales: $5.33 million
Jobs: 140
Personal income: $1.94 million
Profit: $0.68 million
Tax: $0.09 million
Value added: $3.15 million

Type I sales multipliers = 1.302
Type I jobs to MM sales = 33.561
Type I income multiplier = 0.435
Type I profit multipliers = 0.184
2. Business interviews

Positive comments

> The transforming of city imagine
> The marketing of city brand name
> Constituency support with a confidence on the local government
Hotel managers interview

Negative feedbacks

1. Sales volume: Fifteen hotels (75%) indicated that the room sales during WG were lower than expected.

2. Employment: No full-time position was created, and very limited additional personal income was provided.

3. After-event effect: None, except one hotel manager, claimed that the hosting of World Games generated consistent tourist demand.
3. Secondary data – occupancy rate

- Nationwide tourism hotels
- KHH tourism hotels

- World Games
Room price and hotel revenue of July is 14% and 2% above the yearly average, respectively.
The jobs to sales ratio of July is 16% below the yearly average.
Total personal income is 2% above and the income to sales ratio is 10% below that average of May to December 2009.
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Conclusion

- Standard IO results may not accurately reflect the reality because the resemblances between a long-run IO technical coefficients and a short-run production function of the business sectors are not sustained.
  - Technical coefficients should be relatively stable.
  - The value added component (jobs to sales ratio, personal income to sales ratio, and profit to sales ratio) has greater variation.

- Capacity utilization can be adopted as a factor in explaining the differences of production function in the service industries as it reflects changes in the rate of investment, labor productivity, and price of services.
Conclusion

Endogenize capacity utilization to the IO model however is very challenging due to

- The concept of capacity utilization is not well defined in many service sectors, besides the lodging, transportation, and some entertainment subsectors.
- Lack of secondary data from the government statistics, especially for a short-period of time.
- Difficult to obtain cooperation from the business sectors due to confidentiality.
Conclusion

Suggestions for evaluating economic impacts of short-term tourism events or crisis using IO model

1. Acknowledge the estimation bias on income, jobs, profit, and value added
2. Obtain information from the supply side
3. Adopt a wide-spectrum of indicators
The incomplete picture of the economic impact analysis

Estimates of sales, jobs, personal income, tax, value added

$5.33 million in sales; 140 jobs; $1.94 million in personal income; $0.09 million in tax
Demand side indicators

1. **Importance of the tourist revenue**
   - Percentage of tourists (non-local residence) among all spectators
   - Percentage of tourists that spend overnight in the region
   - Average spending ratio per capita between event tourists vs. non-event tourists
   - Length of stay for overnight tourists
   - Ratio between event admission fee and other expenditure

2. **Displacement & crowding out**
   - Consumer substitution: local residents may choose to leave or spend differently
   - Percentage of tourists whose primary trip purpose is to attend the event

3. **Future outlook**
   - Percent of tourists would like to visit the hosting area in the future
   - Percent of tourists that would recommended the hosting city to their friends and relatives
Supply side indicators

Supply side (in the example of accommodation)

- Percentage of room sales contributed by event attendances
- Number of full-time job generated
- Number of part-time job generated
- Additional employee benefits that are distributed
- The comparison of occupancy rate before, during and after the event
Future research

> What type of tourism events (or tourism crisis) will lead to permanent job creation (or lay-off) and real wage increase (decreases)?

- Larger demand change vs. Longer event period
  - 2009 World Games (11 days)
  - 2011 Taipei Flora Expo (6 months)

- One larger event vs. many small events
  - 2009 World Games
  - Culture & art festivals
References

Journal papers

Conference papers
Thank you for your listening. Any questions or comments?

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