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Sources of Variation in Economic Impact Multipliers

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Abstract

The conceptual arguments and empirical analyses in the article illustrate that when tourism organizations replicate economic impact analyses and/or compare their results with those reported by others, perceived differences often are specious because they are attributable to artifacts in multiplier measurement as well as to changes in the structure of host economies. Four sources of variation in multipliers that may result in specious comparisons are addressed: differences in specifications of the three main types of models used in economic impact analyses, semantic and definition confusion, changes in communities' economic structures, and calibration and decision rule changes.

Keywords

economic impact analyses, multipliers, specious comparisons, IMPLAN, SAM, tourism

There is widespread recognition among tourism professionals that when visitors inject new money into an economy it spreads like ripples in a pool after a stone has been thrown into it. The concept of the new money being spent and re-spent so its initial impact is multiplied is easy to grasp. However, measurement of the flows and magnitudes of the process is complex and often controversial. The earliest efforts to do this were pioneered by Archer (Archer and Owen 1971; Archer 1975, 1977, 1982) who observed, "There is perhaps more misunderstanding about multiplier analysis than almost any other aspect of tourism research" (1982, 236).

In the 1970s and 1980s, many studies in tourism used multipliers that had appeared in other published works, disregarding obvious differences in size of region, structure of economies, or types of activities (Archer and Owen 1971). The most common abuse was using multipliers derived from national studies at the regional or local level so their size was grossly exaggerated. Considerable progress has been made in developing models, techniques, and processes to measure these secondary expenditures in the three decades since Archer made his observation. Nevertheless, the level of misapplication and confusion that remains led the author of a guide on undertaking economic impact analyses to recommend:

> Given the complexities associated with multipliers, the wisest course of action is to focus economic impact efforts on obtaining a good estimate of visitor spending and not attempt to use multipliers. This will remove the high probability that the multipliers applied to the spending data will be flawed. (Crompton 2010, 37)

Notwithstanding this advice, the use of multipliers is likely to continue for two reasons. First, the concept of secondary expenditures is both rich and valid. It has powerful economic implications, it is intuitively appealing, and it is real. Thus, researchers are likely to respond to the challenge of seeking accurate measures of it.

The second stimulus sustaining the use of multipliers is perhaps more pragmatic and certainly less honorable. It is that they can be abusively applied to inflate visitor spending numbers without most target audiences for economic impact studies being aware of their misapplication.

The potential for malfeasance when undertaking economic impact analyses has long been recognized (Smith 1989; Crompton 1995). Because sponsors of these studies often are seeking to demonstrate the effectiveness of a public subsidy that their agencies, facilities, or events receive; justify relief from environmental regulation; or in the case of in-house tourism personnel, demonstrate the value of their work, there are strong pressures to report large visitor impacts to legitimize their position: "The temptation to engage in mischievous practices is substantial. In some cases the practices are the result of ignorance and are inadvertent, but too often they are deliberate and enacted with intent to mislead and distort" (Crompton 2006, 67).

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A review in this journal of these mischievous practices identified and discussed 10 of them (Crompton 2006). A recent article by the authors (Jeong, Crompton, and Dudensing 2015) extended this list by identifying, discussing, and empirically testing the potential for mischievous hyperbole of an additional eight procedures on estimates of economic impact. The data were derived from studies undertaken at nine state parks. The eight practices differed somewhat from the 10 listed in Crompton's earlier article (2006) in that those 10 are usually identifiable in reports of economic impact analyses. In contrast, the eight practices discussed in Jeong, Crompton, and Dudensing (2015) for the most part are "hidden." That is, they are internal process and procedural decisions made by researchers that most lay audiences are likely to consider esoteric, arcane, and mundane, and to view with disinterest. They are frequently invisible, because they are rarely mentioned in reports. Nevertheless, they have the potential to substantially distort visitors' expenditures and economic impact estimates.

After reporting the economic impacts of the nine state parks on their host counties, the commissioning agency requested the authors compare them with those reported in a study at the same parks a decade earlier in 2004 (Tomas and Crompton 2004) and with those reported by other parks and tourism attractions, and to offer explanations for the different results. The Jeong, Crompton, and Dudensing (2015) article on "hidden" procedures did not address issues related to multipliers. However, as we attempted to compare and reconcile results at the nine state parks with those reported by others, it became apparent that explaining differences in economic impacts required an understanding of why the secondary impacts of studies reported at ostensibly similar tourism attractions differed often by large amounts. A relatively cursory initial review of these studies indicated there were substantial differences in the multipliers used by analysts that were unlikely to be explained by differences in the size of local economies.

Subsequently, a more careful review revealed there were four challenges. First, there were inherent differences among models in the sources of their data, specifications, and procedures. Second, there was semantic and definitional confusion created either by giving the same names to a multiplier but using different operationalizations of it, or by giving different names to multipliers that were similarly defined. Third, the structure of host economies changed over time. Fourth, model calibrations and decision rules changed over time. All these challenges highlighted the dangers inherent in making comparisons among studies. These challenges morphed into the four objectives of this study:

1. To review differences in the construction and specifications of the main types of models used in economic impact analyses, which result in them generating different-sized multipliers.
2. To identify and empirically demonstrate the implications of inconsistent definitions and semantic terminology used to describe multipliers that are derived from the same type of model.
3. To identify and to empirically explore the implications for multipliers associated with changes in economies' structures.
4. To explore the influence of changes in model calibration and decision rules.

Multiplier Variations Attributable to the Types of Models used to Estimate Secondary Expenditures

In the tourism field, three different types of models have been used to estimate secondary expenditures: input–output, social accounting matrices, and computable general equilibrium models. The three different modeling approaches belong to the same family, but like apples, apricots, and artichokes they are different taxonomic genera and so will generate different-sized multipliers. Their different configurations, processes, data sources, and requirements inevitably lead to different estimates of secondary impacts that cannot meaningfully be compared. As Dwyer and Forsyth (2005) observed, "The type of model employed in impact assessment will determine the size of the multipliers and the estimates of changes in output, value added, and employment resulting from the holding of some special event" (352).

The most widely adopted tools for estimating secondary impacts are input–output (I-O) models. This approach was originally applied in a national context (Leontief 1936, 1937, 1941) but is now widely used at the regional and local levels. Until the 1990s, constructing I-O models was a laborious, complex, and expensive task undertaken by highly trained economists. This situation changed dramatically in the United States with the development and subsequent refinement of the RIMSII, REMI, and IMPLAN software packages.

Among these three options, RIMSII (Regional Input-Output Modeling System) maintained by the U.S. Department of Commerce, Bureau of Economic Analysis, is the simplest and least expensive. However, it is the least sophisticated. It is limited in that while it shows total economic impact, it does not give a breakdown of impacts by industry. Further, the analyst has to manually apply different sets of multipliers to determine indirect and induced impacts. In contrast, REMI (Regional Economic Modeling Inc.) is a complex dynamic, highly sophisticated model that layers econometric, computable general equilibrium (CGE) features, and New Economic Geography modeling techniques onto the basic input–output modeling and requires an extensive amount of data (Charney and Vest 2003; Steinback 2011). However, this makes explanation of the modeling process and its multipliers difficult, and it is many times more expensive than the RIMSII and IMPLAN alternatives. The limitations of these two models have resulted in IMPLAN (Impact Analysis for Planning) being the most widely used option in the United States because of its level of detail, user friendliness, accessibility, ease of interpretation, and relatively low cost.

There are two components of the IMPLAN system, the software and the databases. The software performs the calculations and the databases, which are updated annually, provide the basic information needed to create the IMPLAN input–output models. They provide information from 536 different industrial sectors, closely following the North American Industry Classification System and accounting conventions used by the U.S. Bureau of Economic Analysis. The databases incorporate comprehensive data for the entire United States. They are available in standard form at the county, state, and national levels and can also be customized and made available at the ZIP-code level. Thus, an input–output model can be defined for a section of a city, a single city, a single county, several counties, a state, a group of states, or the entire United States.

A detailed technical critique of I-O models is provided by Dwyer, Forsyth, and Dwyer (2010). The primary limitations associated with I-O models such as IMPLAN are as follows:

1. No allowance for slack in the local economy is made. The models assume the economy is fully stretched so visitor spending will result in additional jobs and income being generated. In reality, employees of many businesses may not be fully occupied, and increased spending does not require additional workers or labor hours.
2. They assume prices and purchasing patterns remain constant. In a fully stretched economy, it is likely, however, that additional demand will lead to short-term increases in price that will consequently bring about substitutions in business inputs and redistribution of income with related changes in consumption patterns (Briassoulis 1991). Over the longer term, as more capacity emerges, prices likely will return to their previous levels.
3. As Archer (1982) noted in his early article, I-O models assume there are no resource constraints or substitutions, so additional resources of land, labor, or capital needed to meet the new tourism demand are simply available. They are not taken from other sectors and do not result in reductions elsewhere. For example, if a major sports stadium is built, it is assumed that construction and other workers are readily available in the economy, and that they neither leave other jobs nor move or commute from outside the economy being analyzed.
4. The model does not specify the time it will take for the new inflow of money to generate the additional income and jobs (i.e., will they emerge in six weeks, six months, or six years?).

Social accounting matrices (SAM) are related to I-O models and operate with the same basic set of assumptions, but give more emphasis to the distributional aspects of the new injection of visitor spending being modeled (Loveridge 2004). Hence, they are likely to be employed only when decision makers are especially concerned with the distributional consequences of visitor spending. In the tourism literature, SAM's use was illustrated by Wagner (1997) in his analysis of the regional impact of tourism in the Brazilian municipality of Guaraqueçaba, by Li and Lian (2010) in Jiangsu Province, China, and by Daniels, Norman, and Henry (2004) measuring the impact of a road race in the southeastern United States. SAM effects on household groups are available in IMPLAN but are rarely reported, perhaps because sponsors are interested only in visitor spending impact, not in its distribution. As Sandahl noted: "Tourism has been promoted for the economic revitalization it can bring to a region but researchers have given little attention to the inequitable ways that this wealth gets distributed among community members, or to which segments of the population are served through the tourism industry" (1999, 121).

In the last decade, Dwyer, Forsyth, and their associates have suggested that I-O models are "incomplete" and as a result they exaggerate tourism economic impacts:

> [I-O] ignores key aspects of the economy. It focuses on the industry which is being directly affected, and on its direct relationships with other parts of the economy. It effectively assumes that there is a free, unrestricted flow of resources to these parts of the economy. The effects which come about because of resource limitations, the workings of the labor and other markets, the interactions between the economy and the rest of the world, are all ignored. As a result, it does not capture the feedback effects, which typically work in opposite directions to the initial change. As a consequence, input-output estimates of impacts, in economic activity generally or on specific variables such as employment, are usually overestimates, very often by large margins (Dwyer, Forsyth, and Spurr 2004, 307).

They convincingly argue computable general equilibrium modeling (CGE) offers a more accurate approach for estimating secondary impacts in tourism (Dwyer 2011; Forsyth 2011; Dwyer, Forsyth, and Spurr 2004, 2006; Dwyer, Forsyth, and Dwyer 2010).

CGE models recognize that economies are general equilibrium systems which are integrated wholes, so an injection of tourism funds will likely have negative as well as positive impacts. They incorporate an I-O framework, but are much more flexible and dynamic. For example, they allow for interactive effects between industries, for the reality of resource constraints, relative price changes, and the feedback from them; they accommodate "crowding out" of one activity by another; they can be tailored to allow for alternative conditions such as flexible or fixed prices, different exchange rates, or changes in the competitive environment; and by varying the assumptions they can be used to respond to a variety of "what if" scenarios (Dwyer 2011). Thus, CGE multipliers are likely to be smaller because adding supply and demand constraints reduces the impact of new visitor spending, in contrast to the perfectly elastic supply assumptions in I-O models.

While advocates claim CGE models represent a "paradigm shift" (Dwyer, Forsyth, and Dwyer 2010) and their superiority is accepted, they nevertheless "have received relatively little use in assessing tourism impacts or impacts of events. . . . Almost invariably the technique used is I-O analysis or some variant of it" (Dwyer, Forsyth, and Spurr 2006, 59). CGE use in tourism has almost exclusively been confined to Australia where a considerable investment in developing CGE models has been made. There are two factors that have inhibited its wider use.

First, CGE models are complex to develop and need extensive amounts of data. Their advocates' claim that "CGE modeling techniques and software programs are now routinely available" (Dwyer, Forsyth, and Dwyer 2010, 361) is overly optimistic. They require highly skilled, specialized, and experienced economists to develop and operate them. In the tourism field, there are likely only a handful of teams or individuals in the world with the expertise and resources to do this. Hence, CGE models are likely to require six-figure investments. In contrast, "off-the shelf" I-O models and multipliers are widely used in the United States because they are widely available and typically cost less than $1,000; in addition, noneconomists can grasp their fundamentals and produce outputs with three to five hours of training.

Second, the superiority of CGE models for measuring the impact of major changes in tourism flows at the national or statewide scale is clear. However, their advantages are much less pronounced at the local level (Mules 1999; Loveridge 2004), which is where most economic impact studies in the United States are commissioned. Local elected officials who commission them usually are not concerned about the effects of tourism events or facilities on state or national economies. Rather, their interest is confined to effects on the local residents whose votes elect them to office.

At the local level, the impact of a tourism event or facility is likely to be relatively small when measured against the total local economy. In these contexts, the I-O assumptions of fixed coefficients, elastic input supplies, and constant prices "are probably reasonable" (Loveridge 2004, 308). Indeed, it is suggested, "In practice, errors in data estimation are probably greater than errors produced through unrealistic assumptions" (Loveridge 2004, 308). CGE's primary advocates in tourism appear to concur with this conclusion. After declaring that "the impact on economic activity in the state as a whole cannot be determined from an I-O analysis," they go on to say, "which may provide a good estimate of the impact on the local economy" (Dwyer and Forsyth 2005, 357).

Thus, at the local level, the considerable extra cost of using CGE compared to I-O models for relatively small gains in accuracy is likely to lead to I-O models being preferred. Selection of the type of model is likely to be driven by availability and cost, which explains why IMPLAN is so pervasive in the United States. It is likely to be less accurate than a CGE model, but the magnitude of error is likely to be accepted, especially given the numerous other potential sources of error in secondary spending analyses.

In summary, multipliers from different types of models (e.g., I-O and CGE) are not comparable. Although there will be exceptions attributable to specific circumstances in particular local economies, typically, the systematic biases in the models will result in the following (Loveridge 2004):

$$\text{SAM multiplier} > \text{I} - \text{O multiplier} > \text{CGE multiplier}$$

However, advances in modeling systems have blurred the line between these types of models. Thus, IMPLAN defines itself as an I-O model that uses SAM multipliers (IMPLAN website; Lindall and Olson 2003), while Steinback (2011) characterizes IMPLAN as a SAM I-O. Indeed, IMPLAN no longer reports Type II multipliers but rather relies on its SAM to estimate induced effects.

Mischievous Use of SAM Multipliers

Table 1 shows the IMPLAN labor income total effects coefficients, while Table 2 reports Type SAM income multipliers, for a metropolitan (Travis), micropolitan (Uvalde) and rural (Morris) county in Texas.[1] The multipliers in Table 1 are substantially lower than those in Table 2. The total effects coefficients in Table 1 act as multipliers on direct output (accounting for the capture rate) to estimate the labor income impact across the entire economy. The equation for estimating the total labor income impact of an activity using the total effects coefficient is:

$$\text{Gross sales} \times \text{Capture rate} \times \text{Total Labor income effects coefficient} = \text{Total labor impact}$$

For example, the labor income impact of $1,000,000 in 2010 Travis County grocery sales would be calculated as:

$$\$1\text{ million} \times 0.282 \times .771136 = \$217,460$$

An unscrupulous or uninformed analyst may be tempted to apply the much larger SAM income multipliers in Table 2.[2] However, this is an egregious misapplication that results in an artificially large economic impact. The SAM multiplier is simply a ratio of a total effect to a direct effect.[3] In the case of the SAM income multiplier, the ratio is appropriately applied to direct income but not to *direct output*. The equation for estimating the labor income impact of an activity using the SAM multiplier is

$$\text{Direct labor income} \times \text{SAM labor income multiplier} = \text{Total labor income impact}$$

Table 1. Labor Income Multipliers in a Metropolitan, a Microplitan, and a Rural County in Texas in 2007, 2010, and 2013.

	IMPLAN 2.0	2007			2010			IMPLAN 3.0	2013		
	Sector	Total Income Multiplier[a] (1)	Capture Rate[b] (2)	Effective Income Multiplier[c] (1)×(2)=(3)	Total Income Multiplier	Capture Rate	Effective Income Multiplier	Sector	Total Income Multiplier	Capture rate	Effective Income Multiplier
Travis (Metro County)	324 Grocery	0.64	0.29	0.19	0.77	0.28	0.22	400 Food and Beverage Retail	0.68	0.28	0.19
	326 Gas	0.53	0.16	0.09	0.64	0.15	0.10	402 Gasoline Stations	0.69	0.11	0.07
	328 Recreational Equipment	0.61	0.40	0.24	0.73	0.39	0.28	404 Recreational Equipment	0.67	0.42	0.28
	329 Other Expenses–retail	0.63	0.27	0.17	0.71	0.27	0.19	405 Gen Retail	0.58	0.26	0.15
	330 Retail Shopping	0.65	0.44	0.28	0.82	0.43	0.35	406 Misc. Retail	0.89	0.45	0.40
	411 Hotel	0.52	1.00	0.52	0.57	1.00	0.57	499 Hotel	0.60	1.00	0.60
	412 Other Accommodations	0.54	1.00	0.54	0.71	1.00	0.71	500 Other Accommodations	0.69	1.00	0.69
	413 Restaurant	0.52	1.00	0.52	0.58	1.00	0.58	501 Full Svc Restaurant	0.69	1.00	0.69
								502 Limited Svc Restaurant	0.63	1.00	0.63
								503 Other food and drink	0.55	1.00	0.55
	414 Private Auto	0.57	1.00	0.57	0.75	1.00	0.75	504 Auto repair	0.83	1.00	0.83
	362 Auto Rental	0.44	1.00	0.44	0.77	1.00	0.77	442 Auto equip rental	0.32	1.00	0.32
Morris (Rural County)	324 Grocery	0.50	0.29	0.15	0.52	0.28	0.15	400 Food and Beverage Retail	0.44	0.28	0.12
	326 Gas	0.43	0.16	0.07	0.43	0.15	0.06	402 Gasoline Stations	0.60	0.11	0.06
	328 Recreational Equipment	0.49	0.40	0.19	0.26	0.39	0.10	404 Recreational Equipment	0.53	0.42	0.22
	329 Other Expenses–retail	0.48	0.27	0.13	0.49	0.27	0.13	405 Gen Retail	0.39	0.26	0.10
	330 Retail Shopping	0.53	0.44	0.23	0.37	0.43	0.16	406 Misc. Retail	0.63	0.45	0.29
	411 Hotel	0.41	1.00	0.41	0.00	1.00	0.00	499 Hotel	0.00	1.00	0.00
	412 Other Accommodations	0.00	1.00	0.00	0.29	1.00	0.29	500 Other Accommodations	0.61	1.00	0.61
	413 Restaurant	0.32	1.00	0.32	0.35	1.00	0.35	501 Full Svc Restaurant	0.37	1.00	0.37
								502 Limited Svc Restaurant	0.37	1.00	0.37
								503 Other food and drink	0.35	1.00	0.35
	414 Private Auto	0.35	1.00	0.35	0.46	1.00	0.46	504 Auto repair	0.72	1.00	0.72
	362 Auto Rental	0.00	1.00	0.00	0.00	1.00	0.00	442 Auto equip rental	0.00	1.00	0.00
Uvalde (Micro County)	324 Grocery	0.57	0.29	0.17	0.62	0.28	0.17	400 Food and Beverage Retail	0.57	0.28	0.16
	326 Gas	0.47	0.16	0.08	0.47	0.15	0.07	402 Gasoline Stations	0.53	0.11	0.06
	328 Recreational Equipment	0.55	0.40	0.22	0.51	0.39	0.20	404 Recreational Equipment	0.46	0.42	0.19
	329 Other Expenses–retail	0.56	0.27	0.15	0.60	0.27	0.16	405 Gen Retail	0.46	0.26	0.12
	330 Retail Shopping	0.59	0.44	0.26	0.33	0.43	0.14	406 Misc. Retail	0.64	0.45	0.29
	411 Hotel	0.43	1.00	0.43	0.31	1.00	0.31	499 Hotel	0.36	1.00	0.36
	412 Other Accommodations	0.41	1.00	0.41	0.49	1.00	0.49	500 Other Accommodations	0.48	1.00	0.48
	413 Restaurant	0.39	1.00	0.39	0.39	1.00	0.39	501 Full Svc Restaurant	0.43	1.00	0.43
								502 Limited Svc Restaurant	0.45	1.00	0.45
								503 Other food and drink	0.46	1.00	0.46
	414 Private Auto	0.45	1.00	0.45	0.63	1.00	0.63	504 Auto repair	0.76	1.00	0.76
	362 Auto Rental	0.00	1.00	0.00	0.00	1.00	0.00	442 Auto equip rental	0.25	1.00	0.25

[a]Total Income multiplier = Direct effect + Indirect effect + Induced effect (Total income multiplier is total income impact per *direct output* dollar).
[b]Capture rate = Direct output / Sales.
[c]Effective income multiplier = Total income multiplier × Capture rate (Effective income multiplier is total income impact per *sales* dollar).

Table 2. IMPLAN Type SAM Income Multipliers in a Metropolitan, a Micropolitan, and a Rural County in Texas in 2007, 2010, and 2013.

IMPLAN 2 Sector No. for 2007 and 2010	IMPLAN 3 Sector No. for 2013	Category	Travis(Metro)			Uvalde(Micro)			Morris(Rural)		
			2007	2010	2013	2007	2010	2013	2007	2010	2013
324	400	Grocery	1.37	1.45	1.49	1.23	1.24	1.22	1.10	1.21	1.17
326	402	Gas	1.37	1.55	1.57	1.23	1.30	1.25	1.11	1.25	1.12
328	404	Recreational equipment	1.37	1.53	1.55	1.23	1.31	1.27	1.10	1.68	1.14
329	405	Other expenses–retail	1.38	1.45	1.54	1.23	1.23	1.25	1.11	1.20	1.21
330	406	Retail shopping	1.36	1.45	1.42	1.23	1.51	1.22	1.10	1.35	1.12
411	499	Hotel	1.51	1.84	1.64	1.36	1.59	1.38	1.13	0.00	0.00
412	500	Other accommodations	1.68	1.82	1.56	1.47	1.48	1.30	0.00	1.91	1.14
413	502	Restaurant	1.46	1.57	1.43	1.38	1.35	1.21	1.15	1.27	1.13
414	504	Private auto	1.44	1.45	1.39	1.33	1.24	1.18	1.16	1.21	1.08
362	442	Auto rental	2.25	1.45	2.22	0.00	0.00	1.53	0.00	0.00	0.00

In the case of the grocery store sales above, the analyst would first need to estimate direct labor income:

$$\text{Gross Sales} \times \text{Capture rate} \times \text{Labor income}\,\textit{direct}\ \text{effect coefficient} = \text{Direct labor impact}$$

or

$$\$1\text{ million} \times 0.282 \times 0.532936 = \$150,288$$

Only then could the SAM be used to estimate the total labor income impact:

$$\$150,288 \times 1.446957 = \$217,460$$

Thus, the total effects labor income coefficient and the SAM multiplier, when correctly applied, provide the same result.[4] However, if the SAM multiplier is inappropriately applied to gross sales in the example above, the SAM labor income multiplier used with gross sales would estimate a labor impact of $1.45 million. Even if it were less egregiously applied to output, the estimated labor impact would be $408,042, nearly twice the appropriate labor income estimate.[5]

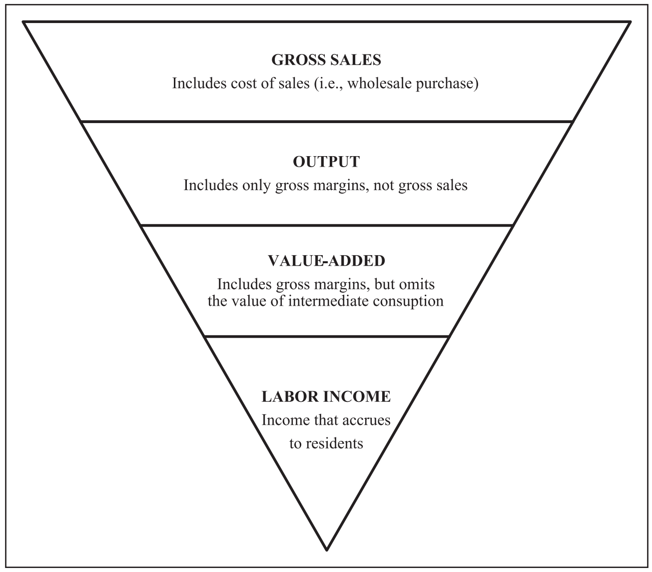

Figure 1. Measures of economic impact.

Semantic and Definitional Confusion

Semantic and definitional confusion is a second potential source of multiplier differentiation. It is similarly attributable to measurement artifact, rather than to changes in economic structures. It is created either by giving the same multiplier name to different operationalizations of it, or by giving different names to multipliers that are similarly defined. The confusion creates a lack of transparency that reinforces the opportunities for mischievous analyses.

Tourism economic impact studies commonly report some combination of five different impact measures: jobs, sales, output, value-added, and income. In this section of the article, the intent is to describe and explain the confusion associated with each of these measures and to illustrate its consequences. If analysts do not clearly define how they have operationalized each measure, it is likely that spurious conclusions will be drawn from some of their analyses. Figure 1 summarizes the definitions. It illustrates that the gross sales indicator will yield the highest economic impact numbers, while the lowest will be the labor income measure.

Job Measures

Definition of the jobs measure tends to be consistent and noncontroversial. It reports the effect of an extra unit of visitor spending on employment in the host community. It is annualized and is expressed in terms of number of jobs per million dollars in direct sales. This definition is clear, universally recognized, and the measure tends to be widely reported. However, five caveats associated with it are rarely articulated.

First, its definitional links to direct sales means the job measure is likely to change over time since it is sensitive to price inflation. For example, if it takes 30 jobs to produce $1 million of direct sales in the lodging sector in 2014, an increase in room rates may result in lodging sales of $1.2 million in 2016. The jobs to sales ratio therefore decreases to 25 jobs per $1 million direct sales (Stynes 1998).

Second, additional jobs that emanate from secondary expenditures associated with (in this example) the lodging industry are *not* in that sector, but are created in other sectors through indirect and induced effects (Stynes 1997).

Third, the IMPLAN measure includes not only full-time but also part-time jobs that may range from 1 hour to 34 hours a week, and it does not differentiate between them. For example, a "job" in IMPLAN is defined as the annual monthly average of full- and part-time jobs and may comprise one job lasting 12 months, two jobs lasting 6 months each, or three jobs lasting 4 months each (IMPLAN 2015). It seems reasonable to posit that local businesses are unlikely to hire additional full-time employees in response to additional demands created by a tournament or event, because the extra business demands will last only for a few days. In these situations, the number of employees is not likely to increase. Rather, existing employees may be requested to work overtime, so the number of hours they work may increase. Alternatively, existing employees may be released from other duties to accommodate this temporary peak demand, so no additional hours are worked. At best, only a few very short-term additional employees are likely to be hired.

Fourth, the job estimates assume all existing employees are fully occupied, so an increase in external visitor spending will require an increase in level of employment. In the context of a hotel's front desk, for example, the employment estimate assumes the existing staff would be unable to handle additional guests checking in for overnight stays associated with a tournament. However, in many cases, they are sufficiently underemployed to do this, so additional staff would not be needed. Furthermore, it has been noted that even after businesses have fully used their existing capacity:

> Expansion is likely to depend on the businesses' longer-term expectation about whether the additional spending is temporary or permanent. In either case, the additional hiring may be delayed for a significant time. This will slow each cycle of expansion and possibly stretch the total expansion out over a lengthy period. (Power 1996, 122)

A fifth potentially misleading interpretation of employment estimates is they imply all new jobs will be filled by residents from within the community. However, it is possible some proportion of them will be filled by commuters from outside the community. A corollary of this is that commuting workers may spend their income where they live rather than where it is earned, which would reduce the induced effect (Stynes 1997).

These caveats suggest the employment multiplier coefficient is an inappropriate measure for reporting the economic impact of short-term events such as festivals and sports tournaments. In the context of tourism, it becomes appropriate only when the focus is on facilities, where a consistent flow of visitors from outside the area to a facility suggests that full-time jobs are likely to be created.

Gross Sales and Output Measures

There is frequent semantic and conceptual confusion between those two indices. The gross sales (or transactions) measure reports the effect of visitor spending on total economic activity within a host community. It relates visitor expenditures to the total increase in business turnover they create. It measures gross sales and not gross margins and includes all intermediate business-to-business sales as well as final sales to customers. This definition has remained essentially unchanged over the past 35 years (Archer 1982).

In contrast, the definition and operationalization of output multipliers have evolved over time. For example, the World Tourism Organization adopted the definition (Howath Tourism and Leisure Consulting 1981, 4) suggested by Archer (1982) in his pioneering works, who noted that the output multiplier was "very similar" to a sales multiplier:

> It relates a unit of tourist spending to the resultant increase in the level of output in the economy. The difference between the two types is that, whilst the sales multiplier considers only the level of sales which result from the direct and secondary effects of tourist spending, the output multiplier takes into account both the level of sales and any real changes which take place in the level of inventories (stocks) held in the economy. (237)

Thus, the output multiplier was the same as the sales multiplier, but it also took into account inventory changes such as the increase in stock levels by hotels, restaurants, and shops because of increased trading activity.

Some have remained loyal to this differentiation. For example, Dwyer, Forsyth, and Dwyer (2010): "Output multiplier: where output is equal to sales plus the increase in the value of stocks" (293); and Teigeiro and Diaz (2014): "In the case of the Hotels and Restaurant industry, the sales multiplier equals the output multiplier given that in this activity there are no stocks" (29).

In contrast, the current operationalization of the output measure in IMPLAN includes all sales in the service sector, *but* for wholesale and retail sales it includes only gross margin not gross sales. The margin is defined as the selling price of an item, less the cost of goods sold (essentially production or acquisition costs). If, for example, a visitor to an attraction purchased a camera from a store while on a trip for $100 and the retailer purchased it from a wholesaler for $60, then the output measure would include only the $40 retailer's markup on the camera.

Confusion between these two measures is rampant. Indeed the terms are often used interchangeably. It is illustrated by the definition offered in an Extension Service guide specifically addressing IMPLAN multipliers: “Output multipliers relate the changes in sales to final demand by one industry to total changes in output (gross sales)” (Mulkey and Hodges 2012, 4). In fact, this is a definition of gross sales, not output.

In the context of studies in state and national parks similar to those undertaken by the authors, there is similar confusion. In their national parks report, Thomas, Huler, and Koontz use the term *output* to describe gross sales: “Output represents the value of industry production. Output is the sum of all intermediate sales (business to business) and final demand (sales to consumers and exports)” (2014, 6).

In a study of New York state parks, the authors use output and sales as synonyms in their definitions: “Output and sales: the total value of economic output that expenditures support” (8), and report “$608 million in economic activity as measured by the value of output and sales” (Heinze, Pollin, and Garrett-Peltier 2009, 10). Similarly, in their emphasis of the impact of the 2004 World Cup on the Korean economy, Lee and Taylor (2005) report, “The tourism output (sales) multiplier measured the ripple effect of one unit change in tourist spending on change in business turnover” (599). Other examples of empirical studies that used sales and outputs as synonyms include Lynch (2000) and Tuck and Nelson (2011), who observed, “output is measured in dollars and is equivalent to total sales” (114), and Thomas, Huber, and Koontz (2014), who did not change their operationalization of economic impact from their previous annual reports, but changed its name stating, “Note: output was referred to as sales in previous reports” (4).

In contrast, Mowen et al. (2012) in their economic impact study of Pennsylvania State Parks state, “Sales represent the sales of businesses in the region with the exception that sales in the retail trade sector are only the retail margins on retail sales and therefore exclude the cost of goods sold” (7). In fact, this is a measure of output not gross sales.

The source of the confusion appears to stem from the emergence of different definitions of “sales.” While the gross sales definition given in the opening paragraph of this section traditionally was used, in the late 1990s more careful analysts pioneered the notion of a “capture rate” which is reflected in the output measure (Stynes 1997). For example, in a study of Michigan State Parks, it was reported,

> The impact on the state economy of state park visitors was $331 million. . . . Multiplying the capture rate (77%) by total spending ($331 million) yields the direct sales effect of $254 million in sales. Roughly $77 million ($331-$254) of the visitor spending immediately leaks out of the Michigan economy to cover the costs of items purchased by visitors that are not made in Michigan e.g. gasoline, groceries, sporting goods, and souvenirs). Only the retail and wholesale margins for most of these purchases accrue to the state economy. (Stynes 1998, 17)

It is common practice to use an average capture ratio for each industry sector, even though capture rates are likely to vary across regions and economies. It seems likely that a future measurement refinement will be to offer more location-specific margins. These capture ratios also fail to account for tourists shopping at stores that carry locally made goods. If these types of expenditures are significant, they should be modeled using a production sector rather than a retail sector multiplier. However, survey respondents often report only total retail expenditures, so the value of locally produced goods is lost in the analysis.

In the context of services, the direct and secondary effects on sales and output are the same in both measures because there are no margins on services. However, in the retail sector, the output measure will always be smaller. Because retail spending is an important component of tourism spending, the distinction is important in tourism impact studies. Table 3 reports the results of the two measures calculated by the authors using IMPLAN at nine state parks in Texas. The magnitude of difference ranged from 43% to 143%.

Since IMPLAN does not give secondary impacts of gross sales, the usual approach to estimating these impacts is to “borrow” them from the output measures. Two different “borrowing” approaches are available. First, the output *values* are applied to the gross sales amount. Table 4 offers illustrative results of deriving these in the context of the impacts of food and beverage expenditures by visitors to Pedernales Falls Park on the economy of Blanco County, Texas. Thus, for example, in the retail sector the indirect and induced effects for gross sales of food and beverages are $27,898 and $25,961, respectively. However, this is likely to be an underestimate, since if the gross sales measure is higher than the output measure, then the secondary effects associated with gross sales also should be higher.

To rectify this underestimation, some analysts export the output *ratios* into an Excel spread sheet and estimate the indirect and induced effects by multiplying the output *ratios* by the gross sales, even though these output ratios are not the ratios of output impacts to *direct sales*, but the ratios of output impacts to *direct output*. This was the method used to estimate the impacts of gross sales shown in Table 3. Table 4 shows that when this approach is applied to retail sales of food and beverages, then the indirect and induced values increase to $98,232 and $91,412, respectively. Table 4 also shows that both approaches result in the same value when applied to the service sector, since the output measure includes all sales in the service sector.

Table 5 illustrates the total impact of using these alternative approaches across all the categories of visitor expenditures. The use of the ratio measure increases the impact of gross sales compared to the use of the output value measures on Blanco County from $3.41 million to $3.87 million.

Ostensibly, it may appear reasonable to conceptualize service sectors as producing a totally new output so they do not incorporate the notion of margins. However, when this is

Table 3. Measures of Economic Impact on the Host Counties of Nine Texas State Parks.

Park Name	Expenditures of visitors	Gross Sales	Output	Value added	Labor income	% by which impact on gross sales exceeds output	% by which impact on gross sales exceeds income
Daingerfield (*n* = 382)	$332,753	$404,326	$166,079	$100,364	$58,096	143%	596%
Dinosaur Valley (*n* = 506)	$1,434,940	$1,763,378	$948,435	$579,526	$292,817	86%	502%
Enchanted Rock (*n* = 1,186)	$6,219,275	$8,297,416	$5,818,234	$3,417,213	$1,762,387	43%	371%
Garner (*n* = 1,286)	$13,339,963	$18,405,310	$9,730,725	$5,792,665	$2,875,843	89%	540%
Goliad (*n* = 444)	$593,784	$717,403	$425,180	$247,629	$131,355	69%	446%
Lake Corpus Christi (*n* = 390)	$1,344,096	$1,670,020	$775,411	$482,021	$273,233	115%	511%
Lake Ray Roberts (*n* = 499)	$11,811,373	$15,979,412	$7,062,781	$4,557,793	$2,773,429	126%	476%
Pedernales Falls (*n* = 494)	$2,954,196	$3,870,880	$1,926,812	$1,112,535	$530,507	101%	630%
Tyler (*n* = 447)	$3,486,834	$5,066,769	$2,480,398	$1,594,462	$931,583	104%	444%

Table 4. Illustrative Comparison of the Secondary Effects of Gross Sales in the Retail and Service Sectors Using Output Values and Output Ratios.

				Secondary impacts using output values		Secondary impacts using output ratios			
						Indirect effect		Induced effect	
Industry code	Sector field	Description	Gross sales	Indirect effect	Induced effect	Ratio	Value	Ratio	value
324	Retail	Food and beverage	$560,355	$27,898	$25,961	0.175	$98,232	0.163	$91,412
413	Service	Food services and drinking places	$670,058	$121,466	$74,849	0.181	$121,466	0.112	$74,849

Table 5. Estimating Output and Gross Sales Impacts at Pedernales Falls Park.

Impact type	Output	Sales using output values	Sales using output ratios
Direct effect	$1,474,225	$2,954,198	$2,954,198
Indirect effect	$292,332	$292,332	$538,772
Induced effect	$160,254	$160,254	$377,910
Total effect	$1,926,812	$3,406,784	$3,870,880

operationalized, the approach becomes arbitrary and the ostensible clarity becomes obfuscated. For example, the restaurant sectors in IMPLAN (501, 502, and 503) are likely to be a central component of tourism economic impact studies. Since they are considered service sectors, no margins are included, so their output is total sales value. However, food and beverage operations do have retail margins, since they are likely to purchase ingredients for the products they offer from wholesalers outside the local area. This results in an overestimation of their output.

Analysts using IMPLAN will generate output impacts. IMPLAN automatically margins the retail sale when the user selects the "Gross Retail Sales" option for an event in the Setup Activities screen. All output, value-added, income, and jobs multipliers are based on direct output using the capture rate for that sector. In this scenario, the primary question of whether output or gross sales is reported is dependent upon whether the analyst uses the direct output number reported by IMPLAN (thus reflecting the capture rate and reporting an output impact) or replaces that number with the total sales figure reported by survey respondents (producing a gross sales impact). More opportunities for mischievous practices are available if multipliers are applied outside of the modeling system by using an Excel spreadsheet.

The Value-Added Measure

Value-added is the value of output less the value of intermediate consumption. That is, the difference between the value of goods and the cost of materials or supplies purchased from businesses in other sectors that are used in producing them. There appears to be wide acceptance of this definition and of its operationalization. It estimates the value added to a study area's gross regional product, which is the regional equivalent of gross domestic product (GDP). This measure eliminates the duplication inherent in the sales and output measures, which results from the use of products of some businesses as materials or services by others.

Thus, in the case of the camera example used to illustrate the output definition in the previous section, the $40 retailer mark-up margin represented in the output measure presumably

Table 6. Income Impacts of Nonlocal Day Visitors to Garner State Park within Uvalde County.

Sectors	Day Visitors' Expenditure	Total Income Multiplier (1)	Capture Rate (2)	Effective Income Multiplier (1)×(2)=(3)	Income Impact Calculated by (1)	Income Impact Calculated by (3)	Percentage Increase [(1)–(3)]/(3)
324 Grocery	$1,742,064	0.64	0.28	0.18	$1,108,749	$314,885	252.1%
326 Gas	$1,615,080	0.55	0.11	0.06	$884,255	$98,152	800.9%
328 Recreational equipment	$885,025	0.53	0.40	0.21	$467,476	$188,860	147.5%
329 Other expenses–retail	$245,504	0.55	0.28	0.15	$136,049	$37,550	262.3%
330 Retail shopping	$857,797	0.38	0.45	0.17	$324,470	$145,363	123.2%
411 Hotel	$2,629,787	0.28	1.00	0.28	$748,571	$748,571	0%
413 Restaurant	$708,425	0.40	1.00	0.40	$286,451	$286,451	0%
414 Private auto	$279,189	0.61	1.00	0.61	$171,158	$171,158	0%
Total	$8,962,871[a]				$4,127,179	$1,990,990	107.3%

[a]This number differs from that shown in Table 3, because this illustration is confined to day visitor expenditure and omits those of overnight visitors.

included costs associated with operating a retail store, such as packaging; fuel, gas, and electricity supply; rent; transportation; insurance; and repair and maintenance. While value added is part of the output measure, the output includes these other costs whereas they are omitted in the value-added measure because they are duplications that appear in other sectors of the economy. Components of value-added include labor and proprietor's income, corporate income, rental income, and taxes.

The Income Measure

The conceptual rationale for measuring economic impact is to compare how much money a community's residents invest in a tourism project with how much income they receive from it (Crompton 2006). Thus, the income measure should be the primary indicator of interest to policy makers. It reports the effect of an extra unit of visitor spending on the changes that result in levels of personal income in the host community. It includes both employee compensation and payroll benefits. This definition is widely adopted and has remained essentially unchanged over the last 35 years (Archer 1982). The only relevant minor definitional difference among analysts and measurement tools is that some extend this definition to include "proprietor income," which refers to payments received by self-employed individuals and unincorporated business owners (e.g., Jeong and Crompton 2015).

Traditionally, this measure was operationalized as the income per dollar of *direct sales* that accrues to residents. The earlier discussion differentiating between sales and output measures is mirrored with the income multiplier. It has similarly evolved and is now defined as the income per dollar of *direct output.* If gross sales are used and capture rates are not applied to the income measure, then it will be substantially exaggerated.

This is illustrated in Table 6 using visitor spending data the authors collected in Garner State Park. When margining is not incorporated into the income measure, the cumulative impact is an overestimation of the income accruing to Uvalde County residents by 107%, or. $2.137 million. To some extent, this average measure of the hyperbole is misleadingly low, because it includes the zero percentage differences for services for which margining does not apply. The five retail categories in Table 6 show the omission of margining, results in exaggerated income estimates ranging from 123% to 801%. The cumulative income accruing to residents from these five categories should be reported as $784,870, but without margining, the estimate would be $2,920,999, an overestimate of 372%.

The ratios in Table 6 were generated by IMPLAN, which includes capture rates in its multipliers. However, most analysts do not report whether or not margining has been incorporated, so those reviewing their analyses remain uninformed unless they are personally very familiar with the nuances of the model being used. The potential for mischievous analysts to provide high values that mislead, rather than inform, is obvious.

Changes in Economic Structure

While multipliers emanating from different types of models will be different, those associated with the same model at different points in time are also likely to vary. Differences in multiplier sizes may be attributable to differences in both the inter and intra characteristics of communities' economic structures. Intercommunity differences reflect differences in the size and degree of integration of economies, while intracommunity shifts in multiplier sizes occur over time as a community's economy evolves.

When analysts discuss intracommunity changes, their implied time period is usually measured in decades. The authors' access to historical versions of IMPLAN went back only to 2007. Thus, the search for trends in multiplier size used the 2007, 2010, and 2013 IMPLAN models. It was

Table 7. The Impact on Labor Income on Travis County of Spending by Out-of-County Visitors to McKinney Falls State Park in 2014, Using 2007 and 2013 Income Multipliers.

			2007		2013	
Sector No.	Category	Visitor Spending	Ratio	Value	Ratio	Value
324	Grocery	$334,960	0.19	$63,642.40	0.19	$63,642.40
326	Gas	$401,251	0.09	$36,112.59	0.07	$28,087.57
328	Recreational equipment	$222,778	0.24	$53,466.72	0.28	$62,377.84
329	Other expenses–retail	$118,086	0.17	$20,074.62	0.15	$17,712.90
330	Retail shopping	$210,777	0.28	$59,017.56	0.40	$84,310.80
411	Hotel	$209,017	0.52	$108,688.84	0.60	$125,410.20
413	Restaurant	$275,400	0.52	$143,208.00	0.63	$173,502.00
414	Private auto	$46,794	0.57	$26,672.58	0.83	$38,839.02
Total		$1,819,063		$510,883.31		$593,882.73

anticipated that while changes over a six-year period would be relatively small, they may be discernable.

For this analysis, three diverse economic structures were selected: A metropolitan, a micropolitan, and a rural area. The authors had developed estimates of spending by out-of-county visitors to a park located in each of these counties. Detailed definitions of these types of areas are provided by The Office of Management and Budget. The key feature of a metropolitan area is that it has at least one city of at least 50,000 population and a core population of at least 2.5 million. Travis County is dominated by the Austin Metropolitan Area. McKinney Falls State Park is located in the county, which is the fifth most populous county in Texas with a highly integrated economy. In 2000, 2010, and 2014, the county's population was reported by the U.S. Census Bureau (in thousands) as 812, 1,024, and 1,157, respectively. The growth rate of 43% from 2000 to 2014 far outpaced the Texas and U.S. national averages of 29% and 13% respectively.

A micropolitan area has at least one city of 10,000–50,000 population, and adjacent territory that has a high degree of social and economic integration with it. Uvalde County, which contained Garner State Park, met these criteria. Daingerfield State Park is in rural Morris County, which has a total population of less than 13,000.

Table 1 shows the total income multipliers (i.e., they exclude capture rates) in the three counties. As expected, there is a consistent decrease in the size of the multipliers from metropolitan, through the micropolitan, to the rural county, reflecting the decreasing size and less integrated structure of their economies. Because the capture rates are national industry averages, they are the same across all counties.

The wide variation in size among sectors within each county illustrates the inappropriateness of using average multipliers across sectors. For example, the 2013 multipliers range from .07 to .83 in Travis County, .06 to .76 in Uvalde County, and .12 to .72 in Morris County.

The Great Recession appears to have had a relatively small impact on income multiplier size in these counties, since the 2010 coefficients for the most part did not meaningfully decrease. This was especially true in Travis County reflecting the continued expansion of the Austin area economy even through the recession. In Uvalde and Morris counties, they meaningfully decreased only in the retail shopping and hotel sectors, while in Morris County the decrease also extended to the recreation equipment sector.

The most surprising trend in Table 1 is the magnitude of change in size that occurred over the short six-year period. This trend was especially strong in Travis County, where the coefficient for retail shopping increased 43% (.28 to .40), for restaurants 21% (.52 to .63), 45% for auto repairs (.57 to .83), 15% for hotels (.52 to .60), and –37% for auto rentals (.44 to .32).

Table 7 illustrates the impacts on labor income in Travis County of applying 2007 and 2013 multipliers to spending by out-of-county visitors to McKinney Falls State Park. It shows if historic 2007 multipliers had been used, rather than those for 2013, the labor income would have been underestimated by 16% ($83,000).

Changes in Model Calibration and Decision Rules

Changes designed to more accurately calibrate the model by "tweaking," rather than respecifying it, are likely to be continuous and ongoing. For example, in 2013 IMPLAN expanded the number of industry sectors from 440, which had prevailed since the release of the 2007 data, to 536 sectors. IMPLAN's sectoring scheme is based on the Bureau of Economic Analysis Benchmarks, so it changes when they are revised. This generally means that some spending categories are more narrowly defined. Typically, analysts prefer more sector detail to less, as it provides greater modeling detail and accuracy.

Of most interest to tourism analysts in the 2013 IMPLAN revision was the splitting of the restaurant category (previously sector 413) into three different categories: Sector 501 is full-service restaurants in which patrons are served while they are seated; Sector 502 is limited service restaurants where customers select items and pay for them before eating in the restaurant, taking them out, or having them delivered; and Sector 503 is other food and drink places primarily engaged in the merchant wholesale distribution of groceries and related products. Generally, the differential among the three multipliers is small. Thus, in the three illustrative counties referenced in Table 6, the respective full service, limited service, and the other places income multipliers were as follows: Travis, .69, .63, and .55; Uvalde, .43, .45, and .46; and Morris, .37, .37, and .35. The influence of minor calibration changes such as this on impact results is likely to be minimal when viewed in isolation, but over time the cumulative impact of multiple such minor calibrations may be substantive. Furthermore, the new scheme poses a challenge in terms of asking survey respondents to break down their restaurant expenditures by restaurant type.

Sometimes, researchers change their decision rules for assigning tourists' expenditures to industry sectors. For example, the National Park Service does an annual study on the economic contributions of their parks to local communities (Thomas, Huber, and Koontz 2015). In the 2014 report, a decision was made to move visitors' retail and souvenir expenditure from the general merchandise stores sector to the miscellaneous stores sectors, "to better represent the types of retail stores most likely frequented by NPS visitors" (6). The authors described the influence of this change:

> The general merchandise stores sectors has a relatively low retail margin of around 27 percent, whereas the miscellaneous store retailers sector has a higher margin of about 45 percent. As a result of this higher applied margin for retail and souvenir expenditures, estimated secondary effects of visitor spending are relatively higher in 2014 as compared to 2013. (Thomas, Huber, and Koontz 2015, 7)

Concluding Comments

It is not uncommon for tourism organizations to replicate economic impact studies, or to compare their results with those reported by others. This may be stimulated by recognition that the structures of local economies may change over time, which influences the nature of the flows of new money through them; a desire to identify trends; or a need to remind and reassure stakeholders of an organization's positive impact on the local economy.

Replication implies recognition that multipliers estimate short-term economic changes. They do not take into account an economy's long-term adjustments. At least some of the short-term effects may be transitory. For example, if a tourism attraction closes or a major league franchise relocates and jobs are lost, some workers are likely to find new jobs in the area, so multipliers may overstate the loss of jobs over a time frame that extends beyond the immediate effects.

Estimates of visitor spending impacts at a given attraction will likely vary widely if different models are used to derive them, with SAMs generating higher multipliers than I-O models, which in turn are likely to provide higher multipliers than CGE models. Semantic confusion is a second source of multiplier differentiation that is similarly attributable to measurement artifact, rather than to real differences in economic structures. Confusion is rampant in the operationalization of the most common impact measures in tourism studies: jobs, sales, output, value added, and income. All five of these measures are prone to misspecification and misinterpretation. Estimates of number of jobs created by tourism activities such as tournaments and special events are invariably optimistic and likely to mislead rather than inform, while the omission of capture rates in income multipliers and the use of gross sales rather than output measures result in substantial mischievous overestimates (Tables 3, 4, and 5).

Clearly, the different underlying structures of host economies and their geographic scale will result in different-sized multipliers (Teigeiro and Diaz 2013). Structural relationships within an economy also are likely to change over time, which will result in changes in the size of multipliers. This has long been recognized and was empirically verified in an early study in the state of Washington that reported output multipliers for industrial sectors shifted by an average of 5% over a 10-year period (Conway 1977). The conventional wisdom among many economic impact analysts is that, absent an unusually large external shock such as the arrival or loss of a dominant employer, substantive changes in multipliers are likely to be glacial, measured in decades rather than years. However, the results shown in Table 1 indicate that in the case of a relatively fast-growing metropolitan area, substantial changes occurred in a relatively short six-year period. Hence, the use of even relatively recent historic multipliers to measure economic impacts may be inappropriate in these contexts.

Finally, it was noted that ongoing minor refinements to the models and data sources and changes in researchers' decision rules could result in changes in multiplier size.

To our knowledge, an in-depth, explicit exploration of the sources of variation in multiplier estimates has not previously appeared in the tourism literature. The conceptual arguments and empirical findings that have been presented here suggest two overarching conclusions. First, differences in sizes of multipliers often are likely to be attributable to artifacts in measuring tools, rather than to differences or changes in the economic structures of communities. Second, multipliers are "study specific." That is, they should be regarded as being unique to a moment in time, to the geographic context in which studies are conducted, to the specific definitions used to operationalize them, and to the type of model from which they are derived.

It has been pointed out that "most research projects are predicated on a search for the truth, but the goal in economic impact studies is less auspicious; the goal is to legitimize a position" (Crompton 2010, 20). Since a variety of methods and indicators can be used to measure economic impact, and because there are temptations to report the highest numbers, it is important that potential differences attributable to measurements and artifacts among these indices are clearly articulated by researchers and understood by stakeholders.

These issues would be much less important if both those undertaking economic impact studies and those commissioning them would act with integrity, and report only the income and value-added measures and disregard the others. Too often, economic impact analyses commissioned by advocates have focused on gross sales. The mischievous consequences of such actions are illustrated in the final column in Table 3, which shows that in the nine studies completed by the authors, the extent to which gross sales (for which secondary effects were measured by using output ratios) exceeded the income measure ranged from 371% to 630%.

Formative efforts to measure conceptually rich, but complex, phenomena like the multiplier concept often are gross with substantial error margins. Our analyses show that the magnitude of potential errors associated with size of multipliers is substantial and that they emanate from multiple sources. The findings reinforce the contention that multipliers are not transferable and that comparing them is hazardous and inappropriate. They comprise a third major class of sources of potential distortion and error in economic impact analyses, joining the set of 10 relatively overt mischievous practices identified by Crompton (2006) and the 8 "hidden" procedures used by researchers (Jeong, Crompton, and Dudensing 2015).

While IMPLAN was used as the exemplar for empirical illustrations, it is likely that the issues addressed in this article—related to using models that use different assumptions, specifications, procedures, and data sources; semantic confusion in operationalization and definitions of multipliers; and ongoing calibrations and changes in researchers' decision rules—are representative and generic irrespective of the measuring tool that is adopted.

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Notes

1. Total effect = Direct effect + Indirect effect + Induced effect
2. Not all types of SAM multipliers are larger than total effect multipliers. For example, SAM output multipliers are the same as the total output multipliers, and SAM employment multipliers are lower than total employment multipliers.
3. SAM multiplier = (Direct effect + Indirect effect + Induced effect) / (Direct effect)
4. In summary, there are three ways to calculate the total (Labor income) impact: (1) Gross sales × Capture rate × Total (Labor income) effect multiplier = Total (Labor income) impact, (2) Direct Output × Total (Labor income) effect multiplier = Total (Labor income) impact, and (3) Direct (Labor income) impact × SAM (Labor income) multiplier = Total (Labor income) impact.
5. The distinctions between gross sales and output are discussed in the following section of the article.

References

Archer, B. H., and C. B. Owen. 1971. "Towards a Tourist Regional Multiplier." *Regional Studies* 5 (4): 289–94.

Archer, B. H. 1975. "The Anatomy of a Multiplier." *Regional Studies* 10 (1): 71–77.

Archer, B. H. 1977. *Tourism Multipliers: The State of the Art*. Cardiff: University of Wales Press.

Archer, B. H. 1982. "The Value of Multipliers and Their Policy Implications." *Tourism Management* 3 (4): 236–41.

Briassoulis, H. 1991. "Methodological Issues: Tourism Input-Output Analysis." *Annals of Tourism Research* 18 (3): 485–95.

Charney, A. H., and M. J. Vest. 2003. "Modeling Practices and Their Ability to Assess Tax/Expenditure Economic Impacts." Paper presented at the AUBER Conference, New Orleans, October.

Conway, R. S. 1977. "The Stability of Regional Input-Output Multipliers." *Environment and Planning A* 9 (2): 197–214.

Crompton, J. L. 1995. "Economic Impact Analysis of Sports Facilities and Events: Eleven Sources of Misapplication." *Journal of Sport Management* 9 (1): 14–35.

Crompton, J. L. 2006. "Economic Impact Studies: Instruments for Political Shenanigans?" *Journal of Travel Research* 45 (1): 47–82.

Crompton, J. L. 2010. *Measuring the Economic Impact of Park and Recreation Services*. Ashburn, VA: National Recreation and Park Association.

Daniels, M. J., W. C. Norman, and M. S. Henry. 2004. "Estimating Income Effects of a Sports Tourism Event" *Annals of Tourism Research* 31 (1): 180–99.

Dwyer, L., ed. 2011 "Epilogue." In *The Discovery of Tourism Economics*, edited by L. Dwyer, 247–66. Bingley, UK: Emerald Insight.

Dwyer, L., and P. Forsyth. 2005 "Estimating the Impacts of Special Events on the Economy." *Journal of Travel Research* 43 (4): 351–59.

Dwyer, L., P. Forsyth, and R. Spurr. 2004. "Economic Effects: New and Old Approaches." *Tourism Management* 25 (3): 307–17.

Dwyer, L., P. Forsyth, and R. Spurr. 2006. "Assessing the Economic Impacts of Events: A Computable General Equilibrium Approach." *Journal of Travel Research* 45 (1): 56–66.

Dwyer, L., P. Forsyth, and W. Dwyer. 2010. *Tourism Economics and Policy*. Bristol, UK: Channel View.

Forsyth, P. 2011. "From Transport to Tourism." In *The Discovery of Tourism Economics*, edited by L. Dwyer, 43–56. Bingley, UK: Emerald Insight.

Heinze, J., R. Pollin, and H. Garrett-Peltier. 2009. *The NYS Park System: An Economic Asset to the Empire State*. Amherst: University of Massachusetts, Political Economy Research Institute.

Howath Tourism and Leisure Consulting. 1981. *Tourism Multipliers Explained*. Madrid, Spain: World Tourism Organization.

IMPLAN. 2015. "Glossary of Terms." http://www.implan.com/index.php?option=com_glossary&task=list&

Jeong, J. Y., and J. L. Crompton. 2015. "Measuring the Economic Impact of a State Park System." *Managing Sport and Leisure* 20 (4): 238–57.

Jeong, J. Y., J. L. Crompton, and R. M. Dudensing. 2015. "The Potential Influence of Researchers' 'Hidden' Procedure Decisions on Estimates of Visitor Spending and Economic Impact." *Journal of Travel Research*. doi:10.1177/0047287515605932.

Lee, C. K., and T. Taylor. 2005. "Critical Reflections on the Economic Impact Assessment of a Mega-Event: The Case of the 2002 FIFA World Cup." *Tourism Management* 26 (4): 595–603.

Leontief, W. W. 1936. "Quantitative Input and Output Relations in the Economic Systems of the United States." *Review of Economics and Statistics* 18 (3): 105–25.

Leontief, W. W. 1937. "Interrelation of Prices, Output, Savings, and Investment." *Review of Economics and Statistics* 19 (3): 109–32.

Leontief, W. W. 1941. *The Structure of the American Economy*. Cambridge, MA: Harvard University Press.

Li, J., and C. Lian. 2010. "An Empirical Study of Relative Income Determination of Tourism Industries with Social Accounting Matrix of Jiangsu Province, China in 2002." *Tourism and Hospitality Research* 10 (2): 219–33.

Lindall, S., and D. Olson. 2003. *The IMPLAN Input-Output System*. Stillwater, MN: MIG.

Loveridge, S. 2004. "A Typology and Assessment of Multi-sector Regional Economic Impact Models." *Regional Studies* 38 (3): 305–17.

Lynch, T. 2000. *Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN and REMI*. Springfield, VA: National Technical Information Service.

Mowen, A. J., A. R. Graefe, N. E. Trauntvein, and D. J. Stynes. 2012. *The Economic Significance and Impact of Pennsylvania State Parks*. Harrisburg, PA: Bureau of State Parks.

Mulkey, D., and A. W. Hodges. 2012. *Using IMPLAN to Assess Local Economic Impacts*. Gainesville: University of Florida Cooperative Extension Service.

Mules, T. 1999. "Estimating the Economic Impact of an Event on a Local Government Area, Region, State or Territory." In *Valuing Tourism: Methods and techniques*, Occasional Paper Number 28. Canberra: Bureau of Tourism Research.

Power, T. M. 1996. *The Economic Pursuit of Quality*. Armonk, NY: M.E. Sharpe.

Sandahl, D. 1999. "Epistemological and Methodological Issues in Leisure Research." In *Leisure Studies: Prospects for the Twenty-First Century*, edited by E. Jackson and T. Burton, 119–33. State College, PA: Venture.

Smith, S. L. J. 1989. *Tourism Analysis: A Handbook*. New York: Longman.

Steinback, S. 2011. "Overview of Regional Economic Impact Models." Presentation at National Martine Fisheries Service Recreational Fisheries Data and Model Needs Workshop, Silver Spring, MD, July 26–28.

Stynes, D. J. 1997. *Economic Impacts of Tourism*. Illinois Bureau of Tourism, Department of Commerce and Community Affairs. https://msu.edu/course/prr/840/econimpact/pdf/ecimpvol1.pdf.

Stynes, D. J. 1998. *State and Regional Economic Impacts of Michigan State Park Visitors*. Lansing, MI: Parks and Recreation Division, Michigan DNR.

Teigeiro, L. R., and B. Diaz. 2014. "Estimation of Multipliers for the Activity of Hotels and Restaurants." *Tourism Management* 40:27–34.

Thomas, C. C., C. Huber, and L. Koontz. 2014. *2012 National Park Visitor Spending Effects. Economic Contributions to Local Communities, States, and the Nation*. Fort Collins, CO: National Park Service.

Thomas, C. C, C. Huber, and L. Koontz. 2015. *2014 National Park Visitor Spending Effects. Economic Contributions to Local Communities, States, and the Nation*. Fort Collins, CO: National Park Service.

Tomas, S. R., and J. L. Crompton. 2004. "Repositioning Texas State Parks." *Journal of Parks and Recreation Administration* 22 (1): 115–28.

Tuck, B., and D. Nelson. 2011. *The Economic Impact of Minnesota Vikings Game Attendees: A Playoff Example*. Minneapolis: University of Minnesota Extension.

Wagner, J. E. 1997. "Estimating the Economic Impacts of Tourism." *Annals of Tourism Research* 24 (3): 592–608.

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