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Table of Contents

Inexpensively Estimating the Economic Impact of Sports Tourism Programs in Small American Cities

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In America, and increasingly across the globe, sports tourism commonly serves as a tool to spur local economic development. Some studies have shown that amateur sporting events can return significant economic benefits to host communities.

Because of the perceived positive impacts such programs can have on local economies, sports tourism bundled as a multi-event annual program is thought by some to be an effective tool for economic stimulation in small cities. Yet, how do we measure to see whether this assumption is true?

Because community sports tourism programs commonly span numerous events and event types each year, estimating the annual economic impact using traditional event-specific surveying and local economic multiplier modeling is expensive—particularly for small communities. This article outlines an alternative method communities can use to estimate the economic impact of annual sports tourism programs using existing event studies alongside relevant free economic data that is readily available.

Measuring the economic impact of a single event is quite different from measuring the annual economic impact of a comprehensive sports tourism program spanning numerous event types located at various places and times throughout the year, the latter being considerably more complex and challenging. Traditionally, visitor spending patterns are calculated event-by-event, using surveys of event attendees. Thus, estimating the total economic impact of an entire annual sports tourism program with dozens of sporting events using surveys would become expensive. Beyond that, the need for an economic multiplier model arises. In fact, for small communities, conducting event surveys and hiring economists is often financially infeasible.

Absent costly event-specific data and an economic model, community planners currently have no clear method of estimating the economic impact of an annual multi-event sports tourism program. Currently, the literature on economic impact studies focuses on survey approaches for specific events, rather than on estimating the economic impact of annual sports tourism programs, which community leaders need.

Here, we offer a procedure for estimating economic impact which differs from the traditional, relatively labor-intensive models in two ways:

1. Our procedure allows community leaders to estimate the economic impact of an annual sports tourism program comprising dozens of events and several event types, rather than an individual event.
2. Our procedure requires neither event-specific surveys nor economic models, providing community leaders a relatively cost-effective way to determine the impact of their entire annual program.

Economic Impact 101

Economic impact analyses attempt to answer the questions of how many external dollars enter a host community for a given event, and how much the new money benefits members of the host community.[1] The general formula for calculating economic impact is given by the product of number of tourists, average spending per tourist, and appropriate multipliers.[2]

> *"This article outlines an alternative method communities can use to estimate the economic impact of annual sports tourism programs using existing event studies alongside relevant free economic data that is readily available.*

In the inevitable absence of perfect information, economic impact analyses are complicated by the process of estimating the required inputs where facts are unknown. This study simplifies the process by detailing a procedure using specific economic data, whereby users can effectively deal with imperfect information yet produce reasonable estimates of economic impact.

Required Inputs

The first required input is the *number of tourists*. Estimating the number of tourists requires finding or calculating not only estimates of total event attendees, but also an estimate of the percentage of nonlocals attending the event. Including only attendees from outlying regions is critical because local spending cannot be considered new spending in the community. For this procedure, prior surveys of similar events also held in small or mid-sized cities will reflect a reasonable estimation of the percentage of nonlocals in attendance.

The second formula input is *average spending per visitor*. This,

too, is estimated by relying on prior surveys, which have outlined expenditures by type, generally including lodging, dining, shopping/retail, entertainment, transportation and number of days spent in the region.

Finally, the appropriate *multiplier and capture rate* are needed to translate total spending to the measure of final demand. Afterward, the result is local final demand, the net monetary infusion to the local economy as a result of the initial tourist direct spending over a specified period of time. We refer to this as "economic cash flow."

Applying the Method to the Columbus, Indiana, Sports Tourism Program

We applied our method to estimate the economic impact of the Columbus, Indiana, sports tourism program for 2012, 2013 and 2014. This article walks through the details of the 2012 analysis, while results are presented for all three years.

To calculate the economic impact, total nonlocal attendance, average daily spending, multipliers, and capture rate were needed. Starting with primary data from the events, we estimated the required inputs using methods described in the economic impact literature, as follows:

- *Gibson et al.'s (2012) "Small-scale event sport tourism: A case study in sustainable tourism."* This study addressed the direct spending impacts of six sporting events in Gainesville, Florida, including three adult tournaments and three youth tournaments. Among other findings, the study calculated the average party size and daily spending per party for each event, segmenting attendees by overnight visitors or "day-trippers." This study particularly suits the sports tourism situation of Columbus because it examines a cross-section of amateur sporting events for both youth and adults—a mix similar to the Columbus sports tourism program.
- *Crompton and Lee's (2000) "The Economic Impact of 30 Sports Tournaments, Festivals, and Spectator Events in Seven U.S. Cities."* The authors of this study conducted surveys at 30 sports and festival events in seven different cities to estimate their economic impacts. Sixteen of these events were similar to those held in Columbus in 2012. The nonlocal percentages at these 16 games were used to estimate the nonlocal attendance percentage at the Columbus program's events.
- *Cobb and Olberding's (2007) "The Importance of Import Substitution in Marathon Economic Impact Analysis."* The authors of this study analyzed the economic impacts of the 2006 "Flying Pig" marathon in Cincinnati, Ohio. This study reported the proportions of nonlocals and locals participating in the marathon. These proportions were used to estimate the number of nonlocals attending the marathon events in our study.

Event Segmentation

The Gibson et al. (2012) study reported average spending levels and median party size for both overnight visitors and day-trippers for three youth and three adult amateur sporting events in Gainesville, Florida (see **Table 1**).

Each of the 82 events in the Columbus study was segmented first by participant age (adult or youth), then by event type. Those events not matching one of the event types from the Gibson et al. study were assigned as either an "adult average" or "youth average" event, which represented the average expenditures per party for the three events in that age group.

Table 1: Spending per Party Results from Gainesville, Florida

	Overnight Visitors				Day-Trippers			
Event Type	Total Spending per Party	Days	Daily Spending per Party	Party Size	Total Spending per Party	Days	Daily Spending per Party	Party Size
Adult Marathon	$316.57	2	$158.29	2	$95.64	1	$95.64	2
Senior Games	$275.66	2	$137.83	2	$169.76	1	$169.76	2
Adult Archery	$560.43	3	$186.81	3	$123.13	1	$123.13	2
Adult Average	-	-	$160.98	-	-	-	$129.51	-
Youth Soccer	$649.87	3	$216.62	2	$206.45	1	$206.45	2
Youth Softball	$828.94	4	$207.24	4	$199.95	1	$199.95	3
Youth Swimming	$586.64	3	$195.55	3	$147.63	1	$147.63	3
Youth Average	-	-	$206.47	3	-	-	$184.68	-

Note: Days and party size are median values for each event.
Source: Gibson et al. 2012

Table 2: Segmentation of Columbus Sports Tourism Events

Event Type	Overnight Parties		Day-Tripper Parties	
	Events	Participants	Events	Participants
Adult Marathon	-	-	13	1,720
Senior Games	1	1,080	-	-
Adult Archery	-	-	-	-
Adult Average	13	3,440	10	3,094
Youth Soccer	-	1,050	-	-
Youth Softball	26	10,566	1	180
Youth Swimming	6	2,406	-	-
Youth Average	7	1,110	4	440
Totals	54	19,652	28	5,434

Source: Authors' calculations

Table 3: Estimating the Number of Nonlocal Parties

Event Type	Overnight Parties				Day-Tripper Parties			
	Events	Travel Parties (estimate)	Percent Nonlocal	Nonlocal Parties	Events	Travel Parties (estimate)	Percent Nonlocal	Nonlocal Parties
Adult Marathon	-	-	52.55%	-	13	1,720	52.55%	904
Senior Games	1	1,080	88.31%	954	-	-	88.31%	-
Adult Archery	-	-	88.31%	-	-	-	88.31%	-
Adult Average	13	3,440	88.31%	3,038	10	3,094	88.31%	2,732
Youth Soccer	-	1,050	89.48%	939	-	-	89.48%	-
Youth Softball	26	10,566	89.15%	9,420	1	180	89.15%	160
Youth Swimming	6	2,406	91.70%	2,206	-	-	91.70%	-
Youth Average	7	1,110	84.82%	942	4	440	84.82%	373
Totals	53	19,652	-	17,498	28	5,434	-	4,170

Source: Authors' calculations

Next, events were denoted as either overnight or day-tripper events, based on the duration of the event: those events taking place in one day were labeled day-tripper events, while those events with a duration of two or more days were labeled overnight events.

Table 2 shows the segmentation of the Columbus events. We used the number of participants, which was known precisely for each event, as a proxy for the total number of parties; in other words, we assumed one party per athlete. There were an estimated 25,086 parties attending the 82 study events over the entire 2012 Columbus, Indiana, sports tourism program.

Excluding Local Attendees

Crompton and Lee (2000) and Cobb and Olberding (2007) offer empirical evidence of the percentage of nonlocals at the various events types. We applied the overall proportion of nonlocals participating in races—approximately 53 percent—to the 13 running events in Columbus, while about 80-90 percent of other sports participants were nonlocal.

Table 3 shows the resulting total *visiting parties* attending the Columbus events.

Adjusting the total number of parties to exclude local attendees resulted in an estimated 21,668 sports tourist parties visiting Columbus in 2012.

Direct Spending Calculation

Before applying average spending per party to estimate the total direct spending effects of the nonlocal parties, we adjusted the original Gibson et al. (2012) daily spending averages for variances in the costs of living between Columbus, Indiana, and Gainesville, Florida.

To adjust for cost of living, we utilized a living wage calculator developed by the Massachusetts Institute of Technology (MIT), which measures household price variations for all counties across the country.[3] We formed a proportion from the after-tax required living wage for a household of two adults and two children for Bartholomew County, Indiana, and Alachua County, Florida. The living wage was

Table 4: Adjusting Daily Spending per Party Estimates for Cost of Living

Event Type	Overnight Visitors		Day-Trippers	
	Gibson et al. (2012) Original Averages	Adjusted Daily Spending per Party	Gibson et al. (2012) Original Averages	Adjusted Daily Spending per Party
Adult Marathon	$158.29	$147.74	$95.64	$89.27
Senior Games	$137.83	$128.64	$169.76	$158.45
Adult Archery	$186.81	$174.36	$123.13	$114.92
Adult Average	$160.98	$150.25	$129.51	$120.88
Youth Soccer	$216.62	$202.19	$206.45	$192.69
Youth Softball	$207.24	$193.42	$199.95	$186.62
Youth Swimming	$195.55	$182.51	$147.63	$137.79
Youth Average	$206.47	$192.71	$184.68	$172.37

Note: The cost of living adjustment figure was 0.9334 based on MIT's living wage calculator.
Source: Authors' calculations

Table 5: Calculating Total Direct Spending

Event Type	Overnight Parties			Day-Tripper Parties		
	Travel-Party Days	Cost Per Party/Day	Total Direct Spending	Travel-Party Days	Cost Per Party/Day	Total Direct Spending
Adult Marathon	-	$147.74	-	904	$89.27	$80,684
Senior Games	3,815	$128.64	$490,768	-	$158.45	-
Adult Archery	-	$174.36	-	-	$114.92	-
Adult Average	7,608	$150.25	$1,143,043	2,732	$120.88	$330,273
Youth Soccer	2,818	$202.19	$569,856	-	$192.69	-
Youth Softball	27,884	$193.42	$5,393,500	160	$186.62	$29,948
Youth Swimming	7,545	$182.51	$1,377,087	-	$137.79	-
Youth Average	2,495	$192.71	$ 480,722	373	$172.37	$64,330
Totals	52,165		$9,454,976	4,170		$505,234

Source: Authors' calculations

$33,108 for Bartholomew County and $35,472 for Alachua County—making the living wage in Columbus 93.34 percent of the living wage in Gainesville. For Columbus, adjusting the daily expenditures per party by this ratio resulted in **Table 4**.

After the number of parties and adjusted average daily spending figures were calculated for each event type, total direct spending was calculated. To do this, we used a "travel-party days" figure for each category of event, calculated by multiplying the number of travel parties at each event by the event duration, in days, then summing the results within each event category. The adjusted daily spending per party captured variations in both spending patterns and party size per event type (thus spending per party rather than spending per person). Multiplying the travel-party days figure and adjusted daily spending per party for each event type yielded the results shown in **Table 5**.

These calculations yielded a total *direct visitor* spending of **$9,960,210** for all 82 events in 2012.

Estimating the Multipliers

To estimate the revenue multiplier, we utilized Chang's (2001) model for prediction using region population and population density. Specifically, this model shows that a region's tourism sales multiplier is given by:

$$1.566 + 0.053 \times \ln(POP) - 0.009 \times POPDEN$$

where ln(POP) is the natural logarithm of the region's population, in millions, and POPDEN is population density, in thousands of persons per square mile.

In the Columbus metro (Bartholomew County), total population was 79,587 and population density was 195.6 persons per square mile.[4] Therefore, the sales multiplier computation was given by:

$$1.566 + 0.053 \times \ln(0.079587) - 0.009 \times 0.1956 = \mathbf{1.4301}$$

Table 6: Economic Impact of Amateur Sports Tourism in Columbus, Indiana

Year	Number of Events	Direct Spending	Economic Impact: Lower Bound	Economic Impact: Upper Bound	Estimated Economic Impact
2012	82	$9,960,210	$8,546,468	$9,970,879	$9,259,000
2013	49	$10,581,024	$9,079,164	$10,592,358	$9,836,000
FY 2014*	74	$11,703,137	$10,042,005	$11,715,673	$10,879,000

Note: 2014 calculation represents August 2013 to September 2014.
Source: Authors' calculations

Stynes (1997) notes that capture rates are typically between 60-70 percent. Therefore, the final demand multiplier (total spending multiplier x capture rate) is estimated to fall between:

$$0.6 \times 1.4301 < \textit{Final Demand Multiplier} < 0.7 \times 1.4301 \quad \textit{or}$$
$$0.8581 < \textit{Final Demand Multiplier} < 1.0011$$

Applying this range of multipliers to the direct spending estimate yields the following:

$$0.8581 \times \$9{,}960{,}210 < \text{Total Economic Impact} < 1.0011 \times \$9{,}960{,}210$$

$$\textit{or}\ \$8{,}546{,}468 < \text{Total Economic Impact} < \$9{,}970{,}879$$

Therefore, we concluded that the Columbus, Indiana, 2012 amateur sports tourism program generated about $9,259,000 of total economic impact in 2012, which reflects the net cash flow Columbus experienced that year arising from the annual sports tourism program.

Table 6 shows results for the 2012 and 2013 calendar years and the 2014 fiscal year.

Summary

Using the Columbus, Indiana, amateur sports program as a case study, we have presented a process of estimating economic impact requiring only a few basic primary inputs—event type, event duration and number of participants. From these, we estimated economic impact by extrapolating spending and attendance averages from existing economic impact studies, adjusting the figures as necessary using published economic data.

The nine-step process (see sidebar) provides a systematic means of estimating total attendance, average daily spending and net direct spending effects. Estimating a total sales multiplier and applying a likely range of capture rates yields a range for the estimated annualized economic impact of the amateur sports program, which can be useful for city officials when considering whether or not to invest resources into a multi-sport type, multi-event annual sports tourism program.

In choosing sources from which to extract spending and attendance figures, two key issues arise: First, in order for the extrapolated figures to even be reasonably considered for calculating economic impact, the secondary study should be comparable to the situation at hand. Second, the

Nine-Step Process for Estimating Economic Impact

1. **Gather primary data:** Gather data on event type, event duration and number of participants.
2. **Identify key secondary study:** From available literature, identify a study (or studies) of similar events with segmentation categories resembling those of the sports program being analyzed. The study should provide average party size, direct spending figures and nonlocal percentages.
3. **Segment events:** Using the segmentation from the study chosen in stage 2, assign each of the program's events to an event category.
4. **Calculate travel-party days:** For each event, multiply the number of parties by the event duration using number of participants as a proxy for number of parties.
5. **Estimate total nonlocal parties:** From a key secondary study or a similar source, retrieve estimated nonlocal attendance percentages. Multiply the total travel-party days in step 4 by this percentage for nonlocal travel-party days.
6. **Apply cost of living adjustment:** Using MIT's living wage calculator (or a similar source), calculate the ratio of the host community's living wage to the living wage of the key study's location. Apply the resulting proportion to the direct spending averages.
7. **Estimate total direct spending:** For each event, take the product of nonlocal travel-party days (step 5) and the adjusted average daily spending for that event (step 6).
8. **Estimate total spending multiplier:** Calculate the estimated spending multiplier with the following formula: $1.566 + 0.053 \times \ln(POP) - 0.009 \times POPDEN$, where ln(POP) is the natural logarithm of the region's population, in millions, and POPDEN is population density, in thousands of persons per square mile.
9. **Calculate estimated range of final demand economic impact:** Multiply direct spending by the estimated total spending multiplier. Create an economic impact range by multiplying this result by the capture rate range of 0.6 and 0.7.

level of segmentation available within the study is important. Different categories of events have significantly different spending patterns, and differentiating among age groups, event type and overnight visitors versus day-trippers allows for more accurate results.

Economic impact analysis represents an attempt to measure cash flow experienced by the host community. It is certainly in the best interest of the home communities to arrive at estimates of such community cash flow in order to approximate a return on investment for any new sport project under consideration. Using this procedure, planners should take care to select studies and data best reflecting the subject city and its sports tourism profile, which likely means keeping the comparative analysis to relatively recent studies and data from similar sporting events located in small American cities.

In describing a process for utilizing secondary information to form conclusions for the situation at hand, we do not discount the need for primary information. In fact, crucial to the process explained in this report is key information about the actual number of participants, event type and participant age group. For amateur sporting events, the type of event and event duration should be apparent; the number of participants is typically known from registration or planning data as well. While using some extent of primary data is necessary, these data typically require no special effort outside of ordinary event planning requirements.

With an emphasis on both accuracy and practicality, the process outlined in this article provides a systematic method of estimating economic impact when money is not available to spend on surveys and economic models. The nine-step process details a specific protocol for estimating economic impact using secondary studies and available data. The key contribution of this study is relieving city planners of their reliance upon event surveys and city input-output models. ❑

Notes

1. Examples include: Michael J. Mondello and Patrick Rishe, "Comparative Economic Impact Analyses: Differences across Cities, Events, and Demographics," *Economic Development Quarterly* 18, no. 4 (2004): 331-342; and Margaret J. Daniels, "Central Place Theory and Sport Tourism Impacts," *Annals of Tourism Research* 34, no. 2 (2006): 332-347.
2. D. J. Stynes, *Economic Impacts of Tourism: A Handbook for Tourism Professionals* (Urbana, IL: University of Illinois, Tourism Research Laboratory, 1997), 1-32.
3. Amy K. Glasmeier, "Living Wage Calculator," Massachusetts Institute of Technology, http://livingwage.mit.edu/.
4. Data retrieved from STATS Indiana (www.stats.indiana.edu/).

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Industry Clusters and Economic Development

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For more than two decades, policymakers and economic development professionals have stressed the importance of encouraging and supporting industry clusters to promote job creation and economic growth.

A cluster-based approach starts with the industries and assets that are already present in the region and regional stakeholders pursue initiatives to make those industries better. An approach for creating entirely new clusters in a region is a strategy to improve overall business environment conditions, by upgrading skills, access to finance and infrastructure, by streamlining government rules and regulations, by supporting local demand, and by being open to foreign investment and competition.

While clusters of industries that are present in a region do not necessarily need public sector strategies in order to exist—the industries cluster regardless—the right policies and strategies can help the businesses within a cluster become more successful and competitive. A cluster-based strategy is not, in other words, necessarily organized around attracting large entities from elsewhere.

What Makes a Cluster?

Simply put, industry clusters are regional concentrations of related industries. Clusters consist of companies, suppliers and service providers, as well as government agencies and other institutions that provide education, information, research and technical support to a regional economy. One might say that clusters are a network of economic relationships that create a competitive advantage for the related firms in a particular region. This advantage then becomes an enticement for similar industries and suppliers to those industries to develop or relocate to a region.

Think of it this way: if you wanted to relocate your smartphone application development company from your basement in Loogootee, would you move it to Vermont or to the Bay Area? On the other hand, if you made artisanal cheeses in your barn out back and wanted to expand, would you move to the Bay Area or Vermont? Whether you know it or not, your decision on relocation is informed by the presence of strong industry clusters.

Developing industry clusters has become a key goal for regional economic development as clusters have been shown to strengthen competitiveness by increasing productivity, stimulating innovative new partnerships, even among competitors, and presenting opportunities for entrepreneurial activity.[1] Michael Porter and others have identified which industries tend to cluster together. This serves as the analytical foundation for cluster-based economic development strategies that may target certain types of industries to locate in a region to strengthen a cluster, or they may target regional resources to help bolster a developing cluster. A cluster-based development strategy may not be easy or quick to implement, but the supporting argument is that it beats a piecemeal or scattershot approach to generating jobs. Instead of looking at specific industries or types of companies, cluster analysis detects the potential spillovers of technology, skills and information that cut across industries, workers and resources.[2]

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The Economic Impact of Clusters

Cluster-based strategies have an economic rationale and, for the sake of argument, let's operate under the assumption that the approach will endure. The question then becomes, what else does an economic development practitioner need to know? We posit that applying the cluster framework to economic impact studies can provide a more comprehensive picture of the potential benefits of a cluster-based strategy.

Economic impact studies typically ask the question: if Production Plant Z with 100 workers is located in Acornville, how many more jobs will be created in the region?[3] The size of the regional impact depends on the industry for Production Plant Z. If it is a food processing plant, the workers may not be as well compensated compared to a gas turbine assembly plant. In other words, just as all employment multipliers are not the same industry to industry, employment multipliers vary based on a type of cluster.

One of the benefits of clusters is that they are easier to get one's hands

around. It is a more manageable set than detailed industries. There are some 450 industries in a detailed input-output table, which is the table of industry inter-relationships used to estimate the economic impact of an economic event (like establishing a new production plant). Meanwhile, there are 67 industry clusters. While there are more clusters than can easily fit on a page, the greatly reduced set makes analysis and results easier to absorb for the average analyst, policymaker or practitioner.

The 67 clusters are grouped into two large categories: "traded" (51 clusters) and "local." Local relates to those industries that generally serve the regional population, including health care, food services, residential construction or personal services. While these local clusters may be very interrelated, may share workers and are important for the well-being of the local population, they don't inject money into the local economy. Traded industries, on the other hand, do inject money into the local economy. Traded industries, generally speaking, make for and sell to those outside the local economy. Economic impact studies are generally focused on traded industries.

IBRC researchers assigned the full set of 450 "economic impact" industries into the 67 clusters to determine which industry clusters would have the greatest effect on the economic development of a region. Put another way, an attempt to draft a regional economic development strategy by assessing the potential economic impact of some 450 individual industries would be overwhelming. The attempt to convey the potential impact of a new project—say a new production plant—on 450 industries runs the risk of overloading economic development practitioners with too much information. Furthermore, this level of disaggregation may overlook the linkages and profitable connections between industries within the same cluster.

Using the Porter cluster aggregation scheme, IBRC researchers estimated output, employment and total value added multipliers for a five-county region in south central Indiana[4] together with the state of Indiana and the entire nation. If the five counties comprised a region that was in the process of coordinating their economic development strategy and efforts—these five counties are more of a hypothetical than a real region with a common development strategy—then the magnitude of the multipliers could be one of many criteria for defining the focus of their partnership.

The larger the multiplier, the larger the ripple effects for a particular industry cluster. For example, an employment multiplier of 1.9 in the medical devices cluster suggests that for every 10 employees hired in that cluster, another 9 jobs would be created in the region in this and other clusters (both traded and local).

The Role of Regional Purchase Coefficients

It is important to note that due to variations in how much of the regional consumption of inputs (for example, a raw material like wood for making furniture) can be supplied by regional production—a measure called the regional purchase coefficient—multipliers for one particular industry or cluster can vary greatly between regions. The regional purchase coefficient (RPC) is the proportion of the total demand for an input by all users in the study area that can be supplied by producers located within the study area.

For example, if the RPC for hardwood is 0.4, then 40 percent of the local demand for hardwood can be met by local loggers and millworks, while 60 percent of the demand for hardwood must be satisfied from outside the region. Multipliers increase as the region expands in scope because as the geographic area expands, it becomes increasingly likely that a region can supply its own inputs. Thus, national multipliers are larger than state multipliers, and these in turn are larger than the multipliers of the five-county, south-central Indiana region.

Employment Multipliers by Cluster

Table 1 shows the 10 clusters with the largest employment multipliers for the five-county region. The upstream chemical products cluster—which includes petrochemical

Table 1: Top 10 Clusters by Regional Employment Multiplier

Cluster Name	Regional Employment Multiplier	State Employment Multiplier	National Employment Multiplier
Upstream Chemical Products	4.4	4.5	21.7
Biopharmaceutical	3.5	5.6	8.7
Music and Sound Recording	3.2	4.0	7.8
Food Processing and Manufacturing	2.9	4.0	7.8
Upstream Metal Manufacturing	2.6	4.1	7.2
Electric Power Generation and Transmission	2.5	3.0	4.9
Downstream Chemical Products	2.4	3.5	7.6
Communications Equipment and Services	2.4	2.9	4.9
Aerospace Vehicles and Defense	2.1	2.8	5.5
Information Technology and Analytical Instruments	2.1	2.6	6.3

Source: Indiana Business Research Center

manufacturing, industrial gas manufacturing, basic organic chemical manufacturing, as well as synthetic rubber manufacturing—leads the regional employment multiplier ranking. This 4.4 employment multiplier indicates that for every 10 employees hired in that cluster, another 34 jobs are created in other clusters (both local and traded). These jobs may be created in other industries and clusters that supply upstream chemical production, and a large share of the jobs created would be generated locally to help provide goods and services—health care, auto repair and kitchen renovations, for example—to those 10 new workers.

Another cluster that would have considerable employment ripple effects in the area is the biopharmaceutical cluster.

As expected, for each cluster, all the state employment multipliers are slightly larger than the regional multipliers, and the national multipliers are even larger still. The relative size of the multiplier can provide some insights into the regional and state economy. If the multipliers are similar, then it is likely that the two areas share a similar density of firms and industries that can supply a particular cluster. On the other hand, if the multipliers differ greatly, then one area may lack a critical link in a supply chain that would require sourcing an input from outside the region.

Of course, before committing to any industry or cluster-based development strategy, one would have to do more homework to determine any potential snags in the availability of resources and inputs, just as one would also evaluate the depth and breadth of a region's labor shed before landing on a set of target industries. The purpose of knowing the cluster multipliers is to hint at which clusters may be more favorable to investigate further.

As stated above, the national multipliers are largest because of greater breadth, depth and geographic scope of a cluster or an industry's supply chain. One may wonder, however, why the upstream chemicals production has such a large multiplier. This large value reflects several important features of the cluster:

1. There are industries in this cluster that are not present in Indiana and some of those industries have very large multipliers. So, the industry mix, or profile, of a state will influence the size of an industry's, or cluster's, multiplier.
2. There is a massive capital requirement for plant and equipment. The physical scale of a chemical plant can be awe-inspiring, and much of that equipment may not be sourced within a region.
3. That massive complex requires a lot of maintenance and repair. There is a lot of money spent on contractors to supply the labor and materials to maintain these facilities.
4. Despite the size of the plant and equipment, relatively few workers are needed to operate the plant compared to an assembly plant or slaughterhouse. In other words, the denominator is relatively small.
5. The workers, both production and engineering, tend to be well compensated compared to those working in many other lower-skilled occupations. This contributes to a greater number of "induced" employment—jobs generated to serve local needs—for every job added in upstream chemicals as opposed to, say, food processing.

An appendix at www.ibrc.indiana.edu/ibr/2015/spring/appendix.xls presents the entire list of traded and local cluster multipliers for Indiana. (Note that local clusters tend to have lower multipliers.)

Conclusion

In recent years, there has been much talk about cluster-based economic development strategies. The purpose of this article is to provide a quick overview of the theory and to provide economic development practitioners some numbers to contemplate and possibly apply as they consider drafting and implementing cluster-based economic development strategies.

What we see is that all clusters are not created equal in terms of employment effects. We have also broached the issue that targeting one cluster over another would depend on the supply chain and workforce requirements. This latter work must be carefully done. It can't be done in a brief article. But, we hope, that this material will help enrich the conversations that will ultimately result in a sound application of cluster-based economic development strategies. ❑

Notes

1. M. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review*, November 1, 1998.
2. "Clusters 101," U.S. Cluster Mapping, www.clustermapping.us/content/clusters-101.
3. The opposite question is also asked: if Production Plant X with 100 workers closes, what will the economic ripple effects be in terms of jobs or regional income?
4. This region was constructed to anticipate the possible economic effects and linkages of the completion of Interstate-69 and is instructive for showing how multipliers get larger as the region of analysis gets larger.

View the entire list of traded and local cluster multipliers for Indiana at www.ibrc.indiana.edu/ibr/2015/spring/appendix.xls.