The Economic Impact of

Kosciusko County's Orthopedics Industry

April 2011

KELLEY SCHOOL OF BUSINESS
INDIANA UNIVERSITY
Indiana Business Research Center

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Dear Reader:

In 2009, a new community-based organization, OrthoWorx, was founded to work with the Warsaw, Indiana-based orthopedic industry cluster and community stakeholders to leverage the region's considerable assets.

Specifically, OrthoWorx was created to focus on target areas that were defined in a study conducted by BioCrossroads, Indiana's statewide life sciences organization.

The BioCrossroads study found that the Warsaw region clearly deserves the title "Orthopedic Capital of the World." According to the report, in 2009, the Warsaw region's orthopedic device manufacturing, supply and technical service companies together generated approximately $11 billion in annual revenues, which represented approximately 50 percent of the U.S. market share and 33 percent of the global market in 2009. The study noted that the Warsaw, Indiana orthopedic device cluster is "one of the most concentrated centers of economic activity anywhere in the United States."

In the pages that follow, we quantify the ways this industry cluster contributes to the region's and the State of Indiana's economic vitality.

Sincerely,

D. Bradley Bishop
Executive Director

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Executive Summary

Kosciusko County's orthopedic industry cluster makes a significant contribution to the regional and state economy. The county's orthopedics manufacturers employ approximately 6,800 workers, representing nearly one in every four jobs in the county. This level of employment ranks alongside Orange and Los Angeles counties in California, and Minneapolis, Minnesota, as the largest medical device work forces in the country. (The broader medical device industry is used to compare geographic regions outside of Indiana.) The industry also boosts Indiana's average income per capita. The average annual wage for the county's medical device workers is more than $10,000 greater than the state or national averages.

The data tell only part of the story. Kosciusko County's orthopedics manufacturers are export powerhouses, injecting dollars into the Indiana economy. These firms rely on an extensive network of suppliers, many of which are located in the county or elsewhere in Indiana. The employees of these firms and their suppliers generate additional economic activity when they spend their earnings. The economic ripple effects of Kosciusko County's orthopedics manufacturers are felt throughout the state.

This report presents the results of an input-output analysis designed to capture the broad economic impact of this industry. The report outlines the contributions this industry makes in terms of economic output, employment and government revenues.

- The Kosciusko County orthopedics industry generated an estimated $2.4 billion in direct output in 2009. (Direct output is the economic concept for the value of local production only. It is not equivalent to sales. A company's global sales includes the value of production from facilities located elsewhere and marketing and transportation margins.) Within the county, the ripple effects of this output supported an additional $742 million in economic activity to bring the total "footprint" of this industry to nearly $3.1 billion, 44 percent of Kosciusko County's total output.
- The ripple effects throughout the state of Indiana spurred an additional $581 million in economic activity. The total economic impact of Kosciusko County's orthopedic establishments on the state was an estimated $3.7 billion in 2009, nearly 1 percent of Indiana's total economic output.
- The combined effects of the orthopedic industry generate 13,000 jobs in Kosciusko County, which accounts for 43 percent of the county's employment. Statewide, the industry's total employment footprint is 16,700 jobs.
- Between 2003 and 2009, the county's employment in medical devices jumped 37 percent, or 1,800 jobs. An explosion compared to the growth in employment the medical device industry nationally.
- For every dollar of orthopedic manufacturing output, an additional $0.31of economic activity is generated in Kosciusko County and, statewide, an additional $0.55.
- The total economic activity attributed the county's orthopedics industry produced an estimated $114 million in state and local government revenues in 2009.

In making these estimates for economic impact, researchers took a conservative approach. These figures do not include the spending of retired industry employees or a dollar value of the contributions these companies or their employees make through philanthropy or volunteer service. Similarly, researchers did not quantify "intangibles," such as how an industry-leading cluster contributes to the reputation of Kosciusko County or the state. Simply put, there are many benefits that these companies bring to Kosciusko County and to Indiana that are not easily expressed in terms of dollars or jobs

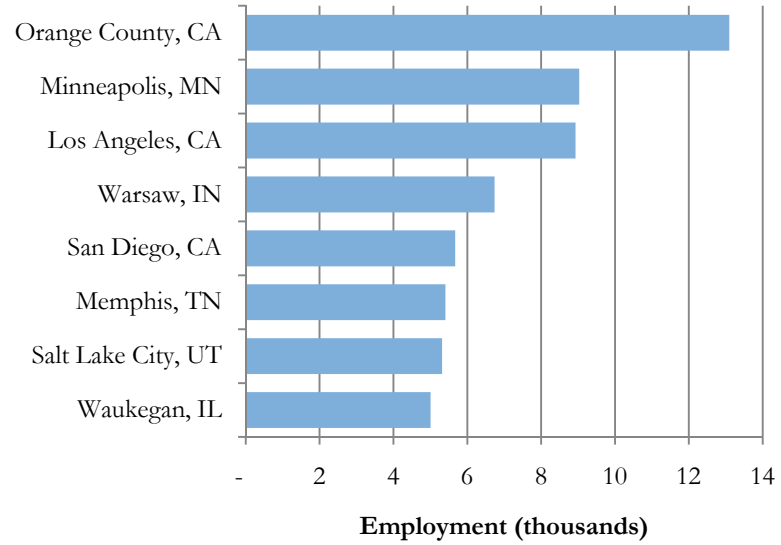
Industry Overview

Kosciusko County has perhaps the largest concentration of orthopedic firms in the country. Industry giants like Zimmer, DePuy and Biomet headline the cluster, yet they are not the only players. In all, Kosciusko County is home to 17 orthopedic manufacturing establishments. These establishments combine to employ approximately 6,800 workers, accounting for 23 percent of the county's total employment.

For the purposes of data reporting, orthopedic manufacturers are classified in the "medical equipment and supplies" industry (medical devices). In Kosciusko County, where the medical device industry consists almost exclusively of orthopedic firms, the terms medical devices and orthopedics are practically synonymous. IBRC researchers estimate that there are 7,300 workers in the orthopedics industry statewide, roughly 36 percent of Indiana's total medical device industry. However, because public data sources do not distinguish the orthopedics segment from the rest of the medical devices industry, researchers have no way to estimate the orthopedic-specific data for other areas. Therefore, in order to make geographic comparisons, researchers present data from the broader medical device industry.

As **Figure 1** highlights, Kosciusko County is one of only four counties in the nation with medical device industry employment in excess of 6,000. What sets Kosciusko County apart from these communities (or any other community in the country), is its concentration of medical device employment. The most common measure of regional industry specialization is the location quotient (LQ). In this instance, the LQ is a ratio comparing the medical device industry's share of total employment in a county to the corresponding share for the nation. Kosciusko County had a medical device employment LQ around 80 in 2009, meaning that this industry's employment is 80 times more concentrated locally than it is nationally. To put this number in perspective, Owen County, Indiana, had the next highest LQ at 30 followed by Queensbury, New York, and McMinnville, Oregon, with each around 17.

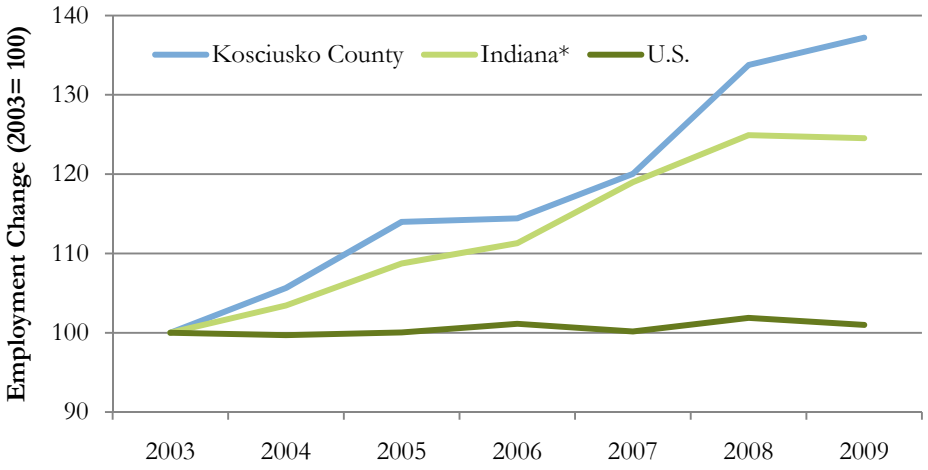
Figure 1: Medical Device Employment in 2009, Largest Counties*



*These are county level data. However, in most cases, the counties are referred to by a more familiar city name.
Source: IBRC, using data from Moody's Economy.com

Kosciusko County's medical device firms have also had impressive employment growth in recent years. Between 2003 and 2009, the county's medical device employment jumped 37 percent from roughly 5,000 jobs to 6,800. As **Figure 2** illustrates, this growth rate outpaced the remainder of Indiana and the U.S. over this period. Employment growth in Kosciusko County and in Indiana is particularly noteworthy given that medical device employment in the U.S. has been essentially flat in recent years.

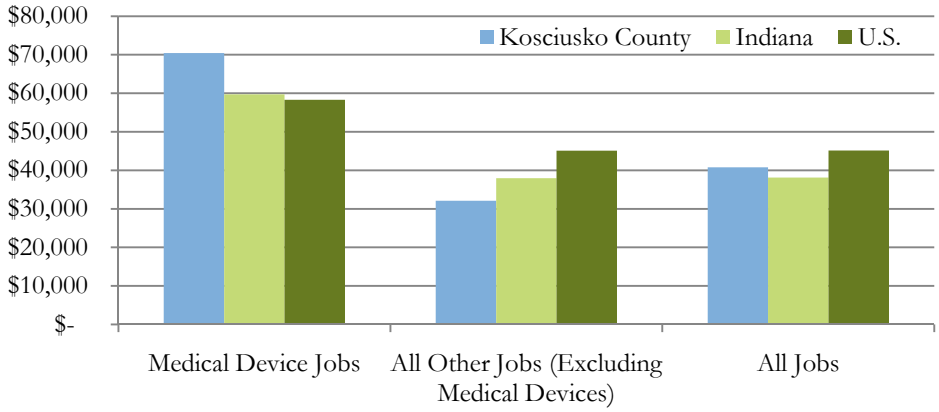
Figure 2: Medical Device Employment Change Index, 2003 to 2009



*Indiana's figures exclude Kosciusko County's employment.
Source: IBRC, using Bureau of Labor Statistics data

The wages associated with the county's medical device jobs also outpace the state and national averages. As **Figure 3** shows, the average annual wage for a medical device job in Kosciusko County was more than $70,000 in 2009. This mark was nearly $11,000 greater than the Indiana average and more than $12,000 above the U.S. figure. Wages in the county are no doubt buoyed by the presence of headquarters for companies such as Zimmer, DePuy and Biomet. This means that in addition to the production positions created by this industry, Kosciusko County has the full range of professional jobs that accompany headquarters operations.

Figure 3: Average Wage per Medical Device Job and All Jobs, 2009



Source: IBRC, using Bureau of Labor Statistics data

Economic Impact Estimates

The economic effects of the Kosciusko County orthopedics industry extend beyond the cluster of firms detailed previously. The economic activity spurred by the orthopedic industry's purchase of goods and services—along with the household spending of employees—cascade throughout the local and state economies. In order to estimate these effects, researchers used the IMPLAN economic modeling software to conduct a standard input-output analysis of the county's orthopedics industry. This model provides a detailed account of the structure of Kosciusko County's economy as well as that of the state.

For instance, the IMPLAN model indicates that roughly 33 percent of the production inputs and services required by the local orthopedics industry (measured in dollars) are provided by other Kosciusko County establishments. Looking statewide, Indiana firms meet nearly half of the industry's supply chain needs. The estimated economic effects of these purchases are captured in the "indirect effects" columns of the tables below. Additionally, the employees of Kosciusko County's orthopedic firms—as well as employees throughout the supply chain—spend their earnings on clothing, home furnishings, food, entertainment, etc. The estimated ripple effects of this spending are represented in the "induced effects" columns.[1]

Economic Output Effects

Orthopedic firms in Kosciusko County had an estimated $2.4 billion in economic output in 2009.[2] As **Table 1** shows, this level of output generated $742 million in additional economic activity in Kosciusko County to bring the industry's total economic "footprint" in the county to $3.1 billion. According to the IMPLAN model, the orthopedic industry's total footprint accounts for 44 percent of all economic output in Kosciusko County. A useful way to interpret these effects is to look at the multiplier. The ratio of total effects to direct effects yields a multiplier of 1.31 meaning that each dollar of output generated by the local orthopedic industry stimulates another $0.31 in economic activity in Kosciusko County.

The county's orthopedic firms have an even larger impact on Indiana since a sizeable portion of the industry's supply chain is located elsewhere in the state. The industry's purchase of goods and services in other areas of the state spurs an additional $581 million in economic output. Therefore, the Kosciusko County orthopedic industry's total economic footprint in Indiana stands at nearly $3.7 billion. This figure accounts for nearly 1 percent of all economic activity in the state, according to the IMPLAN model. The multiplier of 1.55 indicates that every dollar of sales for these firms results in an additional $0.55 in sales throughout the state.

[1] See the appendix for a more detailed explanation of the key terms used in this report

[2] Note that in terms of input-output analysis, economic output is conceptually different from company sales. Kosciusko County's orthopedic firms combine to generate an estimated $11 billion in annual sales. However, some of the larger firms operate many facilities around the world so only a portion of their total activity can be assigned to Kosciusko County when measuring economic impact. Therefore, the $2.4 billion in direct output for Kosciusko County represents only the estimated dollar value of all Kosciusko County-*based* orthopedic industry activity.

Table 1: Economic Footprint of Kosciusko County's Orthopedic Firms, 2009 ($ millions)

Economic Output	Direct Effects	Indirect Effects	Induced Effects	Total	Multiplier
Kosciusko County	$ 2,385	$ 393	$ 349	$ 3,126	1.31
Rest of Indiana	-	$ 283	$ 298	$ 581	-
Indiana Total	$ 2,385	$ 676	$ 647	$ 3,707	1.55

Source: IBRC, using results from the IMPLAN modeling software

Employment Effects

Table 2 highlights the estimated employment effects created by the county's orthopedics firms. In addition to the 6,800 direct employees in the county's orthopedic firms, the purchase of production inputs from local suppliers supports an estimated 2,600 jobs in the county. The household spending of these direct and indirect employees generate another 3,600 jobs locally. The ratio of total employment effects to the orthopedic industry's direct employment gives a multiplier of 1.9, meaning that every ten jobs in the orthopedics industry support an additional nine jobs in Kosciusko County. Employment multipliers tend to be higher than output multipliers since household spending supports many part-time and low-wage jobs in industries such as entertainment, food service and retail.

Purchases from suppliers and household spending elsewhere in Indiana create an additional 3,700 jobs. All told, the statewide employment footprint of Kosciusko County's orthopedic firms is 16,700 jobs. With an employment multiplier of 2.5, each local orthopedics job translates to an additional 1.5 jobs in Indiana.

Table 2: Employment Footprint of Kosciusko County's Orthopedic Firms, 2009

Employment	Direct Effects	Indirect Effects	Induced Effects	Total	Multiplier
Kosciusko County	6,800	2,600	3,600	13,000	1.9
Rest of Indiana	-	1,600	2,100	3,700	-
Indiana Total	6,800	4,200	5,700	16,700	2.5

Source: IBRC, using results from the IMPLAN modeling software

Tax Effects

The direct, indirect and induced economic activity created by Kosciusko County's orthopedic firms also generate state and local government revenues, primarily through indirect business taxes. The IMPLAN model calculates tax revenue estimates from corporate profit taxes, indirect business taxes (e.g., sales, property and excise taxes), personal taxes (e.g., income and property taxes) and employer and employee contributions to social insurance. **Table 3** indicates that the industry's Kosciusko County activity alone generates an estimated $93 million in state and local annual revenues. Expanded statewide, the total tax effect jumps to an estimated $114 million annually.

Table 3: State and Local Tax Effects, 2009 ($ millions)

Tax Effects	Indirect Business Taxes	Personal Taxes	Corporate Taxes	Social Insurance Taxes	Total
Kosciusko County	$ 46.4	$ 27.2	$ 18.2	$ 0.7	$ 92.6
Rest of Indiana	$ 15.9	$ 3.4	$ 1.8	$ 0.8	$ 21.8
Indiana Total	$ 62.3	$ 30.6	$ 20.0	$ 1.4	$ 114.4

Source: IBRC, using results from the IMPLAN modeling software

Conclusion

The importance of Kosciusko County's orthopedic manufacturers is clear. The total effects of these companies account for nearly half of the county's economic output and employment. Additionally, the high wages associated with this industry helped place Kosciusko County 10th out of Indiana's 92 counties in terms of average wage per job in 2009.

At the state level, the economic impact of the county's orthopedic industry stands at 16,700 jobs, $3.7 billion in annual economic output and $114 million a year in state and local government revenue. Furthermore, these firms combine with other Indiana companies such as Cook and Hill-Rom to form one of the strongest medical device industries in the country. Kosciusko County itself represents the epicenter of global orthopedics manufacturing.

Perhaps the best news for Kosciusko County and for the state is that this industry continues to grow. The county's orthopedic establishments have added nearly 1,900 jobs since 2003. As we've seen, any expansion in this industry has significant positive ripple effects throughout the local and state economy. Therefore, the continued health of this industry and its growth within the state will be an important economic indicator to watch in the coming years.

Appendix

Key Terms

Direct Effects: Refers to the increase in final demand or employment in a geographic region that can be attributed specifically to Kosciusko County's orthopedic establishments.

Indirect Effects: A measure of the change in dollars or employment caused when the orthopedic industry increases its purchase goods and services from suppliers and, in turn, those suppliers purchase more inputs and so on throughout the economy. An orthopedics firm, for instance, will buy metal or plastic components from a supplier. The manufacturers of those components buy electricity to power their plants, buy material inputs for those components, and employ people to run the equipment. These transactions are the indirect ripple effects associated with the orthopedic industry's purchases.

Induced Effects: These reflect the changes—whether in dollars or employment— that result from the household spending of employees in the orthopedics industry and its suppliers. Induced spending will increase or decrease as output changes along the economic supply chain. For example, as an orthopedics firm's production and sales increases, the output of its supply chain increases correspondingly. Those output changes also result in changes in household income and spending of suppliers' employees. Induced effects represent the change in overall economic output and employment resulting from such household spending changes.

Total Effects: The total of all economic effects is the size of the economic impact and is the sum of the direct, indirect and induced effects. The IMPLAN model also tracks the tax effects associated with all the transactions and economic activity associated with the direct and ripple effects. For example, household spending at retailers generates state sales tax. In addition, those retailers also pay property taxes to local governments. As a result, this analysis was also able to estimate the state and local government tax flows.

Multiplier: The multiplier is the magnitude of the economic response in a particular geographic area associated with a change—either an increase of a decrease—in the direct effects. For example, every dollar of Kosciusko County's orthopedic industry output is estimated to be multiplied by about 1.31. Another way to look at it is that every dollar of output supports $0.31 in additional economic activity in Kosciusko County.

Output: The value of an industry's total production. Output includes both the price of production inputs and the value-added of the industry.

About IMPLAN Economic Impact Modeling Software

Minnesota IMPLAN Group, Inc. (MIG) is the company responsible for developing IMPLAN data and software. Using classic input-output analysis, IMPLAN can be used to measure the economic effects of an economic event, such as a factory closing or a new plant opening, or the size of the economic footprint of an economic entity like a production facility, headquarters or university.

The economic theory behind IMPLAN

IMPLAN is built on a mathematical input-output (I-O) model that expresses relationships between sectors of the economy in a chosen geographic location. In expressing the flow of dollars through a regional economy, the input-output model assumes fixed relationships between producers and their suppliers based on demand. It also omits any dollars spent outside of the regional economy—say, by producers who import raw goods from another area, or by employees who commute and do their household spending elsewhere.

The idea behind input-output modeling is that the inter-industry relationships within a region largely determine how that economy will respond to economic changes. In an I-O model, the increase in demand for a certain product or service causes a multiplier effect, layers of effect that come in a chain reaction. Increased demand for a product affects the producer of the product, the producer's employees, the producer's suppliers, the supplier's employees, and so on, ultimately generating a total effect in the economy that is greater than the initial change in demand. Say demand for Andersen Windows' wood window products increases. Sales grow, so Andersen has to hire more people, and the company may buy more from local vendors, and those vendors in turn have to hire more people… who in turn buy more groceries. The ratio of that overall effect to the initial change is called a regional multiplier and can be expressed like this:

(Direct Effect + Indirect Effects + Induced Effects) / (Direct Effect) = Multiplier

Multipliers are industry and region specific. Each industry has a unique output multiplier, because each industry has a different pattern of purchases from firms inside and outside of the regional economy. (The output multiplier is in turn used to calculate income and employment multipliers.)

Estimating a multiplier is not the end goal of IMPLAN users. Most wish to estimate other numbers and get the answers to the following questions: How many jobs will this new firm produce? How much will the local economy be affected by this plant closing? What will the effects be of an increase in product demand? Based on those user choices, IMPLAN software constructs "social accounts" to measure the flow of dollars from purchasers to producers within the region. The data in those social accounts will set up the precise equations needed to finally answer those questions users have—about the impact of a new company, a plant closing, or greater product demand—and yield the answers.

IMPLAN constructs its input-output model using aggregated production, employment, and trade data from local, regional, and national sources, such as the U.S. Census Bureau's annual *County Business Patterns* report, and the U.S. Bureau of Labor Statistics' annual report called *Covered Employment and Wages*. In addition to gathering enormous amounts of data from government sources, the company also estimates some data where they haven't been reported at the level of detail needed (county-level production data, for instance), or where detail is omitted in government reports to protect the confidentiality of individual companies whose data would be easily recognized due to a sparse population of businesses in the area.

IMPLAN's accessibility and ease of use also make it a target of criticism by some economists, who charge that in the wrong hands, the software—or any input-output model—will produce inflated results at best, and at worst, completely ridiculous projections. Anyone can point and click their way to an outcome without fully understanding the economics in which the tool is grounded and without knowing how to look at data sets with a nuanced eye. The IBRC has two analysts that have attended advanced training in the use of the IMPLAN modeling software. The estimates that the IBRC analysts generate are pressure-tested and triple-checked to ensure that they are accurate and reflect the most trustworthy application of the modeling software. In all instances, the most conservative estimation assumptions and procedures are used to produce the IMPLAN results.