# Pilot Study: Estimating Rural and Urban Minnesota's Interdependencies

*Kate Searls*
*Minnesota Rural Partners, Inc.*

**We thank the United States Department of Agriculture Rural Development for their support of the Minnesota rural urban partnering project, undertaken by Minnesota Rural Partners, Inc. from October 2009 through April 2011. This rural urban interdependencies analysis is one part of that larger project. Our thanks go, as well, to the Blandin Foundation for their support in the production of this document.**

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# A Rural Urban Partnering Framework

*"Rural development is much more than agriculture development; it entails real linkages to local, national and international resources, markets, distribution, services and enterprises. Similarly, in the real world, urban development, which is sustained by rural production of food, industrial crops and natural resources, has never occurred in isolation of rural development. These observations are sufficient by themselves to suggest the need for better understanding of the nature, including costs and benefits that flow from rural-urban linkages and their interaction."*

**Rural-Urban Linkages: An Emerging Policy Priority,** *The United Nations Development Programme, Bureau of Development Policy, September 2000 p. 54*

## Minnesota Rural Urban Connections
## We are all in this together!

In Minnesota today, as in many states across the nation, rural and urban lines continue to blur — spatially, culturally and economically. Instead of continuing to treat these interdependent places, people and economies as separate entities, Minnesota Rural Partners, Inc. (MRP) believes more can be gained – socially and economically – by intentionally building a rural urban partnering framework that supports existing partnerships and spurs many more new connections, coordination and collaboration for the benefit of all.

Since October 2009, MRP has been co-hosting a national pilot initiative, with USDA Rural Development Rural Business - Cooperative Service to document and leverage the power of rural urban connections and resource sharing to foster increased innovation and job and wealth creation for the state as a whole. This pilot project concludes in April 2011.

The work builds on years of efforts that MRP, Inc. has organized in resource coordination and sharing, rural entrepreneurship development and community informatics across Minnesota, working originally as Minnesota's state rural development council beginning in the mid 1990s.

This report—*Pilot Study: Estimating Rural and Urban Minnesota's Interdependencies*—represents a critical portion of the pilot initiative, as it quantitatively illustrates the economic importance of rural Minnesota to all of Minnesota's economic health and well being. The report is particularly successful in showing how urban Minnesota benefits, or loses, when rural Minnesota prospers or declines. The pilot study provides measures of how rural urban linkages drive wealth and innovation in a state's economy.

## In addition to this report, the pilot initiative has spurred:

- Minnesotans talking and thinking about the interdependence between rural and urban areas, as well as future opportunities arising from stronger rural urban connections. This was accomplished through a series of videoconferences connecting every region of the state from January to April 2010, followed by a face-to-face Rural Urban Gathering in June, 2010, alongside the Symposium on Small Towns hosted in Morris, Minnesota. The outreach was supported by our project blog, Rurb.Mn, organized with assistance from MinnPost.com.
- An interactive map of existing rural urban connections developed with the help of individual Minnesotans, businesses, agencies, nonprofits, economic development groups, academic institutions, foundations, associations and related groups. The map provides a detailed online inventory and mapping of the partnering already occurring to show its strength, breadth and depth, and the economic, demographic and cultural factors at work, and spotlight opportunities for other helpful connections and partnering. Being able to see the existing connections increases understanding of the depth and dynamics of the linkages between rural and urban Minnesota and our inherent interdependence.
- Renewal of a framework for rural urban partnerships that can lead to new connections, coordination and collaboration to benefit the state. This includes the formation of a Rural Urban Partnering Steering Committee to further develop the evolution and governance of a Rural Urban Partnering Framework that could more intentionally leverage rural urban connections to help Minnesota thrive.

Our aim is to develop more focused rural–urban coordination and resource sharing and to spur innovation and wealth creation in a host of development arenas. We are working to build a solid foundation of urban allies for rural policy development and advocacy so that rural Minnesota is not an afterthought in state policymaking but front and center as a key economic and social engine for Minnesota's current and future economic growth.

We are grateful for the financial support of the United States Department of Agriculture to carry out this project, and for the support and encouragement we received early on and throughout this project from USDA Deputy Under Secretary for Rural Development, Victor Vasquez, and USDA's Minnesota State Director of Rural Development, Colleen Landkamer.

I am personally thankful for the assistance we received from the MRP, Inc. board members, and my colleagues on this project: Deb Miller Slipek, Emily Kissane, Kate Searls, Linden Weiswerda, Christy James and Pam Matchie, without whom this project would not have been attempted or completed.

*Jane Leonard, former president of Minnesota Rural Partners, Inc. and instigator of the Rural Urban Connections project, November 2010*

# Overview

This pilot study begins by using cluster analysis tools provided by The Innovation in American Regions Project to arrive at estimates of the distribution of jobs between the Twin Cities region (urban) and the rest of Minnesota (rural). We next selected one cluster (manufacturing) and conducted input-output analysis (using IMPLAN software) to arrive at estimates of the linkages between rural and urban businesses and economies. Finally, we compared two clusters (manufacturing and agribusiness) in terms of the nature of their rural urban linkages and their general contributions to economic vitality for Minnesota as a whole. We are aware that there are numerous ways in which this research could be improved and should be extended (although we do not have the funding to do so at this time). However it is clear that this approach has enormous value for improving understanding of how and when rural urban linkages drive wealth and innovation in a state's economy.

***"… there is a high degree of connectedness between metropolitan and rural America. No bright lines separate the two types of areas, either geographically or economically. If metropolitan American is to drive national prosperity, metropolitan areas will need a healthy and sustainable rural economy and culture. Likewise, if rural America is to flourish, it will surely depend on vibrant, well-functioning cities and suburbs."***

***Brian Dabson,* Rural-Urban Interdependence: Why Metropolitan and Rural America Need Each Other, *A Background Paper Prepared for The Blueprint for American Prosperity, Metropolitan Policy Program at The Brookings Institute, November 2007, p. 3.***

# Acknowledgements

Our research effort owes a great deal of gratitude to Dr. William Lazarus of the University of Minnesota's Applied Economics Department. Dr. Lazarus provided substantial critical expertise in structuring and running the IMPLAN model and provided valuable professional insights at a number of important points during the project.

Additional thanks are due to Brigid Tuck and David Nelson, of the University of Minnesota's Extension Service, Regional Office in Mankato, Minnesota, Neil Linscheid of the University of Minnesota's Extension Service, Regional Center in Marshall, Minnesota, Dr. Elton Mykerezi and Dr. Laura Kalambokidis and Dr. Tom Stinson, all of the University of Minnesota's Applied Economics faculty.

Christine Nolan, Indraneel Kumar and Victoria Nelson at Purdue's Center for Regional Affairs provided important insights into the working of the Innovations in American Regions Project cluster data and tools.

Lee Munich of the University of Minnesota's Humphrey Institute for Public Affairs and Burke Murphy of Minnesota's Department of Employment and Economic Development contributed insights regarding cluster analysis in theory and in practice.

Thanks also to Laura French and Bob Keller who influenced both the content and the look of this report through their expert editorial and graphic design skills.

Any and all errors are the responsibility of Kate Searls.

# Executive Summary

***I grew up in southern Minnesota but lived in the Twin Cities and Washington D.C. during my college years. I loved the experience, but my choice was {to return to} living in southern Minnesota. My home is on a farm near Truman, my business is in Fairmont, but the market for our products is national.***

***Perhaps my company is unique, or it is because our products bridge the gap between rural and urban on many levels – that I feel no barriers. We have subscribers from the Twin Cities and across the country. We have writers from the Twin Cities and across the country. We publish stories about people across the country. It didn't matter to Rosalynn Carter that our magazine,* Caregiving in America *was published in southern Minnesota, she still wanted to be a part of it. Nor has it mattered to any national organization wanting to participate.***

*Kay Sauck, President, Sauck Media, Fairmont, MN at one of eight MRP, Inc/USDA sponsored video conferences*

Most Minnesotans agree that our rural and urban areas compliment one another. Certainly many urban residents value the rural areas for their recreational opportunities and scenic beauty. Minnesota's agricultural, mining and timber areas, and the small towns that grew up around them, are often identified as the wellspring of Minnesota's work ethic and values—honesty, loyalty, cooperation and ingenuity.

But, in the current era of government austerity and hard choices, these positive attributes are not likely to attract the resources needed to keep rural Minnesota healthy and vibrant. Some observers suggest we now live in a period where it's "every community for itself!" This view predicts that rural communities, challenged to independently attract business investments or population growth in their taxpayer base, will instead receive the sad, but unavoidable, consequences of funding depletion and neglect.

The worldview that supports indifference to rural Minnesota's economic and cultural vitality is built on a fundamental ignorance, a lack of insight regarding the material ways in which rural and urban areas are interdependent; how they are linked to each other in relational exchanges that provide for mutual benefits and losses. This pilot study illustrates a few of the ways in which Minnesota's continued prosperity and innovation are most aptly appreciated as grounded in a network of rural urban connections.

This pilot study combines two established approaches to measure the economic interdependencies between rural and urban Minnesota and reaches two major conclusions:

***First,*** *the economic dependence of urban Minnesota on rural Minnesota is real, measurable and significant. Development dollars spent in rural Minnesota will benefit both urban and rural businesses and populations.*

***Second,*** *all development investments will not have identical impacts on rural urban trade flows and job creation. While two stones of the same size dropped into the same pond might create identical ripple effects, economic development investments into rural Minnesota will have very different impacts (both within the rural region and on urban centers) on business and consumer spending and job creation based on the specific industrial cluster targeted. Planners can anticipate varying "formulas" for impacts to business and consumer spending and new jobs creation subsequent to a change in output for specific*

*industry clusters. Increasing the output of some clusters will generate relatively more new part-time local jobs, a desirable feature in some regions. Likewise, by stimulating the output of another industry cluster, planners can expect to see relatively more full-time urban and rural positions. The approach outlined in this pilot research allows planners to consider not only the overall economic impact, but also the specific employment requirements of their region.*

As a pilot study, our approach was, by design, narrow in focus and simplified in structure. Despite this, the results provide clear and measurable projections of the degree to which urban businesses and people are dependent on their rural colleagues.

The results also point to several areas for future research.

# Key Findings

- Rural Minnesota provides critical employment in a number of the most sought after industry sectors. Forty percent of Minnesota's total employment in 17 targeted industry clusters takes place in rural Minnesota.
- Well over half of the state's jobs in the following clusters are located outside the urban region:
  - Education and Knowledge Creation
  - Energy (Fossil and Renewable)
  - Arts, Entertainment, Recreation and Tourism
  - Agribusiness, Food Processing & Technology
  - Forest and Wood Products
  - Glass and Ceramics
  - Mining
- Forty-seven percent of Minnesota's manufacturing cluster output originates in rural Minnesota.
- Minnesota's urban region receives substantial economic benefits from improved prosperity among its rural neighbors.
  - If rural Minnesota's manufacturing cluster experiences a 6 percent growth in output ($1 billion), the urban area picks up 16 percent of all the jobs gained and 38 percent of all additional output.
  - The reverse is also true: a $1 billion decrease in manufacturing output in rural Minnesota results in 1,043 jobs lost and a loss of $207, 822,848 in revenue among Twin Cities area businesses.
- Certain clusters have a footprint spread more evenly between rural and urban regions. For instance, agribusiness has very little output originating in the urban region (only 15 percent of the total statewide output), while manufacturing is almost evenly split (53 percent of the total statewide output originates in the urban region).
- Even though $1 billion is a smaller change in output for the agribusiness cluster (3 percent) than it is for the manufacturing cluster (6 percent), those billion dollars of additional agribusiness output generate 12 percent more subsequent dollars of spending captured in Minnesota and 13 percent more new jobs than would the same dollar value increase in manufacturing output.
- The rural urban distribution of a cluster's suppliers varies depending on the industry cluster.
  - Over three-quarters of agribusiness's subsequent increase in output (the statewide "ripple effect") comes in the form of increased business-to-business sales. More than three-quarters of that stays in rural Minnesota.
  - Almost two-thirds of manufacturing's "ripple effect" comes in the form of increased business-to-business sales. Nearly half of manufacturing's increased business-to-business sales occurs in the urban region.
- Increased consumer spending and investment activities, as a result of increases in agribusiness and manufacturing output, benefits Minnesota's urban region in fairly similar ways.
  - Urban Minnesota realizes close to 30 percent of the additional consumer spending and investing activity due to an increase in either rural manufacturing or rural agribusiness output.
- The urban jobs added due to rural output increases were very similar between agribusiness and manufacturing. Seven of the Top Ten Sectors for job growth were identical. These seven sectors account for about 40 percent of the urban job growth for both manufacturing and agribusiness clusters.

## Methodology

We began with a simplified cluster approach, in which we used industry cluster categories to examine the rural urban distribution of jobs. Industry cluster analysis identifies business sectors that are geographically concentrated and rely on the same network of suppliers, customers, infrastructure, workforce and other resources. We then built on this framework, conducting an input-output analysis, using IMPLAN software. We first examined one cluster's network of rural urban trading relationships, which were made measurable by simulating a change in that single cluster's output. Lastly, we expanded our analysis to compare the rural urban commercial networks of two clusters.

Input-output analysis provides several benefits when added to cluster studies. Most importantly, input-output analysis models economy-wide impacts, rather than excluding consumer activities. Industry cluster analysis typically concentrates on "traded" industry sectors, which are defined as those businesses that export their goods and services outside the region and therefore bring new revenue into the region. This type of study excludes "non-traded", or non-exporting industry sectors, typically those involved in consumer spending and investing activities. In Minnesota, this exclusion removes about 30 percent of total rural output and 36 percent of total urban output from the model. Input-output analysis re-inserts these dollars into the analysis. In rural counties, where consumers may travel great distances to conduct household transactions (for medical care, entertainment, clothing, food, etc.), being a desirable consumer destination can provide a region with substantial economic development potential.

## Future Research

Cluster analysis and input-output analysis, particularly when used in tandem, allow a researcher to highlight urban rural trading connections and yield substantive findings that can direct economic development investment analysis and planning.

Future studies of rural urban connections would benefit from refinements in a numbers of areas.

- Connecting insights from this pilot study with the ongoing cluster analysis research stream co-sponsored by the University of Minnesota and the Minnesota Department of Employment and Economic Development (DEED).
- Refining the definitions of "urban" and "rural" beyond the current oversimplified division between Twin Cities Metro and Greater Minnesota. Geographic units as large as Minnesota's Economic Development Regions, or as small as ZIP codes, could support added insights.
- Measuring reciprocity of economic benefits between urban and rural Minnesota (e.g. look at rural impacts due to increases in urban output).
- Examining additional clusters beyond the two included in this pilot study.

***"Why did I come to this symposium,* The Rural Urban Gathering?**

***I am concerned about both the economic balance and the ecological balance as important parts of considering rural and urban balance. Exploring the processes of achieving a resilient sustainable balance is a big draw for me"***

*Attendee, University of Minnesota, Morris Center for Small Towns & Rural-Urban Gathering, "Finding Solutions and Redefining Communities" June 9th and 10th, 2010 Symposium*

# Rural Urban Connections: A Measurable Economic Impact

***How are rural and urban Minnesota interdependent? What types of market relationships tie them together? How can we make statements about where inputs come from, and what the value and characteristics of the inputs are? How much energy is coming from rural areas to be consumed in urban areas? How much timber, minerals, water, manufacturing, and so on, are coming from rural Minnesota and being routed through the urban part of the state? I think if we added it up, it would be extraordinary and would show the true interdependence of our state quite clearly.***

*Jane Leonard, Minnesota Rural Partners, Inc Board Member and Former MRP, Inc President*

As described in Ms. Leonard's Forward to this report, the rural urban connections pilot initiative used a variety of approaches to collect and share narratives about rural urban interdependencies, particularly highlighting what rural regions bring to the shared vitality of our state. Despite the manifold effort, questions and feedback from both sides of the rural urban divide point to a perceived ambiguity of our initiative.

Sometimes our listeners have complained that, while they "know there is something real in this interconnectedness approach," they are frustrated by how fuzzy the conversations can get. As one interviewee put it, "I'm not interested in one more feel-good project aimed at getting people to speaking nicely about each other."

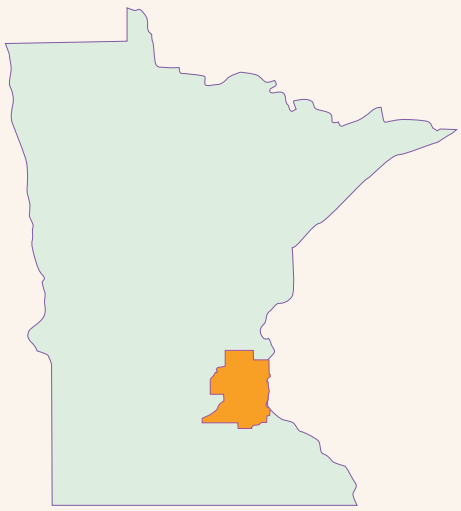
For the people who wonder, "Where is the beef?" the MRP, Inc.-USDA pilot initiative team commissioned this research. Our primary goal is to produce concrete data that unambiguously demonstrates the economic impact of rural urban relationships, using dollars in trade as the unit of measurement.

This research used a quantitative approach to illustrate how one category of rural urban connections is key to the state's prosperity and potential for future innovation. In this paper, we provide quantitative answers to the questions:

***How can we represent rural Minnesota's contribution to the vitality of the entire state's economy?***

***How can we measure the economic interdependence between rural and urban Minnesota?***

This is a pilot study. Its main benefit is in identifying approaches to answering questions about economic interdependencies. Future studies can, and should, advance this work.



This pilot study uses the simplest possible definition of "urban" and "rural" Minnesota: The well-known division between counties belonging to the Metropolitan Planning Commission's 7-county Twin Cities region (also known as Region 11)and the remaining 80 Minnesota counties that do not belong to this legislatively defined entity. The 7-county urban area contains over half of the state's entire population.

**Urban Minnesota:**
**Hennepin, Ramsey, Anoka, Dakota**
**Washington, Carver, and Scott counties**

**Rural Minnesota:**
**The remaining 80 counties**

The limitation of this definition is that cities such as Rochester, Duluth and St. Cloud, as well as smaller municipalities, are considered "rural." One extension for future funded research should be to employ a more nuanced definition.

# Using Cluster Analysis to Represent Rural Urban Economic Linkages

## Cluster Analysis

Industry clusters are spatial concentrations of businesses active in the same value chain, linked through relationships of supply, sales and competition. Identifying and supporting business clusters is a proven way to increase productivity, stimulate innovation, create world-class competitors and achieve high value from economic development investments.

Michael Porter's early championing of cluster analysis[1] as a tool for economic development strategy has become so successful that it is essentially the gold standard for regional planning and policy professionals. Faculty at the University of Minnesota Humphrey Institute for Public Affairs have successfully harnessed Porter's cluster approaches for regional development projects conducted in conjunction with Minnesota's Department of Employment and Economic Development (DEED). This collaboration is driven by the belief that cluster studies can function as powerful drivers for both the state's economic development and for workforce development.

Desirable clusters have a product or specialized service that brings wealth into a region and drives innovation and competitiveness. These "traded" clusters create economic linkages with other regions. Restaurants and retail outlets, which are not traded industry clusters, tend to derive their revenue from customers located within the region.

Experienced cluster researchers stress that analysis should focus on a knowledge cluster, not just an industry cluster. According to some current practitioners, cluster analytic approaches work in Minnesota, because Minnesota's jobs tend to be higher knowledge jobs and Minnesota's most competitive clusters tend to employ these very highest knowledge employees. Lots of other jobs are generated to support these employees and their households.

Development experts also concentrate on emerging clusters in regions where there is very little outside ownership or control, which can drain the momentum and energy driving the cluster. Cluster strengthening happens most robustly when there are significant numbers of companies with this local "center of gravity."

One of the positive aspects of Minnesota's economy is its variety of clusters. With a few regional exceptions, Minnesota is not overly dependent on a limited number of clusters.

## The Innovations in American Regions Project

We turned to the Innovation in American Regions Project (IARP) for assistance in identifying and measuring Minnesota's industry Clusters. The IARP leverages Indiana's Unlocking Rural Competitiveness Project,[2] which was funded by the U.S. Economic Development Administration to develop cluster analytic tools for innovation-based economic development in rural areas.

The IARP model presents an array of industry clusters or business networks formed by reviewing over 1800 individual NAICS codes and descriptions and assigning them to one or more of 17 potential industry clusters.[3]

### The 17 clusters that result from recombining NAICS codes are:

1. Advanced Materials
2. Agribusiness, Food Processing and Technology
3. Apparel and Textiles
4. Arts, Entertainment, Recreation and Visitor Industries
5. Biomedical/Biotechnical (Life Sciences)
6. Business and Financial Services
7. Chemicals and Chemical–Based Products
8. Defense and Security
9. Education and Knowledge Creation
10. Energy (Fossil and Renewable)
11. Forest and Wood Products
12. Glass and Ceramics
13. Information Technology and Telecommunications
14. Manufacturing
15. Mining
16. Printing and Publishing
17. Transportation and Logistics

NAICS codes are excluded from the cluster typology when it is clear that these firms exist primarily to serve the needs of the local economy. In cluster terminology, these are "non-exporting" or "non-traded" industry sectors. This includes restaurants, construction, wholesale and retail trade, and general and consumer rental of goods, equipment, machinery, dwellings or vehicles.

These non-traded industry sectors, primarily consumer spending or investing sectors, represent about 30 percent of Minnesota's total rural output[4] and 36 percent of Minnesota's total urban output.[5] As we will later see, by adding input-output-based tools to the study approach, we are able to bring these consumer dollars back into the planner's decision-making framework.

## Caveat about IARP

The IARP relies on data from the U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW). Because of concerns regarding data privacy and competitive intelligence, data is suppressed when cell sizes become small enough that a reasonable person with inside knowledge would be able to know exactly which firms are included in a table. This can cause problems when comparing state-level data and county level data. We encountered this difficulty when examining the Biomedical cluster in Minnesota, where the number of excluded, non-trading NAICS codes are quite high, since offices of physicians, dentists, etc.. are considered non-trading. Excluded NAICS (such as doctors' and dentists' offices which make up a fairly large part of the NAICS beginning with 621) cannot always be subtracted because they are suppressed. According to Victoria Nelson at Purdue's Center for Regional Development, "This results in the county biomed cluster numbers being artificially inflated compared to the state biomed cluster." For our purposes, we developed Minnesota's urban rural Biomedical cluster numbers by including the non-traded NAICS codes.

## Findings

The 2008 data on Minnesota's industry clusters was taken from the IARP.[6] As we can see in Diagram 1, Minnesota has a relatively healthy and diverse distribution of employment, with rural Minnesota providing a critical percentage of jobs in a significant number of the clusters most important to our statewide economy.

Although Diagram 1 does not offer a complete distribution of employment across Minnesota, because the non-exporting economic sectors, such as eating establishments, are not represented, 40 percent of all employment in traded industry sectors happened in rural Minnesota. For a number of traded industry clusters, rural Minnesota provided more than half the total 2008 employment. These include:

- Education and Knowledge Creation
- Energy (Fossil and Renewable)
- Arts, Entertainment, Recreation and Visitor Industries
- Agribusiness, Food Processing & Technology
- Forest and Wood Products
- Glass and Ceramics
- Mining

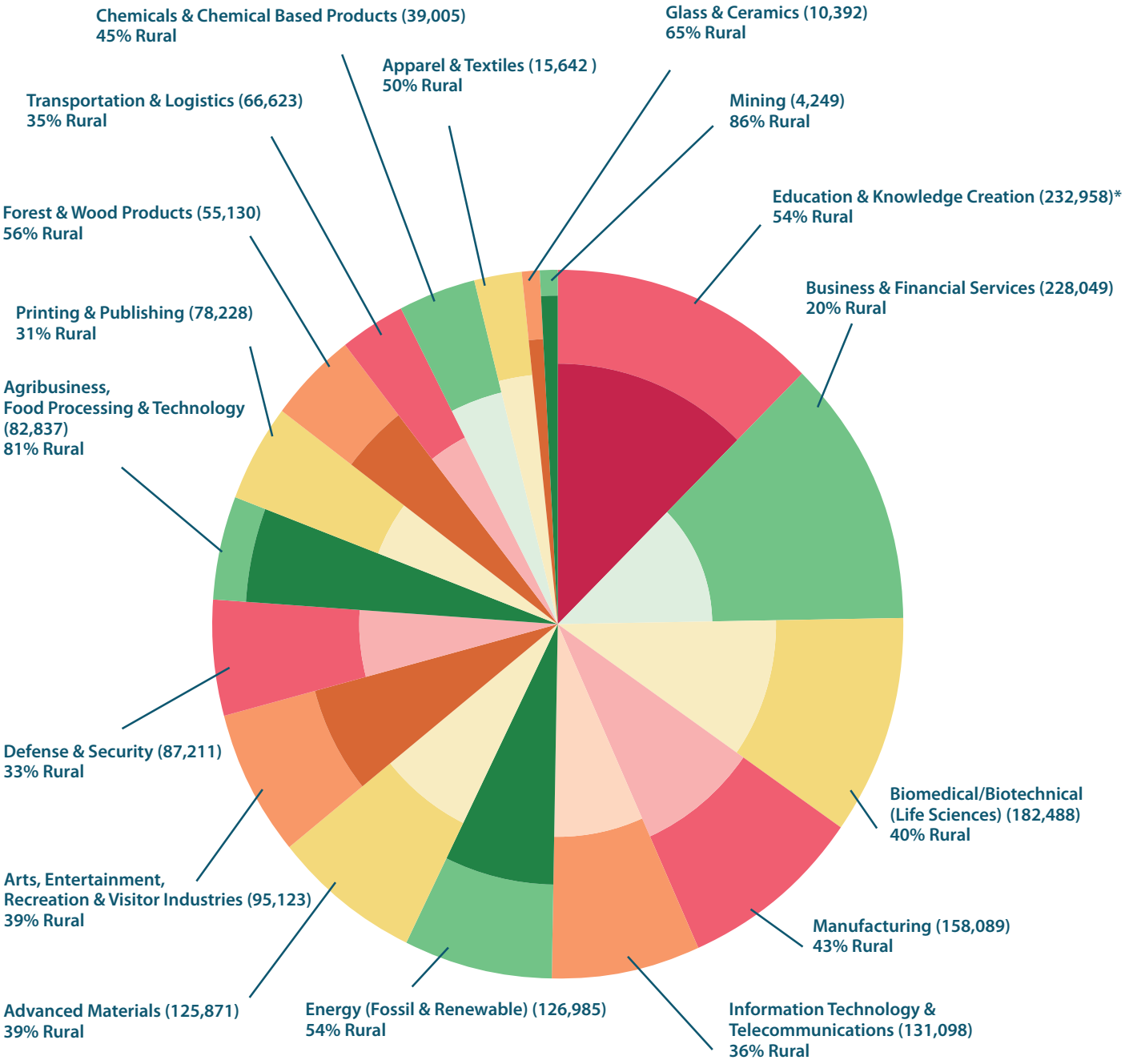
Jobs in the Manufacturing cluster are also significantly likely to be located in rural Minnesota.

Businesses tend to be smaller (employing fewer people) in rural areas than they are in urban Minnesota. Almost half (49%) of all Minnesota's businesses were located in rural Minnesota in 2008. These rural commercial enterprises provided 40 percent of the state's jobs. These jobs were associated with lower wages than comparable jobs in the urban area.

For more complete details on Minnesota's 2008 Rural Urban Employment Distribution by Industry Cluster, please see Appendix A.

## Diagram 1

## 2008 IARP Minnesota Employment: Comparing Rural and Urban Relative Cluster Size and Percent of Jobs




*Cluster labels indicate:
Cluster name (total number of Minnesota jobs in the cluster)
Percent of cluster jobs located in rural Minnesota

For instance the first cluster label should be read "Education and Knowledge Creation Cluster was responsible for 232,958 jobs in Minnesota in 2008. Of these jobs, 54% were located in rural Minnesota."

## Adding Input-Output Analysis to Represent Rural Urban Economic Interdependencies

Based on interviews with a variety of experts, we used input-output analysis as a second-stage framework for measuring commercial interdependencies between rural and urban Minnesota. The USDA has sponsored at least one other investigation employing input-output analysis, the University of Wisconsin's study of "The Economic Impact of Cooperatives."[7]

### Input-Output Analysis

Input-output (IO) analysis is a theoretical framework for examining the ripple effects from increases or decreases in output in a particular industrial sector within a specific geographic region. Using a matrixed representation of the region's economy, IO can approximate the types and degrees of effects on all parts of the economy, including consumers, governments and out-of-region suppliers, due to changes in one industry.

IO analysis, (which won its creator, Wassily Leontief, a Nobel Prize in Economics) illustrates interdependencies between industries by linking the output of one industry to the inputs of others. Today the main use of IO analysis is in regional economic development and planning.

IO analysis begins with businesses acquiring and processing inputs to create and sell their outputs. In an IO analysis, the researcher manipulates the target sector output level and then examines how that change drives up-channel sourcing and employment activities, as well as related consumer spending and investing activities.

### IMPLAN

IMPLAN (IMpact analysis for PLANning)[8] is a cost-effective software tool that employs IO analysis, social accounting matrices (to link buying and selling transactions) and proprietary multipliers (to help estimate "ripple effects" throughout the economy) to create a flexible, accurate model that addresses questions such as, "What economic impact would this factory closing have for our county?"

IMPLAN's default data comes from a variety of sources, including an input-output survey conducted the U.S. Commerce Department each decade. IMPLAN organizes the various databases and algorithms in a useful format to capture business-to-business transactions across the supply chain, as well as ultimate consumer activities. Data can be organized by ZIP code, county or state, or it can be viewed at a national level.

IMPLAN identifies the impacts of specific changes in one region's economic activities on the economies of other selected geographies. In our first scenario, IMPLAN predicts the economic consequences of a localized increase in output for a specific industry cluster in rural Minnesota on the output of urban Minnesota.

In any given IMPLAN analysis, each of the three effects is expressed solely in terms of their within-region impacts. For instance, when we examine the consequences of an increase in manufacturing output in rural Minnesota, the indirect effect numbers for the rural region reflect only additional related business purchases among rural region business establishments. Likewise, when we examine how the urban region is impacted by this change in rural manufacturing, the induced effect numbers for the urban region reflect only the additional consumer spending and investing activities transacted in the urban area.

IMPLAN doesn't track business spending or consumer activities that originate in the target region but are conducted with businesses outside the regions specified in the research model. For example, the dollars associated with a rural Minnesota manufacturer who purchases machined parts from a Wisconsin-based supplier will not be represented in our current model's indirect effects.

### What Is Output?

**Output = Inputs + Value Added**

**Where:**

- **Inputs** = Purchases, both fixed costs (such as plant and equipment) and variable supply chain spending
- **Value Added** = Worker's Income + Proprietor's Income + Business Taxes

**Output includes:**

1. Wages paid to workers, including the taxes they pay as individuals
2. Business proprietor's income
3. Business taxes
4. Purchases - fixed costs & variable costs

## Output's Ripple Effects

Changes in output for a specific industry sector, in a well-defined region, generate three types of effects:

- **Direct Effect** is the initial increase or decrease in target sector activity. Direct effect refers to the initiating change in output that the researcher inserts into the model. Direct effect is the size of the stone that is dropped into the region's economic waters.
- **Indirect Effect** measures changes in up-channel business-to-business spending – these are the ripple effects due to supply chain linkages to other businesses in the region.

  IO researchers use profiles for a "typical" business in a specific sector and then apply some measure of the scale of the firm's operations to anticipate ripple effects. This proxy is necessary because establishment-specific sourcing and sales data would be costly or impossible obtain. Most business establishments normally treat this type of data as closely guarded, proprietary and essential to the business's unique competitive advantage.
- **Induced Effect** measures changes in consumer spending and investing – the additional ripple effect of household transactions conducted by the local labor force and business owners.

  Induced effects are estimated by applying a "typical" household pattern of spending and investing to the wages and dividends paid by a firm. This pattern is used to predict how changes in consumer wages and dividends will result in subsequent related consumer behavior.

Different clusters have different requirements between workforce inputs and supply chain inputs which is reflected in their relative impact on indirect (business-to-business) and induced (consumer) effects.

*A law partnership, which uses principally a labor input, will generate a large induced effect, but almost no indirect effect. Alternatively, an ethanol plant, which uses significant capital and non-labor variable inputs, but very little labor input, will generate large indirect effects, but a small induced effect.*[9]

## Caveats about IMPLAN

A few important qualifications should be made about IMPLAN's measurement approach and the implications it has for interpretation.

### Every job is treated alike

All jobs (part-time, full-time, permanent and seasonal) are given equal weight in IMPLAN. The new jobs listed in our tables under "Employment" cannot be assumed to be full-time or permanent positions. In this study we use "dollars per employee" as a rough surrogate for employee compensation. We arrive at this figure by dividing labor income by employment. Labor income includes employee compensation and proprietor's income. Employment includes paid and self-employed, part- and full-time, and seasonal as well as permanent employees.

Because of this formula for arriving at compensation, industries with relatively more part-time and/or seasonal employment will present lower dollars/employee estimates and industries with relatively more permanent and full-time employees will show higher dollars/ employee figures.

*For instance, retail sectors show relatively lower figures for salary/worker ratios. Retail tends to be more part-time employment (i.e., more employees) therefore driving your ratio down further. If the salary pool for a retail store is $1 million and they need 20 part-time employees (equal to 10 full-time), salary per worker is $50,000. If the salary pool for a manufacturer is the same $1 million, but they use 10 full-time employees, their salary per worker is $100,000. Salary per worker is lower in retail, but it supports more people.*[10]

In the end, it is up to each reader, researcher and policy maker to decide whether their dependent variable (or investment target) is to employ more people (for perhaps shorter hours or fewer months of the year) or to target higher wage, full-time and permanent jobs. A robust economy will contain a variety of types of employment.

### Interpreting employee compensation

We use "dollars-per-employee" to represent employee compensation in this research. This figure is calculated by dividing labor income (including both employee compensation and proprietor's income) by employment (including all paid and self-employed workers, part-time and full-time employees, as well as both permanent and seasonal workers).

Some clusters and some types of workers present challenges when representing employee compensation. For instance, when we compare the manufacturing cluster dollars-per-employee with dollars-per-employee associated with Agribusiness, we have to be careful in drawing conclusions about the apparent sizable differences in employee compensation. In IMPLAN, farmers' "wages" (which represent a sizeable portion of agribusiness output) are treated differently than wages paid to employees in manufacturing. Farmers keep track of their income and pay themselves in more idiosyncratic and complex ways than is true for typical manufacturing employees and proprietors. This is an estimation challenge for IMPLAN, which has not yet been totally solved. Therefore "dollars-per-employee" may not be the best measure of income or wealth for all agribusiness workers or proprietors.

So, while it is obviously easier to support a family on a mid-range job in an average machine shop than it is as a migrant worker traveling between harvest locations, the two clusters under study are more complicated and represent more industrial variety than simple explanations warrant.

### Interpreting indirect and induced effects

As we will see in our discussion of "Findings," increased output for different clusters has differential impacts on business-to-business and consumer spending. For instance, Agribusiness' increased output is relatively in favor of additional business-to-business spending (indirect effects). Manufacturing's increased output results in a larger portion of increased consumer activity (induced effects).

It can be tempting to go from higher wages in manufacturing to the cluster's relatively greater consumer activity and then conclude that manufacturing is a "preferable" cluster because it pays better wages. While this may be true for some portion of manufacturing and agribusiness jobs, the real explanation is likely far more complicated than that.

Industry clusters that employ more permanent and full-time workers, rather than part-time or seasonal workers, may generate relatively larger induced effects.

Similarly, relative increases in indirect vs. induced effects can be due to variations in cluster sourcing patterns. IMPLAN reports within-region spending only. A cluster such as Agribusiness, which tends to source locally, will appear to have a higher percentage of its economic impact showing up as rural business-to-business sales. Manufacturing, on the other hand, tends not to source locally to quite the same degree. This could be part of the reason why impacts are differentially reflected in increased consumer or business-to-business spending.

### Overlap in clusters

There is a small degree of overlap in the two clusters being compared. NAICS codes "33311 – Agricultural Implement manufacturing" and "333294 – Food Product machinery manufacturing" are present in both the Agribusiness and Manufacturing clusters. We believe this does not distort our findings. This would be a frequently encountered situation in any cluster comparison project because many sectors are eligible for inclusion in more than one sector.

### Completely new industries won't appear

IMPLAN cannot anticipate what totally new industries are likely to emerge in a specific region. IMPLAN is only able to work with existing industries, anticipating job gains or losses among existing firms, or other economic responses to change among employees and proprietors.

## Benefits of a Combined Cluster/IO Approach

### IO depicts economy-wide spending benefits

Often used as a stand-alone approach, IO also works well in conjunction with cluster analysis. For instance, after using cluster classifications to center on a "distinguishing industry cluster,"[11] we used IO to forecast economy-wide consequences of an anticipated increase in output for that cluster across a pre-identified geography. IMPLAN begins with the traded cluster's specifications and then identifies all of the anticipated changes in both business-to-business and consumer activities, due to a specific output fluctuation. IMPLAN can begin with only traded cluster data and trace implications throughout all parts of the region's economy, both traded and non-traded, as well as within other targeted regions' economies. IO reinserts consumer activity into a return-on-investment deliberation among economic development policy and planning specialists.

### Cluster validation

IO can also be employed as a validation tool for cluster strategies. Since the indirect effect represents the impact of output changes among linked businesses (suppliers and customers), it is a measure of the degree to which a supply chain cluster is actually present in a community. By studying the indirect effect (increased sales among suppliers to the target industry cluster) due to changes in target cluster activity, a researcher can evaluate the degree to which change in one sector of a region will ripple through a local business network. A relatively large indirect effect indicates that the selected geographic region holds a more densely networked array of trading partners for the specific cluster under study. Thus we can look at IMPLAN results and see which sectors are most strongly networked on a region-by-region basis

## Cluster Studies and Input-Output Analysis: A Powerful Economic Development Approach

*IMPLAN can provide useful estimates for cluster-based economic development questions such as:*

*If the Production Technology cluster in West Central Minnesota were to see a 3 percent increase in output, what would that mean for the local economy, the Twin Cities Metro economy or the statewide economy?*

*What impact would that 3 percent increase have on the job markets in these three regions?*

*What sorts of jobs would likely be added? And in which of West Central's existing industries would these additional jobs be found? How valuable would those jobs be?*

*How much of the increased economic wealth would be captured in increased business-to-business trade?*

*How much of that increase would happen in increased consumer activity?*

## Focus on Manufacturing

### Approach

Our pilot study initially focused on just the manufacturing industry cluster as a next step in a combined cluster/IO approach to measuring rural urban interdependencies. We chose the manufacturing cluster because job losses in this industry cluster have caused considerable concern across the state. These jobs provide critical financial security and support Minnesota's economic vitality. Rural Minnesota clearly shares this concern. According to a recent study, rural Minnesota has seen a 20 percent loss in manufacturing jobs over the last decade.[12]

Despite this job loss, the manufacturing cluster is predicted to show continued workforce shortages due to lack of qualified applicants in some regions of Minnesota.[13] As a workforce development cluster, manufacturing clearly illustrates how output can continue to grow (based on technological advancements), while workforce requirements change in scope and skills requirements.

We created the "Manufacturing cluster" by returning to the IARP website where we found the NAICS codes associated with the Manufacturing Cluster, which are listed in Table 1.[14] Since NAICS codes are hierarchical, if you select only the first three digits, you will get all of the sectors nested under them. A fully articulated NAICS code is six digits in length.

We continued to use the two geographic regions, "rural" and "urban," as previously described. We then ran IMPLAN based on an initial $1 billion output increase and observed the resulting indirect effect and induced effect impacts as they appeared in both the rural and urban regions of Minnesota. The $1 billion change represents a 6 percent change in Minnesota's manufacturing output. This hypothetical increase in output could be the anticipated result of an economic development initiative focused on manufacturing in rural Minnesota.

After assessing the statewide impact of the increase in rural manufacturing output, we examined the unidirectional impact on urban Minnesota, due to an initiating change in cluster output originated in rural Minnesota. We also observed the impacts of this same change in output within the rural region.

**Table 1**
**NAICS Codes Included in Manufacturing Cluster**

| NAICS Code | Sector Description |
|---|---|
| 331 | Primary Metal Manufacturing |
| 332 | Fabricated Metal Product Manufacturing (Except 332992,3,4,5) |
| 333 | Machinery Manufacturing |
| 334 | Computer and Electronic Product Manufacturing |
| 335 | Electrical Equipment, Appliance and Component Manufacturing |
| 336 | Transportation Equipment Manufacturing |

IMPLAN allows us to watch the impact of this $1 billion "stone" and its subsequent ripple effects on the statewide economy, the urban economy and, finally, on the economy of rural Minnesota.

Keep in mind that the portion of the subsequent growth in output that is spent on imports from outside of Minnesota is gone from the region and is not reflected in the indirect and induced amounts shown.

## Findings

### Baseline

Diagram 2 shows that 47 percent of Minnesota's 2008 Manufacturing cluster output originated in rural Minnesota.

### Statewide Impacts

Appendix B shows the complete results table for this analysis. Table 2 presents an overview of the anticipated statewide impacts associated with the 6 percent increase in manufacturing output in rural Minnesota. Although we describe the output change as "$1 Billion", for reasons relevant to IMPLAN's operations, the actual number used was $999,999,936. The columns in Table 2 represent:

**Effect Type** – The three types of effect – direct, indirect and induced – plus total effect

**Table 2**
**Statewide impact of $1 billion increase in rural manufacturing output**

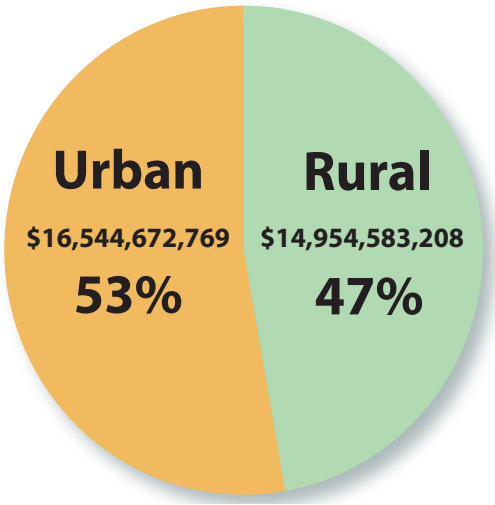
| Effect Type | Employment | Output | Dollars/ Employee |
|---|---|---|---|
| Direct Effect | 2,783 | $999,999,936 | $59,284 |
| Indirect Effect | 1,937 | $336,231,552 | $56,597 |
| Induced Effect | 1,750 | $201,831,896 | $36,188 |
| Total Effect | 6,470 | $1,538,063,360 | $52,233 |

- **Employment** – The number of new jobs associated with the change in output. This figure includes paid employees and self-employed workers, part-time and full-time employees, permanent and seasonal workers.
- **Output** – The change in output associated with each type of effect
- **Dollars/Employee** – The average salary per worker for each type of effect. This figure is calculated by dividing labor income (including both employee compensation and proprietor's income) by employment. Labor income figures can be found in the Tables contained in Appendices B and C.

The initial $1 billion increase would stimulate a statewide ripple effect worth an additional over a half-billion dollars ($538,063,424 or 53 percent of the initiating increase).

- Direct Effect
  By definition, the direct effect of the billion dollars of increased manufacturing output would be entirely experienced within rural Minnesota.
- Indirect Effect
  Additional business-to-business transactions would account for 62 percent of the half-billion dollars of additional output statewide.
- Induced Effect
  Added consumer spending and investing would account for 38 percent of the half-billion dollars of additional output statewide.

## Diagram 2: 2008 IMPLAN Baseline Minnesota Manufacturing Output



| Table 3<br>Urban region impact | | | |
|---|---|---|---|
| Impact Type | Employment | Output | Dollars/ Employee |
| Direct Effect | - | - | - |
| Indirect Effect | 629 | $147,283,120 | $80,287 |
| Induced Effect | 414 | $60,539,720 | $48,652 |
| Total Effect | 1,043 | $207,822,848 | $67,727 |

## Urban Impacts

As Table 3 shows, Minnesota's urban region would obtain a considerable portion of the subsequent economic benefits from additional manufacturing output originating in rural Minnesota.

### *Urban effects*

The urban region would garner 38 percent of Minnesota's total "ripple effect" in increased output, gaining over $200,000,000.

- Direct Effect
  By definition, none of the direct effect of the billion dollars of increased manufacturing output would be experienced in urban Minnesota.
- Indirect Effect
  Increased business-to-business spending based on the trading connections between rural Minnesota's manufacturing establishments and their urban suppliers account for 70 percent of urban Minnesota's additional output.
- Induced Effect
  Increased consumer spending and investing with urban businesses would account for 30 percent of the additional urban output.

### *Urban jobs*

As shown in Table 4, the urban region would be expected to gain 1043 new jobs due to the increase in rural Minnesota's manufacturing output. That's 16 percent of all the new jobs gained statewide associated with that change in rural output.

Of the Top Ten sectors identified, more of the urban region's predicted additional jobs were associated with white-collar, typically full-time and permanent positions. The second largest of these ten sectors "Management of Companies and Enterprises," includes employment at headquarters of businesses. As we see in the next section, the jobs gained in rural Minnesota would tend to be relatively concentrated in manufacturing and machining positions.

As we will discuss further when we compare agribusiness and manufacturing clusters, the seven sectors highlighted in yellow and boldface are impacted similarly in urban Minnesota regardless of whether the output increase stemmed from rural manufacturing or rural agribusiness.

**Table 4**
**Urban Top 10 sectors for additional employment due to increase in rural manufacturing**

| Sector Description | Employment | Output | Dollars/ Employee |
|---|---|---|---|
| **Wholesale trade businesses** | 121 | $29,821,400 | $94,568 |
| **Management of companies and enterprises** | 81 | $24,491,556 | $153,960 |
| **Real estate establishments** | 57 | $10,347,428 | $29,245 |
| **Food services and drinking places** | 53 | $3,031,909 | $20,327 |
| **Employment services** | 41 | $1,578,370 | $27,812 |
| **Securities, commodity contracts, investments, and related activities** | 32 | $6,731,627 | $97,872 |
| **Legal services** | 18 | $3,289,890 | $91,272 |
| Offices of physicians, dentists, & other health practitioners | 18 | $2,401,777 | $83,927 |
| Private hospitals | 17 | $2,096,891 | $65,391 |
| Architectural, engineering, & related services | 17 | $2,083,432 | $72,688 |

### Rural Impacts

We analyzed the local economic repercussions of the 6 percent increase in rural manufacturing output on the rural Minnesota economy. Table 5 offers the expected gains in output and jobs.

*Rural Output*

Table 5 shows that Rural Minnesota would sustain another $330,240,576 (or an additional 33 percent on the initiating increase) in indirect and induced effects from the rural manufacturing output increase.

- Direct Effect
  By design, all of the direct effect of this increase in manufacturing output would be experienced in rural Minnesota.
- Indirect Effect
  Of the additional rural Minnesota output, 57 percent would be seen as increased sales for manufacturing's rural suppliers.
- Induced Effect
  Of the additional rural Minnesota output, 43 percent would take the form of added rural consumer spending and investing.

**Table 5**
**Rural region impact**

| Impact Type | Employment | Output | Dollars/ Employee |
|---|---|---|---|
| **Direct Effect** | 2,783 | $999,999,936 | $59,284 |
| **Indirect Effect** | 1,308 | $188,948,432 | $45,202 |
| **Induced Effect** | 1,336 | $141,292,176 | $32,322 |
| **Total Effect** | 5,426 | $1,330,240,512 | $49,254 |

**Table 6**
**Rural Top 10 Sectors for additional employment due to increase in rural manufacturing**

| Description | Employment | Output | Dollars/Employee |
|---|---|---|---|
| Machine shops | 304 | $50,858,940 | $54,240 |
| **Wholesale trade businesses** | 270 | $45,114,132 | $62,526 |
| **Food services and drinking places** | 232 | $10,684,225 | $13,922 |
| All other transportation equipment manufacturing | 173 | $118,995,448 | $69,303 |
| Ornamental and architectural metal products manufacturing | 167 | $35,850,880 | $53,431 |
| Motor vehicle parts manufacturing | 146 | $50,216,968 | $61,518 |
| Farm machinery and equipment manufacturing | 138 | $75,840,840 | $56,490 |
| Boat building | 133 | $33,635,652 | $54,365 |
| Material handling equipment manufacturing | 116 | $41,198,280 | $56,642 |
| Construction machinery manufacturing | 109 | $83,031,264 | $64,065 |

*Rural jobs*

Table 5 shows that of the 5,426 jobs added in rural Minnesota, about half would be directly associated with the initial 6 percent increase in the region's manufacturing output. The other half would arise in a variety of industry sectors.

Rural suppliers to the Manufacturing cluster would add almost one-quarter of the new jobs. Rural manufacturing trading partners would need to augment their workforce to meet the anticipated $188,948,432 increase in their own output.

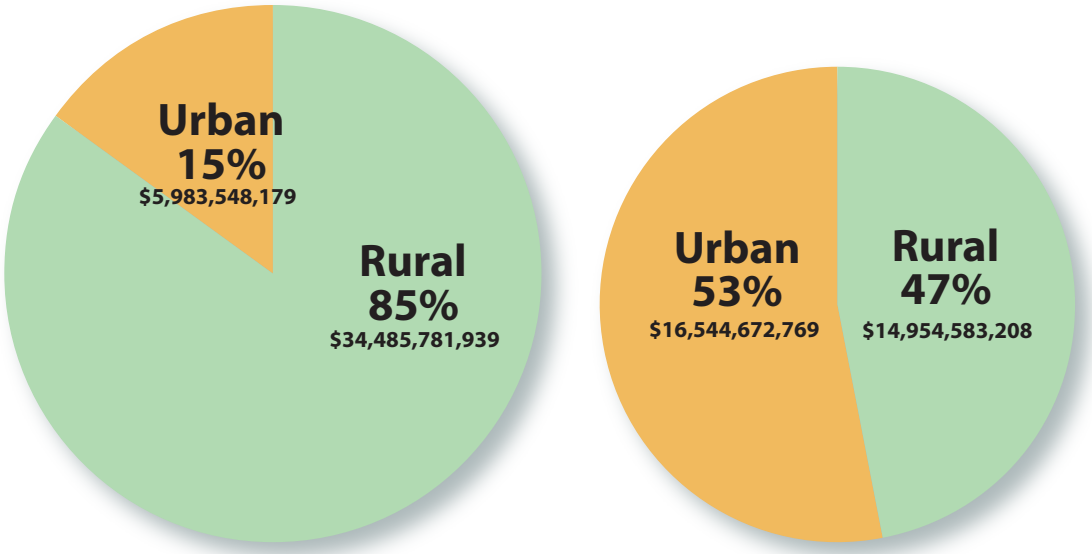
The induced effect, which accounts for the other roughly 25 percent of new jobs, would arise from the increased local household spending and investing by local employees and owners in both manufacturing and related industry sectors, who would have an additional $141,292,176 to spend or invest.

In Table 6 we find that the Top Ten Industry Sectors expected to see job growth in the rural region as a result of indigenous increased manufacturing output account for only about 34 percent of the anticipated rural job growth. This indicates that the rural employment impact would be even more diffuse than urban job impact, creating smaller numbers of jobs over an even greater range of industry clusters.

Eight of the Top 10 Sectors were in the direct effect or Manufacturing cluster. These jobs tend to be relatively well-paying manufacturing and machining positions.

Only two of the Top 10 Sectors for rural job growth were also among the Top 10 Sectors for urban job growth (see areas with yellow highlighting and boldface).

## Diagram 3: 2008 IMPLAN Baseline Comparing Agribusiness and Manufacturing Output




**Agribusiness**
**$40,469,330,118**

**Manufacturing**
**$31,499,255,977**

### Contrast Manufacturing & Agribusiness

For comparison, we examined the impact of a similar change in the agribusiness cluster to demonstrate how changes in rural economic activity impact urban, rural and state economies differently based on unique cluster traits. We wanted to contrast the two sets of "ripple effects," or the differing patterns of impact between changes in output for agribusiness and manufacturing.

By pursuing this tack, we sought to:

- Advance understanding of how changes in output for different clusters create diverse impacts in local and distant economies.
- Begin to illustrate the different ways in which changes in a statewide economic system can be represented as a network of rural and urban commercial connections.

### Approach

We took the combined cluster/IO approach a step further and returned to the IARP's cluster typology to form a contrasting cluster for comparison of urban rural linkages. Following this, we used IMPLAN to identify the differing impacts due to a $1 billion increase in output for the two different clusters in rural Minnesota.

We began by identifying the NAICS codes associated with the IARP "Agribusiness, Food Processing and Technology Cluster."[15] The sectors are listed in Table 7. For convenience, we will refer to this cluster as "agribusiness," knowing that it includes food processing and related technologies, as well.

**Table 7**
**NAICS Codes associated with "Agribusiness, Food Processing and Technology" Cluster**

| NAICS Code | Sector Description |
|---|---|
| 111 | Crop Production |
| 112 | Animal Production |
| 1141 | Fishing |
| 1151 | Support Activities for Crop Production |
| 1152 | Support Activities for Animal Production |
| 311 | Food manufacturing |
| 312 | Beverage and Tobacco Product manufacturing |
| 3253 | Pesticide, Fertilizer and other Agricultural chemical manufacturing |
| 33311 | Agricultural implement manufacturing |
| 333294 | Food Product Machinery manufacturing |
| 42382 | Farm and Garden Machinery and Equipment merchant wholesalers |
| 4245 | Farm Product raw material merchant wholesalers |
| 42491 | Farm supplies merchant wholesalers |

**Table 8**
**Statewide Impacts: Contrasting Manufacturing and Agribusiness**

| | Employment | | Output | | Dollars/Employee | |
|---|---|---|---|---|---|---|
| Impact Type | MFG | AGRI | MFG | AGRI | MFG | AGRI |
| Direct Effect | 2,783 | 3,693 | $999,999,936 | $999,999,997 | $59,284 | $25,713 |
| Indirect Effect | 1,937 | 2,383 | $336,231,552 | $457,717,983 | $56,597 | $42,608 |
| Induced Effect | 1,750 | 1,263 | $201,831,896 | $144,888,827 | $36,188 | $35,896 |
| Total Effect | 6,470 | 7,339 | $1,538,063,360 | $1,602,606,807 | $52,233 | $32,951 |

## Findings

### Baseline

As shown in Diagram 3, Agribusiness is the larger cluster, showing an output that is 30 percent larger than the Manufacturing cluster.

Manufacturing has a more evenly distributed footprint across the rural and urban portions of the state than does agribusiness.

Agribusiness' output is predominantly concentrated in rural areas. Eighty-five percent of Minnesota's agribusiness output takes place among businesses situated outside the urban region.

### Statewide Impacts

We next returned to IMPLAN and this time posited a $1 billion increase for the Agribusiness cluster. Our motivating question now was:

> *How would the effects of a $1 billion increase in output in rural Minnesota's Agribusiness cluster (a 3 percent change) compare with the effects of the $1 billion increase in rural manufacturing's output?*

#### *Statewide Output*

The statewide ripple effect of a $1 billion increase in agribusiness would be $602,206,810, or 60 percent of the initial increase in output. That is a 12 percent larger "ripple" than found with a similar size change in Manufacturing cluster output ($538,063,424 or another 53 percent of the initiating increase).

The increase in manufacturing's output was relatively more associated with increased consumer savings and investing activity (induced effect) when compared with the results of an increase in agribusiness's output.

This could be due to a combination of factors, such as:

- Potentially higher wages associated with manufacturing employment, supporting more consumer activity.
- The relatively greater number of business transactions conducted with suppliers outside the region for manufacturing firms versus retained dollars (or dollars spent with local suppliers) for agribusiness, which could throw the indirect effects higher.

#### *Statewide jobs*

Minnesota would gain 13 percent more jobs with a $1 billion increase in agribusiness than it would with a similar increase in manufacturing.

As mentioned on page 14, IMPLAN encounters greater challeges in representing labor income for agribusiness than it does for manufacturing. This feature has to be taken into consideration when comparing estimates of dollars-per-employee between the two clusters. Regardless, rural manufacturing jobs are critical for many farm families and their neighbors, who often rely on non-farm employment for year-round income and health care benefits.

**Table 9**
**Urban Impacts: Contrasting Manufacturing and Agribusiness**

| | Employment | | Output | | Dollars/Employee | |
|---|---|---|---|---|---|---|
| Impact Type | MFG | AGRI | MFG | AGRI | MFG | AGRI |
| Direct Effect | - | - | - | - | - | - |
| Indirect Effect | 629 | 454 | $147,283,120 | $99,188,891 | $80,287 | $73,973 |
| Induced Effect | 414 | 281 | $60,539,720 | $41,248,252 | $48,652 | $48,887 |
| Total Effect | 1,043 | 735 | $207,822,848 | $140,437,143 | $67,727 | $64,385 |

## Urban Impacts

*Urban Output*

By definition, the urban region would not experience direct effects from an initial increase in either agribusiness or manufacturing output originating in rural Minnesota.

Table 9 demonstrates the impacts of structural differences in how the two clusters enact their sourcing strategies. Rural agribusiness is typically more able to meet its business–to-business sourcing needs outside the urban area. In contrast, rural manufacturing firms tend to have to travel farther to meet their sourcing needs.

Table 9 shows that the urban region would receive about 22 percent of the added business-to-business spending due to an increase in agribusiness output. Just one in every five additional dollars sourced with another business, due to the rural agribusiness increase, would be spent with an urban business.

The urban area would see substantially more business-to-business spending due to an increase in rural manufacturing output, where 44 percent of the business-to-business spending increases would be transacted with an urban supplier.

When we look at urban consumer activity (induced effects), we find very similar impacts from increases in output associated with both Manufacturing and Agribusiness clusters.

Minnesota's urban area would be expected to see close to 30 percent of the additional consumer spending and investing activity associated with an increase in either rural manufacturing or rural agribusiness output.

*Urban jobs*

A $1 billion increase in rural agribusiness output would create 735 new non-direct effect urban jobs, about 10 percent of the statewide total.

Rural manufacturing's increased output would result in 1,043 new non-direct effect jobs in the urban region, which is 16 percent of the statewide total.

Table 10 shows that the urban region Top Ten Sectors for agribusiness and manufacturing had a significant amount of overlap (highlighted in yellow and boldface).

**Table 10**
**Urban Region Top 10 Sectors for Employment Growth: Contrasting Manufacturing and Agribusiness**

| | Employment | | Output | | Dollars/ Employee | |
|---|---|---|---|---|---|---|
| Sector Description | AGRI | MFG | AGRI | MFG | AGRI | MFG |
| **Wholesale trade businesses** | 96 | 121 | $23,458,432 | $29,821,400 | $94,487 | $94,568 |
| **Real estate establishments** | 74 | 57 | $13,448,440 | $10,347,428 | $29,270 | $29,245 |
| **Management of companies and enterprises** | 54 | 81 | $16,234,575 | $24,491,556 | $153,843 | $153,960 |
| **Food services and drinking places** | 35 | 53 | $1,999,001 | $3,031,909 | $20,333 | $20,327 |
| **Employment services** | 26 | 41 | $997,233 | $1,578,370 | $27,816 | $27,812 |
| Support activities for agriculture and forestry | 22 | n/a | $708,060 | n/a | $31,568 | n/a |
| **Securities, commodity contracts, investments, and related activities** | 17 | 32 | $3,512,815 | $6,731,627 | $97,915 | $97,872 |
| Transport by truck | 12 | n/a | $1,758,130 | n/a | $58,505 | n/a |
| Monetary authorities and depository credit intermediation activities | 12 | n/a | $3,391,514 | n/a | $78,588 | n/a |
| **Legal services** | 12 | 18 | $2,129,308 | $3,289,890 | $91,114 | $91,272 |
| Offices of physicians, dentists, and other health practitioners | n/a | 18 | n/a | $2,401,777 | n/a | $83,927 |
| Private hospitals | n/a | 17 | n/a | $2,096,891 | n/a | $65,391 |
| Architectural, engineering, and related services | n/a | 17 | n/a | $2,083,432 | n/a | $72,688 |

However, the sectors found in boldface and highlighted in yellow in Table 10 account for about 40 percent of the new urban jobs, regardless of whether the cluster is Agribusiness or Manufacturing. Urban Minnesota gains jobs fairly similarly for both of the clusters studied in this pilot research.

For both agribusiness and manufacturing, the new urban jobs tended to be higher paying positions, particularly among workers employed in the business-to-business (indirect effect) industries.

**Table 11**
**Rural Impacts: Contrasting Manufacturing and Agribusiness**

| | Employment | | Output | | Dollars/Employee | |
|---|---|---|---|---|---|---|
| Impact Type | MFG | AGRI | MFG | AGRI | MFG | AGRI |
| Direct Effect | 2,783 | 3,693 | $999,999,936 | $999,999,997 | $59,284 | $25,713 |
| Indirect Effect | 1,308 | 1,929 | $188,948,432 | $358,529,092 | $45,202 | $35,221 |
| Induced Effect | 1,336 | 982 | $141,292,176 | $103,640,575 | $32,322 | $32,178 |
| Total Effect | 5,426 | 6,604 | $1,330,240,512 | $1,462,169,664 | $49,254 | $29,451 |

## Rural impacts

*Rural Output*

By definition, 100 percent of the direct effect for both industry clusters would be seen in rural Minnesota.

As Table 11 shows, Agribusiness' effects followed a roughly equivalent pattern for both business-to-business spending and consumer activity. In both cases, about 70 percent of the increased output was transacted within the rural region.

Manufacturing's effects followed the same pattern for consumer activity. About 70 percent of the additional consumer saving and spending activity associated with an increase in rural manufacturing's output took place with rural businesses.

**Table 12**
**Rural Region Top 10 Sectors for Employment Growth: Agribusiness**

| Sector Description | Employment | Output | Dollars/Employee |
|---|---|---|---|
| Grain farming | 966 | $165,792,464 | $14,059 |
| Animal production, except cattle and poultry and eggs | 834 | $75,553,056 | $7,200 |
| Oilseed farming | 426 | $93,558,448 | $19,661 |
| Sugarcane and sugar beet farming | 315 | $19,645,410 | $10,543 |
| Support activities for agriculture and forestry | 302 | $9,359,173 | $30,772 |
| Dairy cattle and milk production | 292 | $76,631,560 | $9,943 |
| Animal (except poultry) slaughtering, rendering, and processing | 272 | $133,048,352 | $50,072 |
| Cattle ranching and farming | 272 | $61,617,468 | $11,297 |
| **Wholesale trade businesses** | 218 | $36,415,624 | $62,525 |
| Poultry processing | 183 | $44,480,048 | $44,319 |

**Table 13**
**Rural Region Top 10 for Employment Growth: Manufacturing**

| Sector Description | Employment | Output | Dollars/Employee |
|---|---|---|---|
| Machine shops | 304 | $50,858,940 | $54,240 |
| **Wholesale trade businesses** | 270 | $45,114,132 | $62,526 |
| **Food services and drinking places** | 232 | $10,684,225 | $13,922 |
| All other transportation equipment manufacturing | 173 | $118,995,448 | $69,303 |
| Ornamental and architectural metal products manufacturing | 167 | $35,850,880 | $53,431 |
| Motor vehicle parts manufacturing | 146 | $50,216,968 | $61,518 |
| Farm machinery and equipment manufacturing | 138 | $75,840,840 | $56,490 |
| Boat building | 133 | $33,635,652 | $54,365 |
| Material handling equipment manufacturing | 116 | $41,198,280 | $56,642 |
| Construction machinery manufacturing | 109 | $83,031,264 | $64,065 |

However, as Table 11 makes clear, relatively more of manufacturing's added business-to-business spending was transacted with urban suppliers. The rural Manufacturing cluster spent 44 percent of its additional business-to-business dollars with urban suppliers, while agribusiness spent 22 percent of those dollars with its own urban suppliers.

*Rural jobs*

As Table 11 makes clear, the 3 percent increase in Agribusiness cluster output would result in more rural jobs than the 6 percent increase in Manufacturing cluster output.

Tables 12 and 13 illustrate that, unlike the urban impacts, there was very little overlap between the Top Ten Industry Sectors for the jobs added in rural Minnesota between the two industry clusters, Agribusiness and Manufacturing.

Tables 12 and 13 also demonstrate that rural job growth would be more concentrated over a narrow band of sectors based on an increase in output for the Agribusiness cluster, than would be true in the Manufacturing cluster.

Table 12 shows that Top Ten Industry Sectors account for 62 percent of rural Agribusiness-related job growth. Nine of the Top 10 Sectors are included in the agribusiness cluster.

Table 13 illustrates that Top Ten Industry Sectors account for 34 percent of rural manufacturing job growth. Eight of the top 10 sectors were included in the Manufacturing cluster.

# Next Steps

***"Why did I come to this symposium,* The Rural Urban Gathering?**

***I grew up in Hancock, MN and am very concerned about the well-being of rural communities. You cannot have effective energy, education and workforce development policy if it doesn't include rural urban connections. I hope to learn more about these connections."***

*Attendee, University of Minnesota, Morris Center for Small Towns & Rural-Urban Gathering, "Finding Solutions and Redefining Communities" June 9th and 10th, 2010 Symposium*

The economic dependence of urban Minnesota on rural Minnesota is real, measurable and significant. Development dollars spent in rural Minnesota will benefit both urban and rural businesses and populations, although not always according to the same trajectories.

There are a variety of methods that can be used to illustrate rural urban commercial linkages. This paper presented results based on two such methods, cluster analysis and input-output analysis.

- Cluster analysis is already a well-established framework among economic development and regional development specialists. Certainly that emphasis is well deserved and should continue.
- IO analysis is a relatively less explored approach that can be helpful to economic development, work force development and regional planning professionals.
- The combination of these two approaches provides a useful tool for making better economic development decisions

Future research efforts would be well-rewarded by aligning investigative activities and design elements with the ongoing economic development and workforce development cluster studies being conducted at the University of Minnesota and DEED.

Our pilot study experience points to a number of areas where improvements in the research approach would likely result in valuable information for future decision-making:

- **Reciprocity of economic benefits**. Understanding mutuality and codependence would be valuable. Our pilot study looked at a single directional flow of influence: assessing the impact on the urban area due to an increase in output originating in rural Minnesota. These findings should be extended via studies of the impact on rural Minnesota due to an increase in output originating in the urban area.
- **Clusters of interest**. This study addresses only two clusters, Manufacturing and Agribusiness, and these were very broadly defined. Other clusters of differing degrees of specificity also merit study, including "Education and Knowledge Creation" and other service sector clusters.

- **Improved articulations of geography**
  - **Refining definitions of "urban" and "rural."** Our study used a grossly defined measure of urban and rural Minnesota. Rochester, Duluth, St. Cloud, Mankato and Moorhead clearly merit treatment as non-rural areas, even if they are not included in the same category as Minneapolis and St. Paul.
  - **Defining regions.** Beyond a clearer binary definition of "urban" and "rural," planning and development studies could benefit from a more nuanced definition of Minnesota's economic regions. This might be accomplished by analyzing regional trade flows within and among Minnesota's Economic Development Regions.
  - **Employing more expressive units of study.** Using counties as our unit of analysis might not be ideal. Minnesota's counties vary greatly in size and composition. Ramsey County is only 156 square miles, while St. Louis County is 6,335 square miles. There are counties that are fairly uniformly rural (Traverse) or urban (Ramsey). There are also counties, like St. Louis County, that are hard to classify as urban or rural because a mid-sized city (Duluth) causes local spike in population, while the great majority of the county's landmass is clearly rural in terms of its land use and population density. Reporting by county may make developing useful comparisons difficult. Researchers have proposed a number of approaches aimed at addressing this classification issue.
- **Cross-Border trading relationships.** Our IARP/ IMPLAN model did not account for important trading connections with areas in bordering states, such as Fargo, North Dakota. One stream of future research might be directed towards using cluster/IO analysis to assess the relative "criticality" of specific neighboring (or more distant) regions in terms of their participation in Minnesota's targeted industrial cluster networks.

***"We have treated rural and urban separately for so long, we have forgotten how they are closely interlaced, especially in economic development. The creation of the Rural Urban Steering Committee as a part of this project to identify and map connections, can be a human and organizational framework for ensuring that ideas, challenges, opportunities, policy etc are shared across the rural urban continuum so that we can more wisely plan for a thriving Minnesota across geography and sectors"***

*Jane Leonard, former president of Minnesota Rural Partners, Inc. and instigator of the Rural Urban Connections project, November 2010*

# End Notes


1. Michael Porter, The Competitive Advantage of Nations, Free Press (1998).
2. Unlocking Rural Competitiveness: the Role of Regional Clusters, (January, 2007), reported published by Center for Regional Development at Purdue University, The Indiana Business Research Center, at the Kelley School of Business at Indiana University, Indiana State Government and Strategic Development Group, Inc. Downloaded on May 5, 2010 at http://www.ibrc.indiana.edu/innovation/reports.html.
3. For more information on NAICS codes please visit http://www.census.gov/eos/www/naics/. The IARP often collapses the six-digit NAICS (North American Industry Classification System) codes, sometimes down to three digit NAICS sectors. For more details on how the IARP project converts NAICS codes to create clusters, please visit http://www.statsamerica.org/innovation/industry_clusters.html and download "Aggregated Cluster Definitions."
4. According to IMPLAN results, $53,118,417,998 of Rural Minnesota's total output of $175,148,499,827 is generated in economic sectors excluded from cluster analysis.
5. According to IMPLAN results, $118,088,343,977 of Urban Minnesota's total output of $324,718,313,914 is generated in economic sectors excluded from cluster analysis.
6. Downloaded from http://www.statsamerica.org/innovation/anydata/ on June 18, 2010.
7. For more information about the University of Wisconsin study, please visit http://reic.uwcc.wisc.edu/.
8. For more information, please visit http://www.implan.com.
9. *Research on the Economic Impact of Cooperatives,* Steven Deller, Ann Hoyt, Brent Hueth, Reka Sundaram-Stukel; University of Wisconsin Center for Cooperatives, Revised June 19, 2009, p. 12.
10. Brigid Tuck, University of Minnesota's Economic Impact Analysis Program and Business Retention and Expansion Program, personal correspondence.
11. "An industry is defined as 'distinguishing' by its location quotient (LQ). An LQ that is greater than 1.0 means that the share of employment in that industry is a region is higher than the average share for the rest of the country." Kyle Uphoff, "Seeds of Change," *Minnesota Economic Trends,* March 10,2010 p.1.
12. "Rural Minnesota suffering from 20% loss in manufacturing jobs since 2000" by Sharon Schmickle, Minn Post Oct 6, 2010, http://www.minnpost.com/stories/2010/10/06/22090/rural_minnesota_suffering_from_20_loss_in_manufacturing_jobs_since_2000. Downloaded 10/7/10.
13. *Understanding the Worker Needs of Manufacturers: 2007 Minnesota Skills Gap Survey,* Executive Summary. http://www.positivelyminnesota.com/Data_Publications/Data/Research_Reports/Workforce_Research/Minnesota_Skills_Gap_Survey_Full_Report_2007.pdf. Downloaded 10/5/10.
14. Downloaded from http://www.statsamerica.org/innovation/industry_clusters.html and download "Aggregated Cluster Definitions."
15. Ibid

# Appendices

## A. IARP 2008 Minnesota's Distribution of Employment by Cluster

**Table 1[1]**
**IARP Comparing 2008 Rural and Urban Minnesota Cluster Size and Distribution of Jobs[2]**

| Cluster Name | # of Employees In this cluster throughout Minnesota | % of Employees in this cluster employed in Rural MN | % of Establishments in this cluster located in Rural MN | % of Wages earned in this cluster that are earned in Rural MN |
|---|---|---|---|---|
| Education & Knowledge Creation | **232,958**[3] | **54%** | **47%** | **48%** |
| Business & Financial Services | 228,049 | 20% | 37% | 14% |
| Biomedical/Biotechnical (Life Sciences)[4] | **182,488** | **40%** | **40%** | **37%** |
| Manufacturing | **158,089** | **43%** | **46%** | **35%** |
| Information Technology & Telecommunications | 131,098 | 36% | 44% | 31% |
| Energy (Fossil & Renewable) | 126,985 | 54% | 56% | 48% |
| Advanced Materials | 125,871 | 39% | 42% | 31% |
| Arts, Entertainment, Recreation & Visitor Industries | 95,123 | 53% | 58% | 42% |
| Defense & Security | 87,211 | 33% | 45% | 28% |
| Agribusiness, Food Processing & Technology | 82,837 | 81% | 82% | 75% |
| Printing & Publishing | 78,228 | 31% | 36% | 21% |
| Forest & Wood Products | 55,130 | 56% | 51% | 52% |
| Transportation & Logistics | 66,623 | 35% | 62% | 25% |
| Chemicals & Chemical Based Products | **39,005** | **45%** | **57%** | **37%** |
| Apparel & Textiles | **15,642** | **50%** | **33%** | **37%** |
| Glass & Ceramics | **10,392** | **65%** | **58%** | **72%** |
| Mining | **4,249** | **86%** | **75%** | **89%** |
| Total All Industries | **2,679,527** | **40%** | **49%** | **31%** |

## B. IMPLAN Results – Manufacturing

### 1 Statewide Impacts: Manufacturing

**Table 2**
**Statewide Imapcts: Manufacturing**

| Impact Type | Employment (# of positions gained) | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | 2,783 | $164,968,352 | $239,945,600 | $999,999,936 | $59,284 |
| Indirect Effect | 1,937 | $109,633,112 | $178,858,030 | $336,231,552 | $56,597 |
| Induced Effect | 1,750 | $63,320,960 | $116,296,490 | $201,831,896 | $36,188 |
| Total Effect | 6,470 | $337,922,432 | $535,100,100 | $1,538,063,360 | $52,233 |

## 2. Urban Impacts: Manufacturing

**Table 3**
**Urban Impacts Manufacturing**

| Impact Type | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | - | $0 | $0 | $0 | $0 |
| Indirect Effect | 629 | $50,508,392 | $81,326,700 | $147,283,120 | $80,287 |
| Induced Effect | 414 | $20,151,544 | $35,916,800 | $60,539,720 | $48,652 |
| Total Effect | 1,043 | $70,659,936 | $117,243,500 | $207,822,848 | $67,727 |

**Table 4**
**Urban Top 10 Sectors: Manufacturing**

| Sector | Description | Employment | Labor Income | Value Added | Output | Dollars/Employee |
|---|---|---|---|---|---|---|
| 319 | Wholesale trade businesses | 121 | $11,471,146 | $19,642,052 | $29,821,400 | $94,568 |
| 381 | Management of companies and enterprises | 81 | $12,439,960 | $16,682,964 | $24,491,556 | $153,960 |
| 360 | Real estate establishments | 57 | $1,655,287 | $8,075,085 | $10,347,428 | $29,245 |
| 413 | Food services and drinking places | 53 | $1,079,383 | $1,604,605 | $3,031,909 | $20,327 |
| 382 | Employment services | 41 | $1,140,275 | $1,229,906 | $1,578,370 | $27,812 |
| 356 | Securities, commodity contracts, investments, and related activities | 32 | $3,171,045 | $3,230,020 | $6,731,627 | $97,872 |
| 367 | Legal services | 18 | $1,661,152 | $2,149,724 | $3,289,890 | $91,272 |
| 394 | Offices of physicians, dentists, and other health practitioners | 18 | $1,468,731 | $1,707,536 | $2,401,777 | $83,927 |
| 397 | Private hospitals | 17 | $1,098,570 | $1,153,712 | $2,096,891 | $65,391 |
| 369 | Architectural, engineering, and related services | 17 | $1,199,347 | $1,216,617 | $2,083,432 | $72,688 |

## 3. Rural Impacts: Manufacturing

**Table 5**
**Rural Impacts Manufacturing**

| Impact Type | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | 2,783 | $164,968,352 | $239,945,600 | $999,999,936 | $59,284 |
| Indirect Effect | 1,308 | $59,124,720 | $97,531,330 | $188,948,432 | $45,202 |
| Induced Effect | 1,336 | $43,169,416 | $80,379,690 | $141,292,176 | $32,322 |
| Total Effect | 5,426 | $267,262,496 | $417,856,600 | $1,330,240,512 | $49,254 |

**Table 6**
**Rural Top 10 Sectors: Manufacturing**

| Sector | Description | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|---|
| 195 | Machine shops | 304 | $16,488,982 | $21,590,724 | $50,858,940 | $54,240 |
| 319 | Wholesale trade businesses | 270 | $16,863,176 | $28,891,182 | $45,114,132 | $62,526 |
| 413 | Food services and drinking places | 232 | $3,233,994 | $4,807,126 | $10,684,225 | $13,922 |
| 294 | All other transportation equipment manufacturing | 173 | $12,017,196 | $19,953,018 | $118,995,448 | $69,303 |
| 187 | Ornamental and architectural metal products manufacturing | 167 | $8,933,614 | $12,225,885 | $35,850,880 | $53,431 |
| 283 | Motor vehicle parts manufacturing | 146 | $8,987,712 | $9,925,129 | $50,216,968 | $61,518 |
| 203 | Farm machinery and equipment manufacturing | 138 | $7,789,928 | $14,742,374 | $75,840,840 | $56,490 |
| 291 | Boat building | 133 | $7,236,012 | $7,998,202 | $33,635,652 | $54,365 |
| 228 | Material handling equipment manufacturing | 116 | $6,559,087 | $8,646,103 | $41,198,280 | $56,642 |
| 205 | Construction machinery manufacturing | 109 | $6,970,297 | $12,588,765 | $83,031,264 | $64,065 |

## C. IMPLAN results – Agribusiness, Food Processing & Technology

### 1. Statewide Impacts: Agribusiness

**Table 7**
**Statewide Impacts: Agribusiness**

| Impact Type | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | 3,693 | $94,960,572 | $262,063,116 | $999,999,997 | $25,713 |
| Indirect Effect | 2,383 | $101,526,030 | $201,851,501 | $457,717,983 | $42,608 |
| Induced Effect | 1,263 | $45,333,001 | $83,484,590 | $144,888,827 | $35,896 |
| Total Effect | 7,339 | $241,819,603 | $547,399,207 | $1,602,606,807 | $32,951 |

## 2. Urban Impacts: Agribusiness

**Table 8**
**Urban Impacts: Agribusiness**

| Impact Type | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | - | $0 | $0 | $0 | $0 |
| Indirect Effect | 454 | $33,598,474 | $57,298,715 | $99,188,891 | $73,973 |
| Induced Effect | 281 | $13,737,366 | $24,473,892 | $41,248,252 | $48,887 |
| Total Effect | 735 | $47,335,839 | $81,772,607 | $140,437,143 | $64,385 |

**Table 9**
**Urban Top 10 Sectors: Agribusiness**

| Sector | Description | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|---|
| 319 | Wholesale Trade business | 96 | $9,023,556 | $15,451,042 | $23,458,432 | $94,487 |
| 360 | Real estate establishments | 74 | $2,151,359 | $10,495,101 | $13,448,440 | $29,270 |
| 381 | Management of companies and enterprises | 54 | $8,246,004 | $11,058,538 | $16,234,575 | $153,843 |
| 413 | Food services and drinking places | 35 | $711,660 | $1,057,950 | $1,999,001 | $20,333 |
| 382 | Employment services | 26 | $720,439 | $777,069 | $997,233 | $27,816 |
| 19 | Support activities for agriculture and forestry | 22 | $694,506 | $519,886 | $708,060 | $31,568 |
| 356 | Securities, commodity contracts, investments, and related activities | 17 | $1,654,770 | $1,685,546 | $3,512,815 | $97,915 |
| 335 | Transport by truck | 12 | $696,204 | $929,496 | $1,758,130 | $58,505 |
| 354 | Monetary authorities and depository credit intermediation activities | 12 | $927,334 | $2,433,586 | $3,391,514 | $78,588 |
| 367 | Legal services | 12 | $1,075,144 | $1,391,360 | $2,129,308 | $91,114 |

## 3. Rural Impacts: Agribusiness

**Table 10**
**Rural Impacts: Agribusiness**

| Impact Type | Employment | Labor Income | Value Added | Output | Dollars/ Employee |
|---|---|---|---|---|---|
| Direct Effect | 3,693 | $94,960,572 | $262,063,116 | $999,999,997 | $25,713 |
| Indirect Effect | 1,929 | $67,927,556 | $144,552,786 | $358,529,092 | $35,221 |
| Induced Effect | 982 | $31,595,635 | $59,010,698 | $103,640,575 | $32,178 |
| Total Effect | 6,604 | $194,483,764 | $465,626,600 | $1,462,169,664 | $29,451 |

**Table 11**
**Rural Top Ten Sectors: Agribusiness**

| Sector | Sector Description | Employment | Labor Income | Value Added | Output | Dollars/Employee |
|---|---|---|---|---|---|---|
| 2 | Grain Farming | 966 | $13,579,189 | $79,674,976 | $165,792,464 | $14,059 |
| 14 | Animal production, except cattle and poultry and eggs | 834 | $6,004,260 | $36,976,348 | $75,553,056 | $7,200 |
| 1 | Oilseed farming | 426 | $8,365,829 | $40,418,236 | $93,558,448 | $19,661 |
| 9 | Sugarcane and sugar beet farming | 315 | $3,325,109 | $8,316,840 | $19,645,410 | $10,543 |
| 19 | Support activities for agriculture and forestry | 302 | $9,296,248 | $6,858,880 | $9,359,173 | $30,772 |
| 12 | Dairy cattle and milk production | 292 | $2,905,464 | $28,677,188 | $76,631,560 | $9,943 |
| 59 | Animal (except poultry) slaughtering, rendering, and processing | 272 | $13,629,477 | $15,248,870 | $133,048,352 | $50,072 |
| 11 | Cattle ranching and farming | 272 | $3,071,523 | $10,609,219 | $61,617,468 | $11,297 |
| 319 | Wholesale trade businesses | 218 | $13,611,767 | $23,320,638 | $36,415,624 | $62,525 |
| 60 | Poultry processing | 183 | $8,123,629 | $8,671,715 | $44,480,048 | $44,319 |

## Notes to Appendices

1. The clusters are listed in descending order of relevance to Minnesota's employment picture. Clusters at the top of the table contribute more jobs to Minnesota's economy than do the clusters at the bottom of the table.

2. 2008 data taken from Stats America http://www.statsamerica.org/innovation/anydata/ downloaded July 15, 2010, Original data Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment & Wages (QCEW) and Purdue Center for Regional Development (cluster definitions).

3. Bolding indicates the cluster is of particular relevance to the economic contribution made by rural Minnesota.

4. Biomedical/Biotechnical (Life Sciences) Cluster is slightly modified in order to contend with data suppression issues at County Levels. The calculation presented in this Table Includes nine NAICS codes ('621111', '621112' ,'621210', '621310', '621320' ,'621330' ,'621340' ,'621391' and '621399') which are traditionally excluded from the cluster. These NAICS codes refer to offices of physicians, offices of mental health specialists and mental health practitioners, dentists, chiropractors and other health practitioners, Optometrists, Physical, Occupational and Speech Therapists and Audiologists, Podiatrists, and all other miscellaneous Health Practitioners. Some clinics and centers are included in these NAICS codes.