

IN the Spotlight:

Integration of Technology into Indiana Manufacturing

The manufacturing industry in the United States is continuing a decades-long transformation from stockpile-inventory based production planning to a faster, more efficient production that involves information technology systems and decision tools. Worldwide competitive pressures are driving the industry to adopt new technologies to remain competitive. Computers as accounting batch processors have evolved into information

technologies or conduits that connect consumer demand to the elements of manufacturing design, production and management.

Supply chain technologies and lean manufacturing techniques (reducing the time from customer order to manufacturing and delivery of products by eliminating non-value added waste in the production stream) are improving production flow and just-in-time

(continued on page 2)

In the state of Indiana, the number of people claiming American ancestry increased 85 percent between 1990 and 2000.



A significant trend in ancestry reporting is the growing tendency among census respondents to forsake their European heritage in favor of an ancestry response that is coded "United States or American."

See Page 6 for More on
Census 2000 Ancestry Data

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Region Five: North Central Indiana

**Indiana
Unemployment
Rate for
July 2002:
5.2%**

IN the Spotlight

(continued from page 1)

Table 1: Use of Technology—A Survey of Indiana Manufacturing Establishments

	Currently Use	Average First Year of Use	Plan to Increase Use	If You Do Not Use		
				Plan to Use	Not Feasible	Not Applicable
Design Technologies	61%	1993	25%	6%	3%	21%
Concurrent or Simultaneous Engineering	23%	1990	8%	6%	10%	51%
Automated Bills of Material via CAD-MRP	24%	1994	13%	13%	19%	39%
Product Data Management to Integrate Process with Mgmt Data	21%	1996	11%	13%	18%	41%
Rapid Prototyping	14%	1993	5%	5%	14%	59%
Manufacturing Technologies						
Cellular Manufacturing	24%	1992	10%	1%	9%	55%
CNC Controlled Machines	35%	1991	17%	8%	4%	46%
CAD Data to Create Machine Instructions	27%	1992	12%	8%	5%	52%
Automated Assembly Systems	13%	1990	7%	9%	8%	65%
Robotic Assembly	7%	1993	4%	7%	10%	68%
CAD Product Data Exchange in Electronic Form with other Firms	38%	1996	17%	6%	5%	42%
Tele-service-Electronic Monitoring by Vendor of Installed Machinery	7%	1998	4%	4%	9%	68%
Information and Management Technologies						
Electronic Mail Communication with Customers or Suppliers	82%	1997	45%	5%	0%	5%
World Wide Web for Information, Marketing	67%	1998	41%	11%	4%	11%
Online Purchasing From Suppliers	47%	1998	20%	24%	6%	16%
Online Sales	28%	1999	12%	30%	6%	25%
Online Supply Chain Management	16%	1998	8%	23%	9%	45%
Distance Learning	15%	1999	8%	20%	15%	41%
Lean Manufacturing Techniques	32%	1995	19%	26%	7%	27%
Teamwork in Manufacturing Planning and Production	48%	1992	27%	17%	5%	16%
Employee Continuous Improvement	55%	1991	23%	19%	3%	14%
Just-in-time to Consumers	37%	1991	17%	9%	4%	34%
ISO Certificate	20%	1997	8%	13%	15%	40%
CE Marketing	5%	1998	3%	2%	15%	57%
Other Information and Management Technologies	6%	1998	1%	0%	0%	6%

Source: Purdue University, Agricultural Economics

*221 establishments responded to at least one item

systems. Computer aided design technologies are improving the link from the engineer's office to the factory floor. The future success of individual manufacturing establishments may very well depend upon their ability to adjust to and implement new technologies for competitive advantage. Establishments are increasingly challenged by the need to keep up with advancing technology and to meet

increasing demands for efficiency in the global marketplace.

For a glimpse into how Indiana manufacturers are meeting these new challenges, the Department of Agricultural Economics at Purdue University—with assistance from the Indiana Manufacturing Association and the Indiana Economic Development Council—surveyed a random sample of 1,401 of the state's 9,673¹ manufactur-

ing establishments.² Of the randomly selected establishments, 236 completed and returned portions of the survey.

The responses provide insight into how manufacturers have implemented advanced technologies. There are three basic areas in which information technologies are being implemented: design, production and administration.

Technologies Manufacturers Are Using

In the implementation of design technologies, the majority of respondents (61%) indicated they were currently using CAD (computer aided design) for engineering and design processes (see Table 1). Twenty-five percent of respondents planned to increase their use of CAD. The average first year of CAD use was 1993, an indication that CAD was seen by companies as a useful design tool early on. Concurrent or simultaneous engineering also had early adoption among users (1990) but was implemented in only 23 percent of the surveyed manufacturing establishments. Design technologies such as rapid prototyping, and associated applications such as automated bills of material from CAD-MRP (material requirements planning) and product data management, have been implemented by a minority of establishments.

Table 2: Implementation of Technology in Various Manufacturing Sectors

	Wood Paper	Metals Metal Prod.	Transportation Equipment	Rubber Plastics	Electrical Elec. Machine	Food Products	Chemicals	Miscellaneous Manufacturing
Design Technologies								
CAD	52%	53%	86%	51%	90%	39%	40%	45%
Concurrent or Simultaneous Engineering	4%	14%	16%	27%	50%	14%	18%	11%
Automated Bills of Material via CAD-MRP	12%	23%	38%	19%	34%	1%	31%	21%
Product Data Management	15%	20%	26%	42%	15%	14%	30%	22%
Rapid Prototyping	14%	11%	14%	26%	23%	0%	0%	7%
Manufacturing Technologies								
Cellular Manufacturing	9%	30%	15%	42%	37%	0%	10%	16%
CNC Controlled Machines	28%	33%	41%	48%	67%	0%	9%	13%
CAD Data to Create Machine Instructions	8%	26%	16%	24%	56%	1%	2%	16%
Automated Assembly Systems	5%	13%	14%	23%	23%	12%	2%	5%
Robotic Assembly	11%	11%	1%	8%	4%	12%	0%	4%
External CAD Product Data Exchange	8%	37%	50%	43%	77%	14%	19%	14%
Tele-service-Electronic Monitoring by Vendor	3%	5%	13%	24%	8%	12%	9%	0%
Information and Management Technologies								
External Electronic Mail Communication	70%	92%	89%	85%	90%	83%	89%	68%
World Wide Web for Information, Marketing	65%	84%	63%	84%	61%	84%	81%	60%
Online Purchasing From Suppliers	34%	35%	26%	42%	60%	43%	60%	53%
Online Sales	19%	28%	24%	33%	24%	26%	40%	36%
Online Supply Chain Management	7%	21%	13%	9%	18%	16%	11%	18%
Distance Learning	0%	12%	13%	15%	14%	27%	19%	23%
Lean Manufacturing Techniques	18%	42%	26%	35%	34%	27%	40%	31%
Teamwork in Manufacturing Production	27%	58%	88%	52%	46%	43%	61%	38%
Employee Continuous Improvement	41%	51%	95%	66%	49%	30%	61%	64%
Just-in-time to Consumers	38%	53%	50%	43%	32%	30%	31%	30%
ISO Certificate	11%	28%	36%	43%	14%	0%	40%	16%
CE Marketing	11%	2%	1%	9%	3%	0%	0%	7%
Other Information and Mgmt Technologies	11%	7%	0%	0%	13%	0%	0%	0%

Source: Purdue University, Agricultural Economics

*221 establishments responded to at least one item

Among manufacturing technologies, computer numerical control (CNC) machines had a 35 percent rate of adoption. Thirty-eight percent of establishments were using CAD in the production process to communicate product data with other firms. About one-fourth of establishments in the survey use cellular manufacturing (the arrangement of people and equipment into efficient, process based cells, to create a smooth flow that shortens the lead time for delivery while supporting low inventory production, space saving and continuous improvement), and about one-fourth use CAD data for machine instructions. Thirteen percent

had automated assembly systems, but few (7%) used robotic assembly or had their equipment monitored online by a vendor (7%). The rate of implementation of manufacturing technologies overall shows that a minority of respondents are using these technologies, but for those who have done so, the average year of adoption was fairly early in the 1990s, and most before 1994. A minority of establishments planned to increase use of any one particular manufacturing technology.

Information and management technologies saw widespread use of the Internet for e-mail and marketing information purposes. The majority

(82%) of respondents use e-mail to communicate with their customers. The average first year of use for e-mail was 1997, and use of the World Wide Web to provide information and marketing began in 1998. Sixty-seven percent of the respondents use the World Wide Web for information and marketing. Forty-five percent plan to increase their use of e-mail; 41 percent plan to increase their use of the World Wide Web.

Approximately half of survey respondents participate in employee continuous improvement (a program that provides ongoing training and development for production and other

workers) and use teamwork production. Nearly half buy online from suppliers; however, 28 percent of respondents sell online and only 12 percent planned to increase online sales.

Technologies Not Implemented By Manufacturers

According to responses in the survey, a common reason for not using a particular technology was because it was not applicable to their business. No one single technology is being planned for future implementation by a majority of establishments. The highest ranked planned future use (30%) was online sales. Lean manufacturing techniques (26%), online purchasing (24%) and online supply chain management (23%) were the next most commonly selected technologies/practices for future use.

Implementation of Technology by Manufacturing Sectors

Different manufacturing sectors will have different needs. For example, CAD is more useful for designing an engine than it is for designing a chemical structure. Table 2 shows the rates of implementation by technology and sector. In general, transportation equipment and electrical manufacturing are technology-heavy sectors; food and chemical manufacturing responses showed less implementation among the categories.

In another part of the survey, manufacturing executives indicated they felt technical progress would be a critical

determinant of competitiveness. The highest ranked factors for competitiveness involved product and process development (see Figure 1).

Responses indicate that improvements in the manufacturing process and improvements in product development will determine future competitiveness. Technological improvements typically involve capital investment. Eighty-nine percent of the respondents have made investments in equipment within the last three years.

Indiana manufacturers have demonstrated a willingness to make capital investments. They invest to improve product and processes and to ensure competitiveness via technological progress. Indeed, the Chairman of the Federal Reserve attributes most of the productivity gains of the 1990s to technological progress. Manufacturers will likely continue to make investments in technologies as they have proved to be productive assets.

For additional information, contact Kevin T. McNamara by e-mail at: mcnamara@agecon.purdue.edu or visit <http://www.agecon.purdue.edu/crd/manufacture.htm>

- 1 U.S. Bureau of Labor Statistics, Covered Employment and Wages Survey Data.
- 2 U.S. Census Bureau, 1997 Economic Census, A-2 Appendix A *Number of Establishments and Companies*. A manufacturing “establishment” is defined by the U.S. Census Bureau to be a “single physical location where manufacturing is performed” (a company may have more than one establishment).

—Kevin T. McNamara, Professor, and David L. Brown, Research Associate, Department of Agricultural Economics, Purdue University



Census Ancestry Changes Reflect Changing America

With the release of new census profiles last month, several media stories made note of the declining number of people in the United States claiming European ancestry. Nationwide, people claiming German ancestry dropped by 15 million, or 26 percent, between 1990 and 2000. Declines totaled 8 million each for both the Irish and English. Numbers were also down for most other European ancestry groups, including Danish, Dutch, French, Scotch-Irish, Swedish and Swiss. Considering that the U.S. population increased by 13 percent over the same period, the large drop in European ancestry represents a big change in the composition of our national population, or at least in the way that we perceive ourselves.

One factor in the drop in population of European descent is “cohort replacement.” In effect, the age composition of the country is determining the ancestry composition. Many of the elderly people in the U.S. are of European descent. When they die, they are being replaced by younger cohorts who are either not European or are less likely to identify themselves as belonging to one of the European ancestry groups.

The likelihood of census respondents identifying with any ancestry group is on the decline and certainly accounts for a large portion of the decline in reporting of European ancestries. Compared to 1990, Census 2000 found more respondents leaving the ancestry item blank. The census long form questionnaire allows respondents to list up to two ancestries, so it’s possible for the total ancestries reported for any given area to be double that area’s pop-

ulation. In the 1990 census, the national ratio of total ancestries reported was 119 per 100 residents. In 2000, that ratio slipped to 102 per 100 residents. The drop in ancestry reporting was even steeper in Indiana, falling to 92 total ancestries per 100 residents in 2000—from 117 in 1990. Presumably, many respondents still select two

ancestries, so it’s reasonable to conclude that nonresponse is contributing substantially to the falling ratio.

Figures 1 and 2 show the distribution of the 50 states in 1990 and 2000, respectively, on the ratio of total ancestries reported per 100 residents. In 1990, 32 states, primarily in the northern and western regions of the U.S.,

Figure 1: Total Ancestries Reported per 100 Residents, 1990

Indiana’s ratio of ancestries reported was 117 per 100 residents in 1990

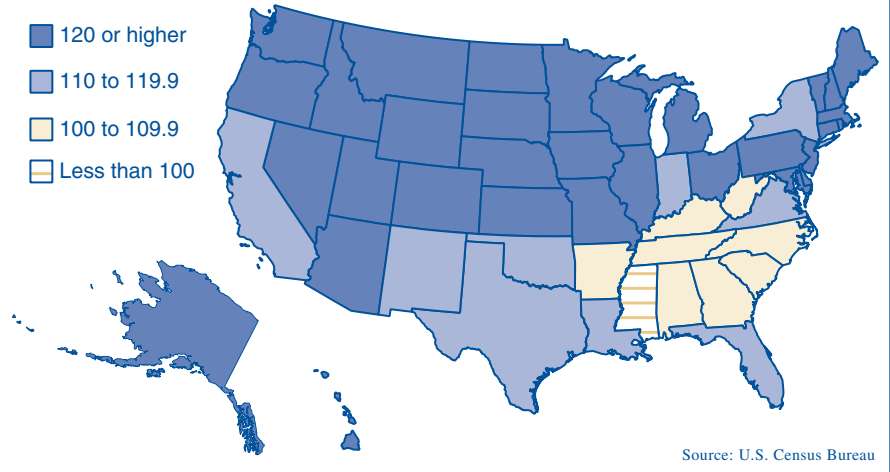
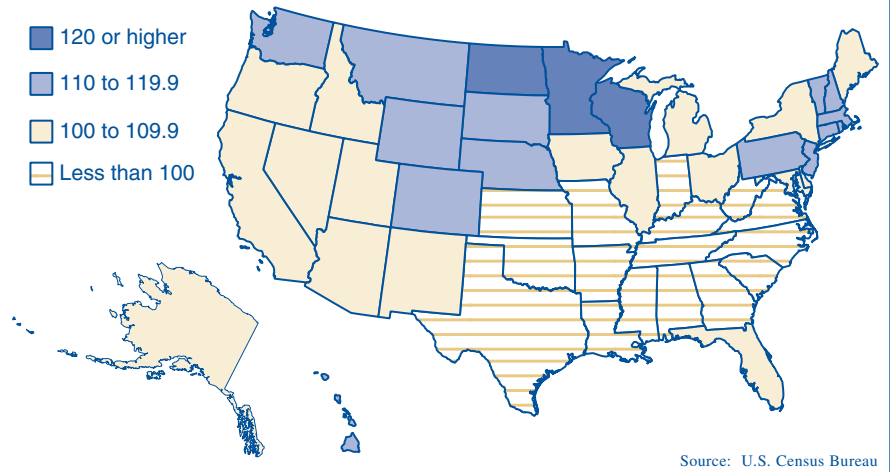


Figure 2: Total Ancestries Reported per 100 Residents, 2000

More respondents left the ancestry item blank in 2000 than in 1990



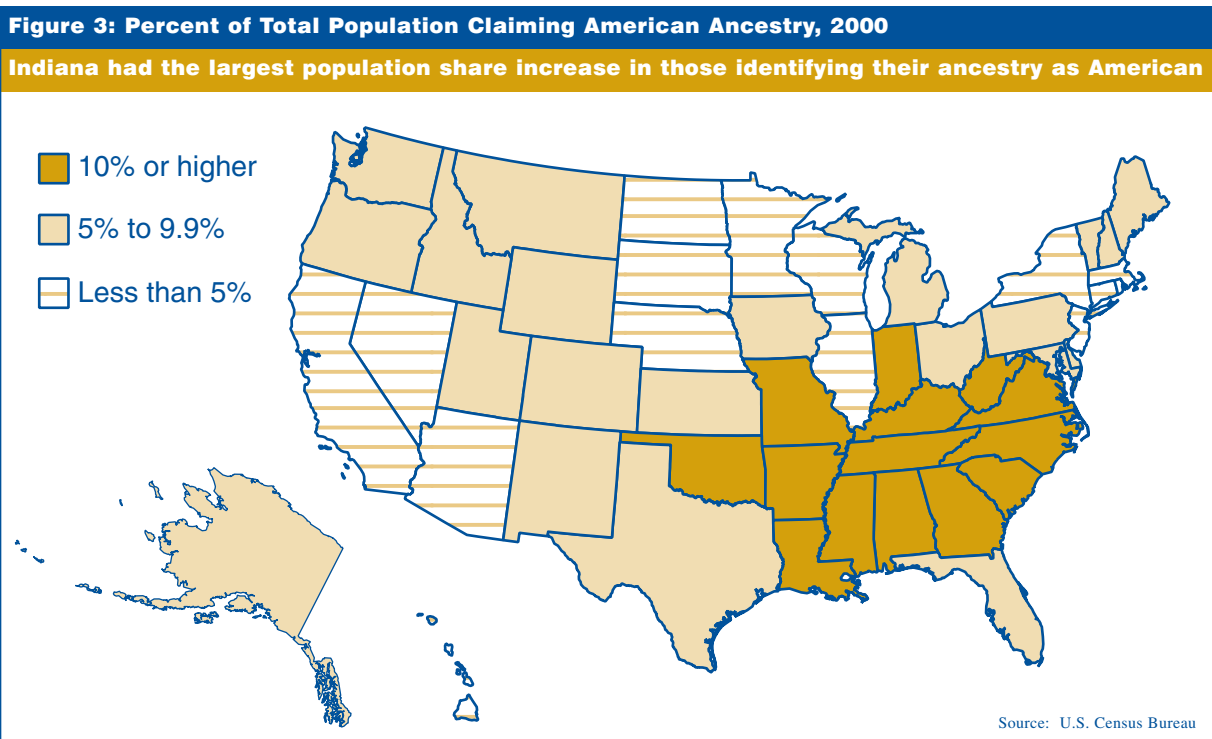
recorded at least 120 total ancestries per 100 residents. Only Mississippi, at 99.1, had a ratio under 100. By 2000, a combination of item nonresponse along with an apparently growing tendency to report only a single ancestry has radically shifted the map. Only three states now have a total-ancestries-to-total-population ratio of 120 or higher, while the number of states below 100 has grown from one to 16. Ten of those 16 states belonged to the old Confederacy; they are joined by Oklahoma, Kansas, Missouri, Kentucky, West Virginia and Indiana. The Hoosier state stands out in Figure 2 as the northernmost state with fewer than 100 total ancestries reported per 100 residents.

Another significant trend in ancestry reporting behavior is the growing tendency among census respondents to forsake their European heritage in

favor of an ancestry response that is coded “United States or American.” The number of people claiming American ancestry increased by 58 percent nationwide between 1990 and 2000, a gain of 7.5 million people. In Indiana, this ancestry group grew even faster, with an 85 percent increase over 10 years. It is likely that this trend has had a disproportionate effect on European ancestry groups, since the largest waves of European immigration to the U.S. occurred 80 to 130 years ago. The descendants of these immigrants probably maintain fewer ties to their ancestral homelands and would have a greater tendency to name a single ancestry: American. Figure 3 depicts the share of each state’s total population claiming American ancestry in 2000. In fourteen states, mostly southern, at least 10 percent of the total

population claimed American ancestry. Again, Indiana is conspicuous as the northernmost state in this category. Indiana, in fact, had the largest increase among all states in the population share identifying their ancestry as American, climbing from 7 percent of all Hoosiers in 1990 to 12 percent in 2000. It’s useful to note that these data were collected at least a full year before the September 11th terrorist attacks sparked a resurgence in patriotism. Future tabulations of ancestry for the United States population can be expected to show continued gains in the American ancestry group.

—John Besl, Research Demographer, Indiana Business Research Center, Kelley School of Business, Indiana University



Questionable Data Can Lead to Questionable Analysis

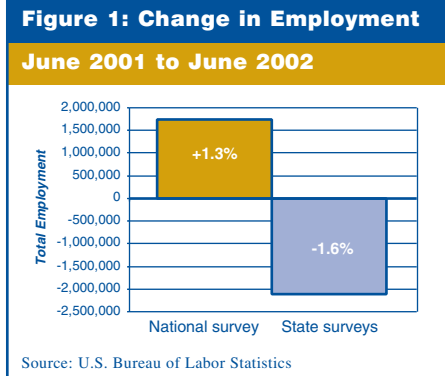
Economic analysts and economic policy makers are constantly confounded by questionable data. One of the most blatant examples arises from the differences in monthly employment data for the nation and the monthly data for the sum of the 50 states plus the District of Columbia. Employment data for each state are derived from monthly surveys of employers.

The national data now available include changes in benchmarking reflecting March 2001 data. As a result of these changes, the Bureau of Labor Statistics (BLS) adjusts the data for the prior years and the survey used to sample the current year. State data, however, are not consistent with the national figures.

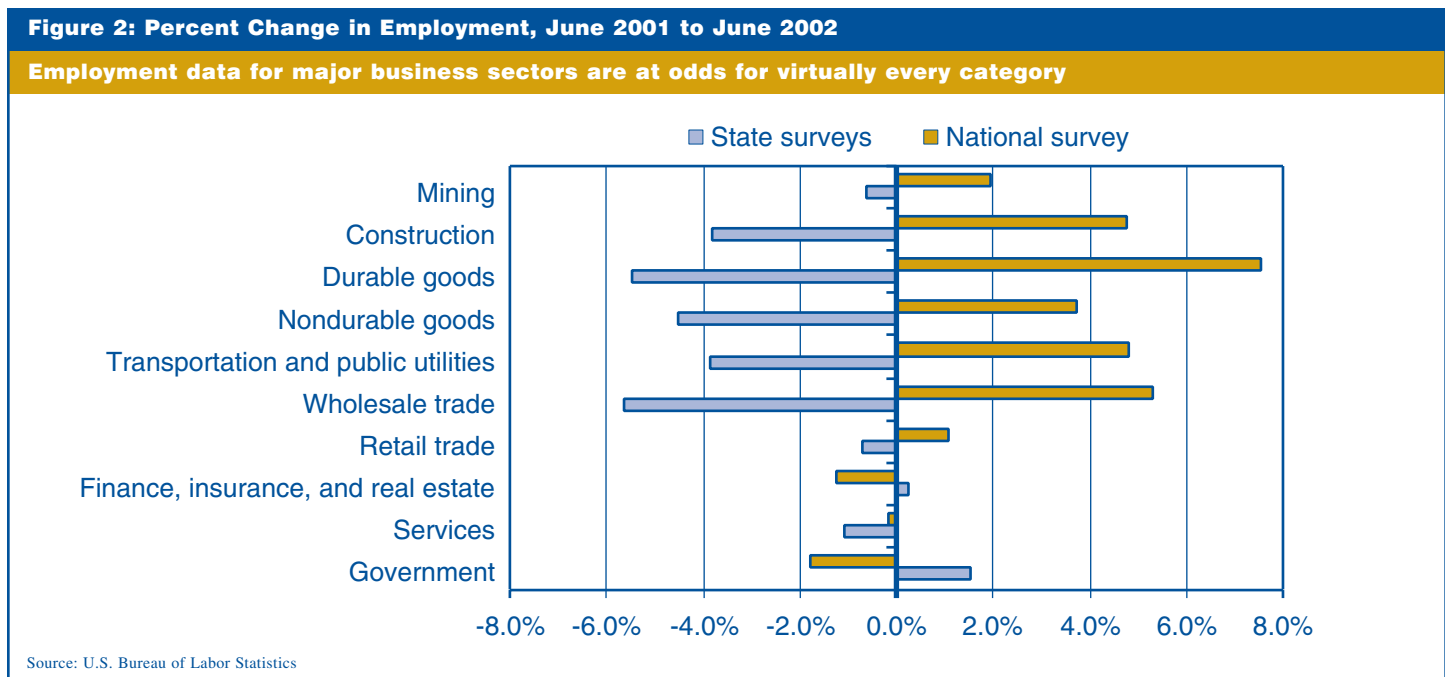
As BLS explains the situation: “State estimation procedures are designed to produce accurate data for

each individual state. BLS independently develops a national employment series; state estimates are not forced to sum to national totals nor vice versa. Because each state series is subject to larger sampling and non-sampling errors than the national series, summing them cumulates individual state level errors and can cause significant distortions at an aggregate level. Due to these statistical limitations, BLS does not compile a “sum-of-states” employment series, and cautions users that such a series is subject to a relatively large and volatile error structure.”

How different is the picture of the nation’s economy when the two series are compared? Figure 1 shows that according to the national series from June 2001 to June 2002, total employment has climbed by 1.7 million (+1.3%) while the sum of the states shows a decline of 2.1 million (-1.6%).



What is true at the level of total employment is also true for individual industries. Figure 2 shows how each major business sector differs when the nation survey is used compared to the sum of states approach. Not only are the data at odds for virtually every sector, but the extremes are most noteworthy. Durable goods manufacturing rose by 7.5 percent in the national survey while the sum of the states indicated a 5.5 percent decline. Only



in services are the two approaches in agreement with respect to direction of change (both show declines).

How is one to interpret the changes in individual states under these circumstances? For example, during the same June-to-June period, Indiana had a reported decline of 44,800 jobs (-1.5%), besting the sum of the states (-1.6%). But Indiana ranked 32nd in percent change among the 50 states. Is this serious if each state has its own error rates in these monthly estimates?

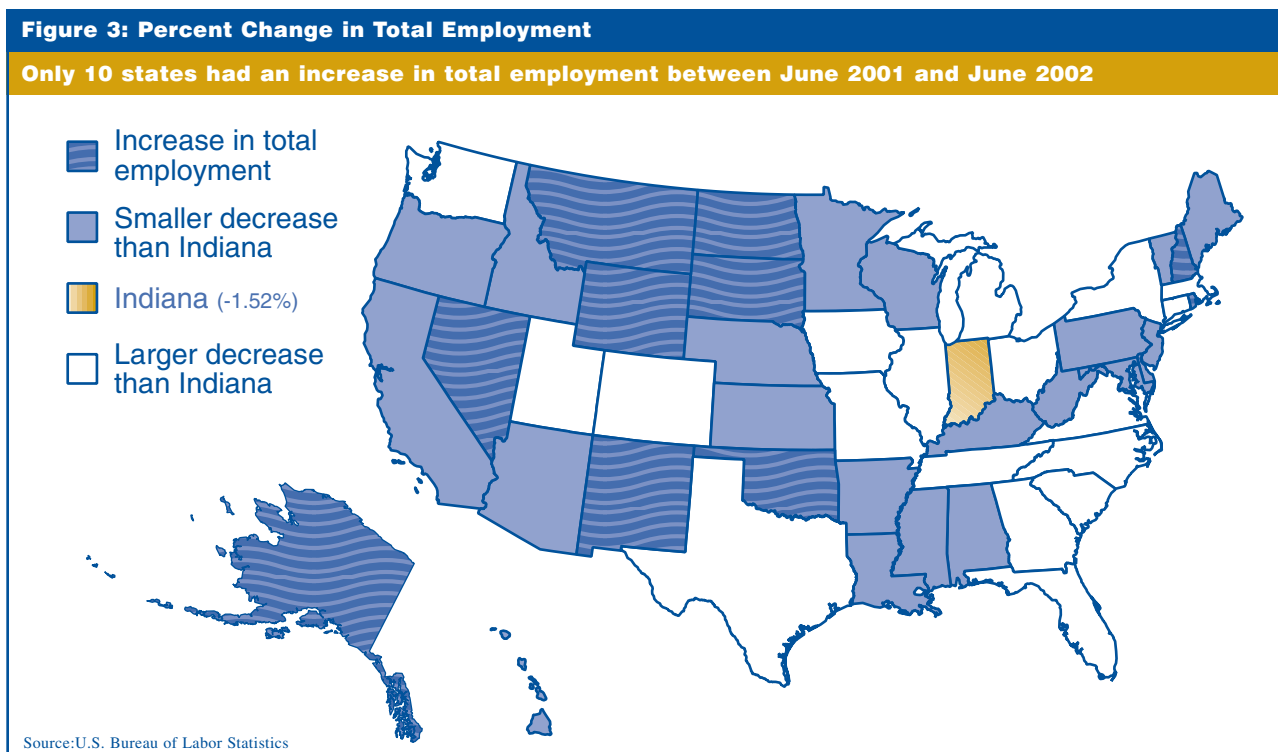
According to BLS, the states should not be added together and compared to the national figure. If the states are not to be added together, can they be compared to one another? Is it appropriate to rank Indiana among the states? Can we say that Indiana is doing better (or

worse) than another state without knowing in some detail the comparability of the state surveys?

Among the 50 states, only 10 had an increase in total employment between June 2001 and June 2002 (see Figure 3). The map shown in Figure 3 suggests how the employment scene is changing, but the agency responsible for the data seems to caution us not to use these data. If that is the case, how are policy makers to make decisions about the course of the economy? Are political candidates likely to read the fine print on the BLS Web site? Are newspapers likely to avoid using the data for their editorials? How can economic analysts be expected to make sense of incomparable data?

Can we say that Indiana is doing better (or worse) than another state without knowing in some detail the comparability of the state surveys?

—Morton J. Marcus, Executive Director, Indiana Business Research Center, Kelley School of Business, Indiana University



Region Five: North Central Indiana

The Area

Region 5 is comprised of six counties: Cass, Fulton, Howard, Miami, Tipton and Wabash. The region's largest city, Kokomo, is 52 miles north of Indianapolis. Howard and Tipton counties comprise the Kokomo Metropolitan Statistical Area (MSA), which is the smallest of Indiana's 12 metropolitan areas.

Population

Region 5 had 234,024 residents in 2000. Rebounding from a 5.9 percent population loss during the 1980s, Region 5 gained 3.5 percent the following decade (see Figure 1). With the exception of Miami and Wabash, each county in the region experienced growth in the 1990s, gaining a total of 7,859 people. Fulton County experienced the largest percent gain (8.9%), while Howard County had the largest numeric increase of 4,137 people. Miami County declined 2.2 percent (815 people), while Wabash decreased 0.31 percent (109 people).

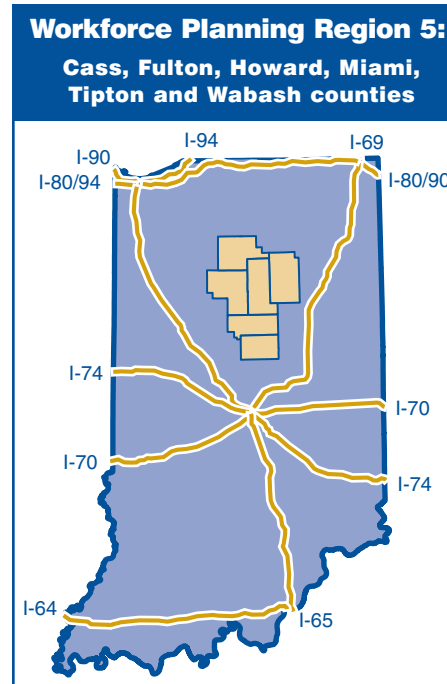
With 84,964 residents, Howard County is the heart of the Kokomo MSA and accounts for 36.3 percent of Region 5's population. Tipton is primarily rural with merely 7.1 percent of the region's inhabitants.

Industrial Mix, Jobs and Wages

While Indiana's nonfarm employment grew 20.3 percent from 1990 to 2000, the rate of growth in Region 5 was 11.0 percent. During that decade, employment in the Kokomo MSA grew slightly faster than the region at 14.9 percent.

According to labor market analysts at the Indiana Department of Workforce Development, well known employers in Region 5 include: IBP (Iowa Beef Processing), T.M. Morris Manufacturing Co., Federal Mogul Co., Logansport State Hospital, Rochester Metal, Syndicate Sales, Haynes International, Delphi Delco Electronic Systems, Daimler-Chrysler, St. Joseph Hospital, Marlburger Foods, Square D Co., Pioneer Hi-Bred International, Steel Parts, GenCorp, and Ford Meter Box.

In contrast to statewide trends, manufacturing remained the dominant industry in Region 5, accounting for 30.3 percent of nonfarm employment in 2000. The fast-growing services industry accounted for 21.1 percent, while retail trade



comprised 18.0 percent. In Indiana, the services industry was 27.6 percent of nonfarm employment while manufacturing comprised just 19.3 percent.

Figure 2 shows the changes in Region 5's industrial mix between 1990 and 2000. The area saw the largest percent increases in construction (25%) and services employment (21.9%). The largest numeric increases were in services (4,898 jobs) and manufacturing (2,841 jobs). The largest decrease involved military employment, which declined 76.5 percent (2,695 jobs) due to the closing of Grissom Air Force Base in Miami County.

Despite growth over the previous decade, employment in the Kokomo MSA declined 4.1 percent in the five years from June 1997 to June 2002. Manufacturing employment declined 13.7 percent, while it only fell 8.4 percent statewide. Between 1997 and 2000, 500 manufacturing jobs were

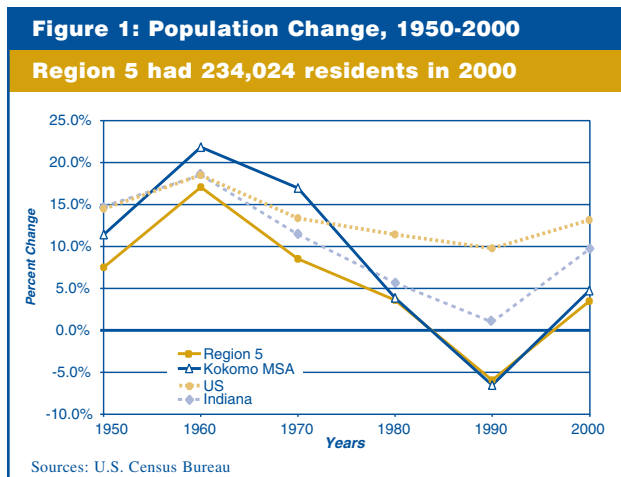
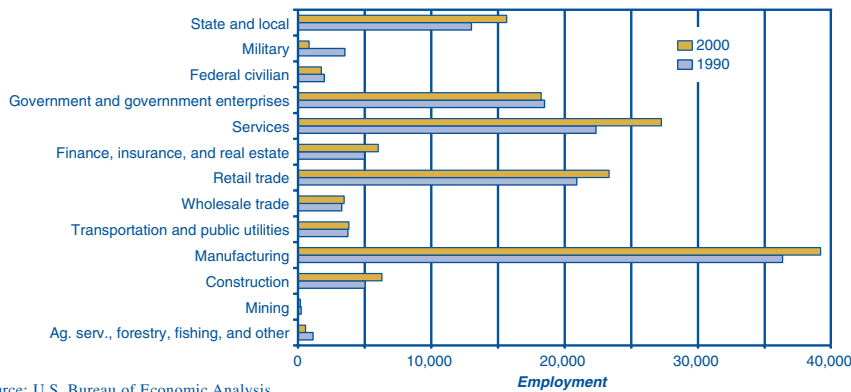


Figure 2: Changes in Regional Industry Employment, 1990-2000

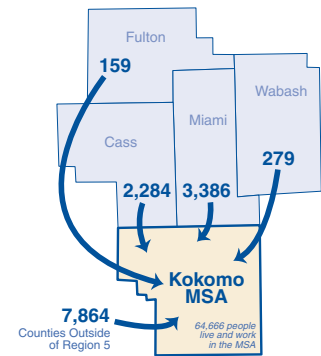
Manufacturing remains the dominant industry in Region 5



Source: U.S. Bureau of Economic Analysis

Figure 3: Commuting to Kokomo

45% of regional labor force work in MSA



Source: STATS Indiana Commuting Profiles, Tax Year 2000

lost in the MSA. In 2000, that number jumped to 3,700 lost jobs primarily because of layoffs from manufacturing plants. Employment in the sector improved slightly with a gain of 500 jobs in 2001, but the first six months of 2002 brought another loss of 100 jobs.

However, manufacturing remains the dominant industry in the Kokomo MSA, accounting for 35.8 percent of employment. Of the state's 12 MSAs, only Elkhart-Goshen had a higher percentage of manufacturing employment (49.1%).

Nearly 45 percent of the region's labor force—70,774 people—were employed in the Kokomo MSA in 2000. Of that number, 64,666 both lived and worked in the MSA. Within the region, Miami County sent the most commuters

to Kokomo, while Fulton County sent the fewest commuters (see Figure 3).

Overall, 5.7 percent of Region 5's labor force commuted into the Kokomo MSA. An additional 2 percent commuted outside of the region into the Indianapolis MSA.

Table 1 shows that in the fourth quarter of 2001, the average quarterly wage for nonfarm employment in Region 5 was \$390 higher than in the

state. The average quarterly wage in manufacturing was \$1,886 more than in Indiana. Manufacturing earnings in the Kokomo MSA show an even greater difference, where the average quarterly wage was \$4,534 higher than in the region and \$6,420 higher than in the state.

—Rachel Justis, Research Associate, Indiana Business Research Center, Kelley School of Business, Indiana University

Table 1: Average Employment and Earnings for Third Quarter 2001

Industry	Employment		% of Employment		Avg. Quarterly Wage/Job	
	Region 5	Indiana	Region 5	Indiana	Region 5	Indiana
TOTAL NONFARM	97,289	2,865,107	100%	100%	\$8,594	\$8,204
AGRICULTURE, FORESTRY & FISHING	855	27,389	0.9%	1.0%	\$7,502	\$6,114
MINING	5	6,619	0%	0.2%	\$5,605	\$13,110
CONSTRUCTION	3,627	149,019	3.7%	5.2%	\$8,580	\$9,993
MANUFACTURING	34,840	617,829	35.8%	21.6%	\$12,847	\$10,961
TRANSPORTATION AND PUBLIC UTILITIES	3,002	159,689	3.1%	5.6%	\$8,730	\$9,486
WHOLESALE TRADE	2,707	138,350	2.8%	4.8%	\$9,116	\$10,814
RETAIL TRADE	17,506	560,782	18.0%	19.6%	\$3,859	\$4,218
FINANCE, INSURANCE & REAL ESTATE	2,913	138,736	3.0%	4.8%	\$7,966	\$10,420
SERVICES	26,067	941,016	26.8%	32.8%	\$6,445	\$7,619
PUBLIC ADMINISTRATION	4,976	125,070	5.1%	4.4%	\$7,079	\$7,951
NONCLASSIFIABLE*	0	608	0%	0%	n/a	\$8,425

*Data for Nonclassifiable establishments were nondisclosable in Region 5. Source: Indiana Business Research Center, Indiana Industry Employment and Wages, based on ES-202 data from the Indiana Department of Workforce Development

IN CONTEXT

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Kelley School of Business
Indiana University
Bloomington Campus
1275 E. Tenth Street, Suite 3110
Bloomington, Indiana 47405
IUPUI Campus
777 Indiana Avenue, Suite 210
Indianapolis, Indiana 46202
E-mail: context@indiana.edu

Indiana Department of Commerce

One North Capitol
Suite 700
Indianapolis, Indiana 46204

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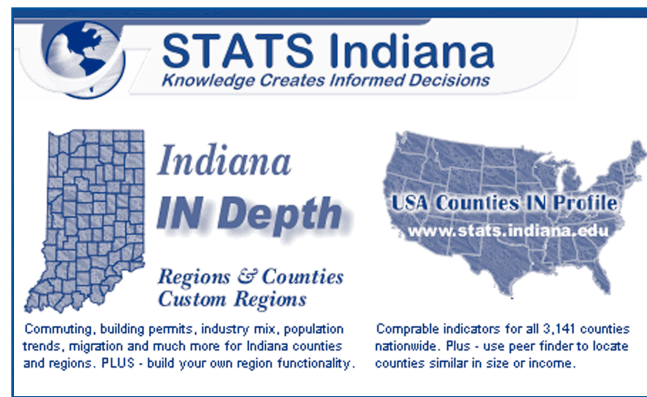
New Economic Development Tools Online

Two new interactive research tools on the *STATS Indiana* Web site provide extensive demographic and economic research in an easy to use format.

Indiana IN Depth gives key indicators for Indiana's counties, regions and metropolitan areas. Annual commuting patterns, education levels, population trends and industry data are available in a printable format. In addition, Indiana IN Depth offers a useful customizable region building feature that can help users better understand local and regional trends.

USA Counties IN Profile provides comparisons between Indiana counties and similar counties in other states. Extensive national and state rankings and percentage changes on such important figures as unemployment rates, education levels, population growth, wages per job and migration patterns are available for

all 3,141 counties nationwide. The profile also offers a peer-finding utility that immediately links the user to profiles of counties that are similar in size or income to the one they chose.



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