

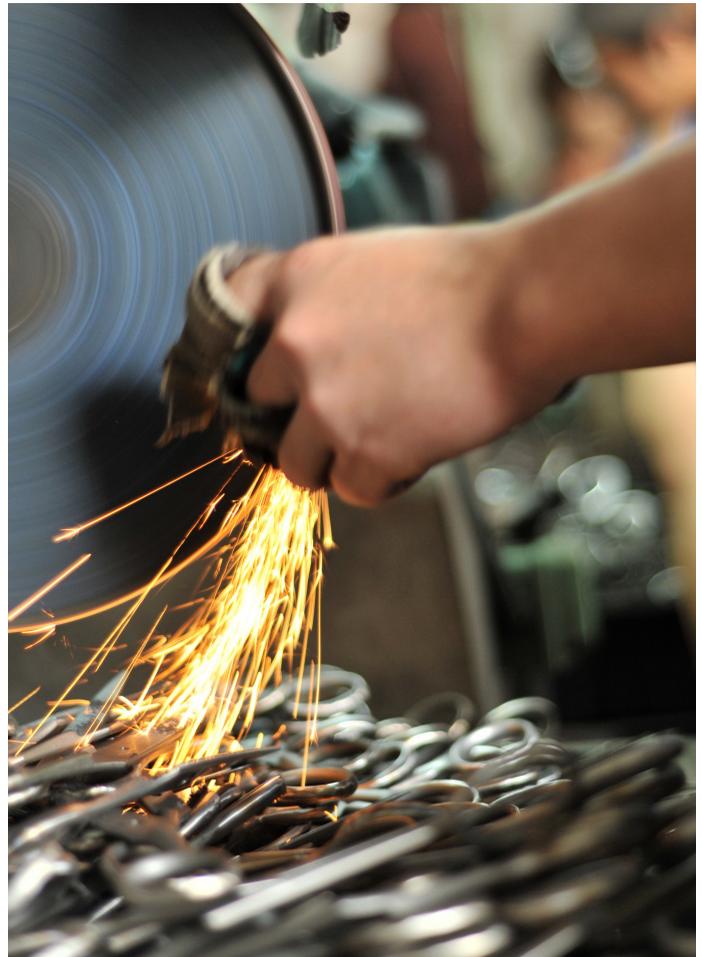
The State of Montana Manufacturing

2011 Edition

BY
Paul Polzin, Emeritus Director
Bureau of Business and Economic Research
The University of Montana
Missoula, MT 59812

**BUREAU OF
BUSINESS
AND ECONOMIC
RESEARCH**

MONTANA
**MANUFACTURING
EXTENSION CENTER**
An affiliate of the **NIST** Manufacturing Extension Partnership



Acknowledgements

This report was prepared by Montana State University Montana Manufacturing Extension Center and The University of Montana Bureau of Business and Economic Research under award 70NANB10H144 from the National Institute of Standards and Technology Manufacturing Extension Partnership, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Institute of Standards & Technology Manufacturing Extension Partnership or the U.S. Department of Commerce.

Contents

- 4** Introduction
- 6** Manufacturing and the U.S. Economy
- 7** Manufacturing and the Montana Economy
- 11** A Closer Look at Montana Manufacturing
 - 11** Manufacturing Establishments
 - 11** Employment Size
 - 12** Composition of Manufacturing
 - 13** Manufacturing Employment
 - 14** Employment by Industry
 - 15** Labor Income by Industry
 - 16** Manufacturing Labor Income
 - 18** Employment and Per Worker Wages and Salaries
 - 19** Manufacturing Exports

Introduction

Manufacturing and the rest of the U.S. economy is now emerging from a severe recession. The official beginning of the downturn was December 2007, and the trough was reached in June 2008. This recession has been the worst since the 1930s. One indication of this cycle's severity is the fact that it has been dubbed "The Great Recession." The ensuing recovery has been weak and sporadic.

The timing and the severity of this recession in Montana has been very similar to the rest of the nation. This recession now appears to be the worst downturn in Montana since the 1980s, when structural changes in several of the state's basic industries combined with national business cycles to lead to almost a decade of economic travail. The recovery in Montana has also been slow, with employment inching upward late in 2010.

The Great Recession has been different for manufacturing. Unlike many earlier recessions, manufacturing has been reacting to events elsewhere in the economy rather than a major cause of the recession. This business cycle began in the financial and housing markets, and then spread to other sectors (including manufacturing) as consumers sharply reduced their spending due to decreased confidence.

Table 1
Manufacturing Wage & Salary Employment, U.S. and
Montana, 2007Q3 and 2010Q3 (Thousands of Workers)

	2007Q3	2010Q3	Percent Change
U.S. Manufacturing	13,865,300	11,580,700	-16.5
Montana Manufacturing	20,500	16,500	-19.5
Wood and Paper Products	5,400	2,900	-46.3
All Other Manufacturing	15,100	13,600	-9.9

Sources: U.S. Bureau of Labor Statistics. Bureau of Business and Economic Research, The University of Montana.

Table 1 presents manufacturing wage and salary employment for the U.S. and Montana during the third quarter of 2007 (the cycle peak) and the third quarter of 2010 (the latest data available). Comparing the trends in U.S. to those in Montana reveals how manufacturing has fared over the course of the recession and the beginnings of the recovery.

U.S. manufacturing wage and salary employment declined from 13.8 million in 2007Q3 to 11.6 million in 2010Q3, a decrease of 16.5 percent. The declines were widespread within manufacturing. All categories experienced employment decreases, with the largest in transportation equipment (autos), fabricated metals, machinery, and furniture.

Montana manufacturing wage and salary employment decreased from 20,500 in 2007Q3 to 16,500 in 2010Q3, a decline of 19.5 percent. At first glance it may appear that Montana manufacturing experienced a slightly greater decline (19.5 percent vs. 16.5 percent) than its national counterpart. But, in fact, the wage and salary employment declines in Montana and nationwide were very different. The national wage and salary employment declines occurred in all categories while the Montana decreases were concentrated in just a few sectors and included a number of permanent closures and shutdowns.

As shown in Table 1, wood and paper products plus primary metals refining employment decreased from 5,400 in 2007Q3 to 2,900 in 2010Q3. In other words, these sectors accounted for 2,500 of the 4,000 total decline in Montana manufacturing wage and salary employment.

There were a number of permanent closures in the wood and paper products industry. The largest were the two Stimson mills and the Smurfit-Stone paper mill, both near Missoula in the western part of the state. There were other shutdowns of smaller sawmills in western Montana. In most cases, the plants have been dismantled and these jobs will not return when the economy recovers. Although the closures occurred during a period of poor markets for these industries, the long-term cause was a significant decrease in the supply of raw material due to decreased harvests on federal land and some industrial land.

The Columbia Falls Aluminum Company also closed during this period. Although the plant can be reopened, the primary cause of the shutdown was the lack of appropriately priced electricity. Given the overall market condition in the Pacific Northwest, it now appears unlikely that these supplies of electricity will be forthcoming.

In summary, manufacturing employment in Montana and nationwide decreased significantly during the Great Recession and the start of the recovery. But a closer look reveals significant differences. The nationwide decrease occurred in a number of categories, but the Montana decline was concentrated in only a few sectors. Furthermore, most of the Montana decreases were due to long-run supply side factors rather than demand side factors associated with the Great Recession. Excluding wood, paper, and primary metals, Montana manufacturing employment decreased about 10 percent, much less than the nationwide figure.

Manufacturing and the U.S. Economy

Table 2
Gross Domestic Product (GDP), United States
(Billions of Chained 2005 Dollars)

Year	Gross Domestic Product	Manufacturing	Percent of Total
1997	9,847,068	1,186,481	12.0
1998	10,275,885	1,245,770	12.1
1999	10,767,451	1,312,715	12.2
2000	11,223,130	1,396,514	12.4
2001	11,364,239	1,332,119	11.7
2002	11,560,341	1,365,339	11.8
2003	11,807,823	1,404,830	11.9
2004	12,212,645	1,517,861	12.4
2005	12,554,538	1,568,037	12.5
2006	12,895,854	1,636,594	12.7
2007	13,144,067	1,690,414	12.9
2008	13,101,207	1,608,640	12.3
2009	12,781,190	1,469,701	11.5

Sources: U.S. Bureau of Economic Analysis

Manufacturing continues as a major component of the U.S. economy, but many of the trends depend crucially on the data chosen to measure them. This section looks at manufacturing as measured by real GDP (which represents real output and production) and finds that it has grown over the past decade and remained a stable component of the U.S. economy. Later sections of this report will look at manufacturing employment and labor income and different trends will emerge.

Price adjusted GDP for manufacturing and all industries is presented in Table 2. Manufacturing GDP rose from \$1.2 trillion (2005\$) in 1997 to \$1.5 trillion (2005\$) in 2009, an average annual growth rate of 1.8 percent per year. This average growth rate rises to about 3.6 if the two years of decline in 2008 and 2009 are eliminated.

Manufacturing's share of GDP remained relatively stable at about 12 percent between 1997 and 2009. This figure dropped slightly during the recession years

of 2001 and 2002 but rose during the recovery period of 2003 to 2007. Manufacturing's contribution started to decline again during the recession years of 2008 and 2009. This lack of trend is partially due to the differences between the price indices for manufacturing and those for other goods and services. The price indices for manufacturing have risen much slower than most of the others. Similar calculations for nominal (non-deflated) data show a continuous downward trend in manufacturing's share of GDP.

The Great Recession is significantly impacting manufacturing. As shown in Table 2, manufacturing real GDP declined in both 2008 and 2009. Overall, the decrease from 2007 to 2009 was about 13.0 percent. In comparison, during the 2001 recession manufacturing real GDP dropped about 4.6 percent during only one year and regained its pre-recession level in slightly more than two years. Current forecasts predict that it will be mid 2012 before manufacturing regains its 2007 peak.

Manufacturing and the Montana Economy

Basic (or export) industries are the primary determinant of Montana's economic trends. Basic industries are those that are located in a state but sell most of their products elsewhere, or are otherwise influenced by factors beyond the state's borders. Basic industries inject new funds into a state economy and are responsible for creating further income as they are spent and respent. Manufacturing, mining, and agriculture are basic industries in almost every state. The federal government and rail/truck transportation do not export products, but are dependent of factors external to a single state and are also usually classified as basic. Service industries may also be basic. For example, financial services in New York, insurance in Connecticut and Indiana, and amusement places (casinos) in Nevada all serve non-local markets and are part of their state's economic base.

The contribution of manufacturing to each state's economy (plus the District of Columbia) is presented in Table 3. Manufacturing's share of each state's economic base as measured by Gross Domestic Product was calculated and is reported. The economic base of each

state was calculated using a method developed by the U.S. Bureau of Economic Analysis. Different methods of identifying the basic industries may yield slightly different findings.

Manufacturing is most important in Indiana, South Carolina, North Carolina, Michigan, and Wisconsin. The major changes in the top tier of states between 1997 and 2007 were the rise of Oregon, which rose from eighth to second, and the decline of North Carolina, which dropped from third to sixth.

Montana has traditionally ranked relatively low in terms of the importance of manufacturing to the overall economy. Montana was 45th in 1997 when manufacturing accounted for about 20.7 percent of the state's economic base. Ten years later in 2007, Montana dropped one place to 46th, with 14.7 percent of its economic base in manufacturing.

GDP data provides an accurate way of examining the importance of manufacturing in Montana as compared to other states, but it is not well suited for analyzing the trends in manufacturing from one year to another. The disadvantages of GDP data is that it is not available prior to 1997, and the latest figures do not provide details of specific components of manufacturing.

Labor income data is more appropriate for examining trends from one year to the next or over the course of a decade or more. But, labor income data also has its own peculiarities. For example, the net farm income of family-owned farms and ranches (a major component of farm labor income) is extremely volatile and not a reliable measure of economic conditions in the agricultural sector. Consequently, the following analysis will use nonfarm labor income to identify overall economic trends. The use of nonfarm labor income does not imply that agriculture is ignored—in fact, agricultural services labor income is included. Rather, excluding farm labor income eliminates an extremely volatile component that could mask important trends elsewhere in the economy.

Accurately estimating manufacturing's contribution to the Montana economy must take into account structural changes and data revisions. The U.S. government in 2000 significantly revised its definitions and the format of its economic data. These modifications were

Table 3
 Manufacturing as Percent of Economic Base, Gross Domestic Product for States, 1997 and 2007

1997			2007			1997, cont.			2007, cont.		
Rank	State	Percent	Rank	State	Percent	Rank	State	Percent	Rank	State	Percent
1	Indiana	74.8	1	Indiana	70.5	27	Oklahoma	42.6	27	Utah	36.1
2	South Carolina	69.8	2	Oregon	67.8	28	Rhode Island	40.4	28	Idaho	33.4
3	North Carolina	69.1	3	South Carolina	62.0	29	Washington	40.2	29	Illinois	32.8
4	Wisconsin	67.2	4	Wisconsin	61.7	30	Louisiana	40.2	30	Nebraska	32.8
5	Michigan	65.9	5	Michigan	57.8	31	Illinois	39.8	31	Rhode Island	32.5
6	Ohio	65.2	6	North Carolina	56.7	32	Idaho	39.3	32	Connecticut	31.5
7	Kentucky	64.9	7	Ohio	55.0	33	West Virginia	39.1	33	West Virginia	30.9
8	Oregon	64.6	8	Arkansas	54.4	34	Nebraska	36.5	34	New Jersey	28.6
9	New Hampshire	63.1	9	Iowa	52.6	35	New Jersey	35.4	35	Oklahoma	28.3
10	Arkansas	59.5	10	Kentucky	52.2	36	Connecticut	35.0	36	Virginia	23.4
11	Pennsylvania	58.9	11	Alabama	49.8	37	Virginia	32.8	37	North Dakota	23.4
12	Iowa	58.7	12	Pennsylvania	49.4	38	Massachusetts	30.0	38	Massachusetts	22.1
13	Maine	58.3	13	Maine	47.3	39	South Dakota	29.3	39	South Dakota	21.3
14	Vermont	56.2	14	Kansas	47.0	40	North Dakota	27.3	40	Florida	18.3
15	Arizona	55.3	15	Vermont	44.4	41	Colorado	27.0	41	New Mexico	18.3
16	Missouri	53.0	16	New Hampshire	43.5	42	Florida	23.3	42	Colorado	17.0
17	Alabama	52.2	17	Tennessee	42.9	43	Maryland	22.8	43	Delaware	16.1
18	Kansas	51.5	18	Missouri	42.3	44	Delaware	21.0	44	Nevada	15.9
19	Georgia	51.0	19	Louisiana	41.5	45	Montana	20.7	45	Maryland	15.7
20	Tennessee	49.9	20	Georgia	41.2	46	New York	17.8	46	Montana	14.7
21	New Mexico	48.3	21	Minnesota	40.2	47	Nevada	12.9	47	New York	12.9
22	Texas	47.9	22	Texas	39.6	48	Wyoming	9.0	48	Wyoming	7.9
23	Minnesota	47.5	23	Mississippi	39.6	49	Hawaii	6.7	49	Hawaii	5.2
24	Mississippi	47.0	24	Arizona	39.0	50	Alaska	5.8	50	District of Columbia	0.3
25	California	44.2	25	Washington	38.5	51	District of Columbia	0.7	51	Alaska	0.0
26	Utah	43.0	26	California	37.4						

Source: U.S. Bureau of Economic Analysis.

designed to better measure an economy more dependent on services. But one of the other consequences was that statistics referring to years prior to 2000 may not be exactly comparable to those referring to years after that date.

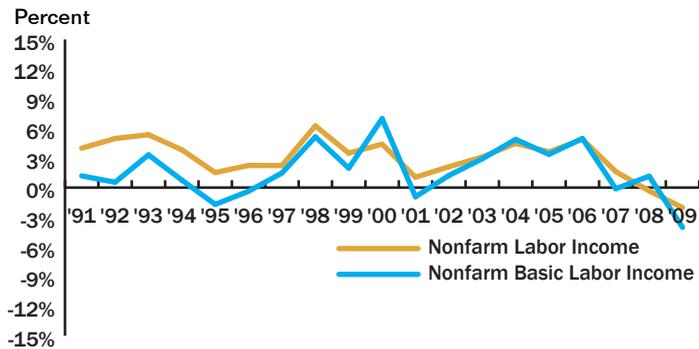
Specific industries within manufacturing may themselves be changing because of evolving and improving practices. For example, the introduction of greater supply chain management suggests that today's production processes may be very different from those of only a few years ago.

The overall trends in the Montana economy are primarily caused by the basic industries. Figure 1 portrays the high correlation between changes in the basic industries and the overall trends in the Montana

economy. Every up or down in nonfarm labor income (which measures the overall economy) was accompanied or preceded by a similar change in basic labor income. For example, the decelerations associated with the 2001 recession and the September 11 aftermaths are clearly pictured in the basic industries. A year later, the impacts were felt in the rest of the economy. There were significant accelerations in the basic industries in 2004, 2005, and 2006 caused by the energy/commodity boom. These were quickly followed by faster growth in the other sectors of the economy. Finally, the layoffs and closures in the wood products industry as well as the onset of the Great Recession in 2007 led to the economy wide declines in 2008 and 2009.

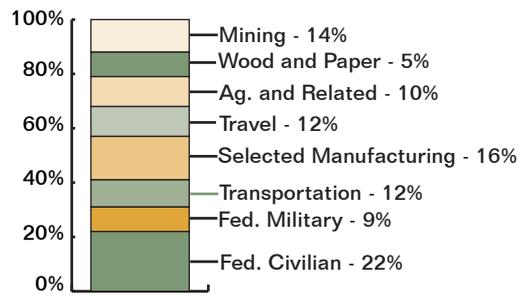
Manufacturing is a basic industry because most of its

Figure 1
Nonfarm Labor Income and Nonfarm Basic Labor Income, Montana



Source: Bureau of Economic Analysis, U.S. Department of Commerce.

Figure 2
Labor Income in Basic Industries, Montana, 2007-2010



Source: Bureau of Business and Economic Research, The University of Montana-Missoula; Bureau of Economic Analysis, U.S. Department of Commerce.

output is shipped out of state. As will be shown later in Figure 4, about 60 percent of the state’s manufacturing GDP is produced in industries such as wood and paper products, petroleum refining, and machinery where almost all the output immediately leaves the state. Even the smaller sub-industries within manufacturing include many firms that sell nationwide and even worldwide.

The employment multiplier for manufacturing is estimated to be 3.58 by the Montana Department of Labor and Industry. This means that there would be 2.58 new jobs created in other industries as the result of one new manufacturing job. The compensation multiplier is 2.72, which implies that \$1.72 in new wages is created elsewhere in the Montana economy for each \$1.00 in additional manufacturing wages.

Manufacturing is a major contributor to Montana’s economic trends despite accounting for just two of the eight components of the state’s economic base. Labor income earned in Montana’s basic industries is shown in Figure 2. Manufacturing is divided into two components: wood and paper products and other manufacturing. Taken together, these two manufacturing components accounted for about 1 percent of basic labor income during the 2008-2010 period. This percentage differs

from that reported in Table 2 because GDP is a measure of the value of output while the data in Figure 2 refers to the income to persons.

The contribution of manufacturing to economic trends in Montana is further examined in Figure 3. The year-to-year changes in basic labor income between 2002 and 2009 are decomposed by major sector.

- 2002-03. Nonfarm basic labor income increased about \$120 million. Manufacturing labor income declined about \$20 million, resulting from the lingering effects of the 2001 recession. Federal government labor income increased about \$20 million, which included expansion of the U.S. Border Patrol and other national securing upgrades. The other basic industries (which include nonresident travel) grew about \$20 million.
- 2003-04. Nonfarm basic labor income grew almost \$206 million. All of the major components increased with the three largest being mining (\$104 million), the federal government (\$25 million), and transportation (\$25 million). Manufacturing was still rebounding from the 2001 recession and its labor income rose a modest \$3 million.

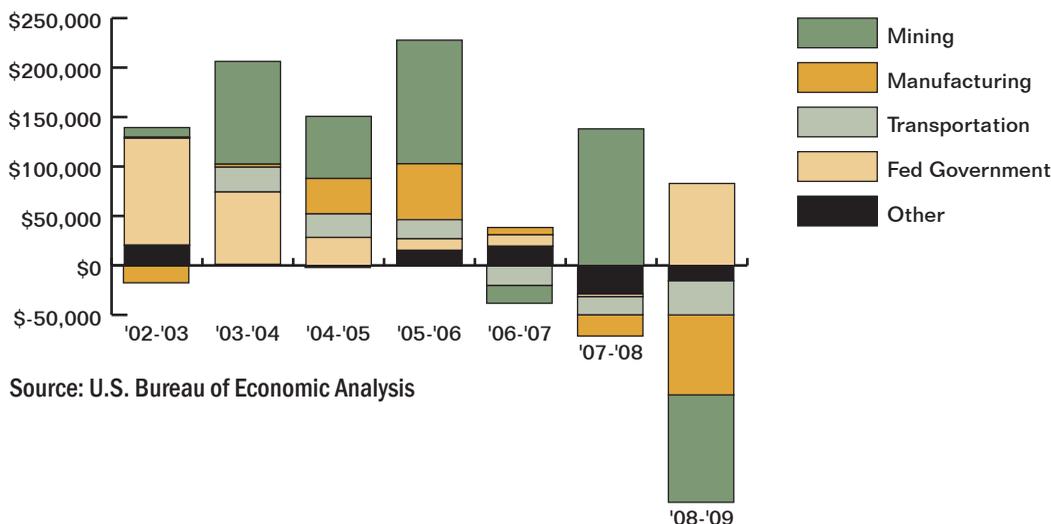
- 2004-05. Nonfarm basic labor increased approximately \$149 million. All of the components grew with the largest increases in mining (\$63 million), manufacturing (\$36 million) and the federal government (\$28 million).
- 2005-06. Nonfarm basic labor income increased about \$228 million and all of the major components also grew. The greatest increases were in mining (\$125 million) manufacturing (\$59 million) and transportation (\$19 million).
- 2006-07. Nonfarm basic labor income declined by about \$5 million which was the net effect of increases in some components and declines in others. Small increases in manufacturing (\$7 million) the federal government (\$11 million), and other industries (\$19 million) were exceeded by the declines in mining (\$-21 million) and transportation (\$-23 million).
- 2007-08. The full impact of the Great Recession was being felt as four of the five major nonfarm basic industries declined. Even so, there was a significant increase in mining (\$138 million) which counterbalanced the decreases and led to a net increase of about \$55 million in total nonfarm basic labor income. Manufacturing declined \$25 million, transportation decreased \$22 million, federal government dropped \$3 million, and other basic industries decreased \$32 million.
- 2008-09. The second year of the recession saw decreases in four of the five components and Montana's nonfarm basic labor income decreased \$196 million. Mining declined \$127 million, manufacturing decreased \$94 million, transportation dropped \$40 million, and the other nonfarm basic industries decreased \$17 million. The only offsetting factor was an increase of \$83 million in the federal government.

Although it may appear repetitious to examine each of the seven years of data, this analysis illustrates a number of important points. First, economic growth or decline is the net result of differing conditions in each of the basic industries. There are always some industries that are growing (or declining) faster or slower than others.

Second, there is usually no single cause of growth during a period. None of the nonfarm basic industries was the fastest growing during all of the seven years.

Finally, and perhaps most importantly, industries that represent a relative small share of the economic base—such as manufacturing— can be major contributors to overall economic growth during specific periods. For example, during 2005 and 2006 manufacturing ranked right behind mining in terms of increases in basic labor income.

Figure 3
Change in Nonfarm Basic Labor Income, Montana



Source: U.S. Bureau of Economic Analysis

A Closer Look at Montana Manufacturing

MANUFACTURING ESTABLISHMENTS

There were 3,273 manufacturing establishments in Montana during 2008, as shown in Table 4. The largest category is miscellaneous manufacturing (NAICS 339) with 604 establishments. The next largest categories were wood products (NAICS 321) with 394 establishments and fabricated metal manufacturing (NAICS 332) with 433 establishments.

EMPLOYMENT SIZE

Montana manufacturers are mostly small businesses. As shown in Table 5, there were 670 establishments with one to four workers; they represented 50.8 percent of the 1,320 manufacturing establishments with employees. There were 923 establishments with less than ten workers, or 69.9 percent of the total. There were no Montana manufacturers with 1,000 employees or more.

Table 4
Manufacturing Establishments, Montana, 2007

NAICS Code	Industry	Number of Establishments
	Manufacturing	3,273
311	Food Products	317
312	Beverages & Tobacco	48
313	Textile Mills	13
314	Textile Product Mills	59
315	Apparel	168
316	Leather & Allied Products	130
321	Wood Products	394
322	Paper Manufacturing	8
323	Printing & Related	180
324	Petroleum & Coal Products	26
325	Chemicals	84
326	Rubber & Rubber Products	33
327	Nonmetallic Mineral Products	142
331	Primary Metals	41
332	Fabricated Metal Products	433
333	Machinery	113
334	Computer and Elec. Products	58
335	Elec. Equipment and Appliances	29
336	Transportation Equipment	72
337	Furniture and Related	321
339	Miscellaneous	604

Source: U.S. Bureau of the Census.

Note: Includes establishments with no employees.

Table 5
Manufacturing Establishments
by Employment Size, Montana, 2007

Employment	Number of Establishments
Total	1,320
1 to 4	670
5 to 9	253
10 to 19	180
20 to 49	135
50 to 99	45
100 to 249	29
250 to 499	7
500 to 999	1
1,000 or more	0

Note: Includes only establishments with employees.

Source: U.S. Bureau of the Census.

COMPOSITION OF MANUFACTURING

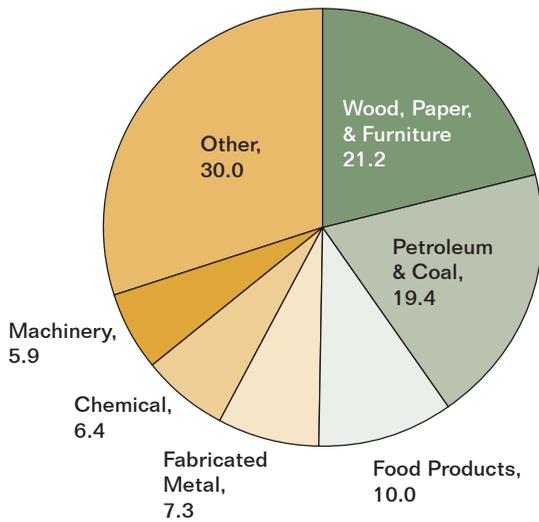
The important sectors of Montana manufacturing are identified and compared to those for U.S. manufacturing in Figures 4 and 5. These comparisons use labor income. Past years' reports have analyzed manufacturing GDP. There have been recent revisions in the GDP data, which have incorporated world energy prices that may not be relevant for Montana. Labor income is the amount earned in the state.

The largest component of U.S. manufacturing was computers and electronics, which accounted for 13.4 percent of manufacturing labor income in 2009. The next four industries were chemical products (10.9 percent), fabricated metal (8.9 percent), food (8.3 percent), and machinery (8.3 percent).

The two largest Montana manufacturing sectors in 2009 were associated with the processing of forest

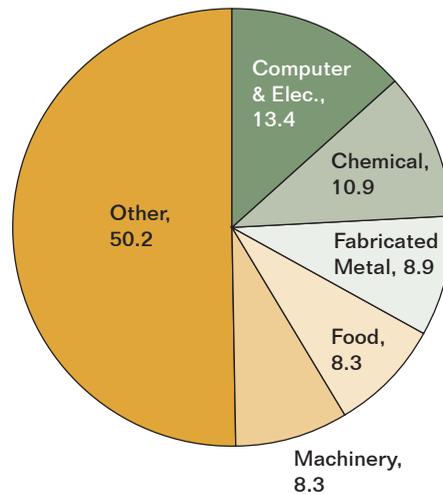
resources and crude oil. Wood and paper products and furniture manufacturing accounted for 21.2 percent of Montana manufacturing labor income in 2009. The next largest industry is petroleum and coal products, which is primarily the oil refineries in Billings and Great Falls, with labor income accounting for about 19.4 percent of the total in 2009. The recent shutdowns and closures in the wood processing industries suggest that petroleum and coal products may become the largest Montana manufacturing sector as measured by labor income (but not by employment). Food products and fabricated metals are the third and fourth largest sectors accounting for 10.0 percent and 7.3 percent respectively. Labor income in chemical products (which includes REC Silicon) accounted for 6.4 percent of the total and machinery (which includes Allied Materials) represented 5.9 percent.

Figure 4
Composition of Manufacturing, Montana, 2009
(Percent of Manufacturing Labor Income)



Source: Bureau of Economic Analysis

Figure 5
Composition of Manufacturing, United States, 2009
(Percent of Manufacturing Labor Income)



Source: Bureau of Economic Analysis

MANUFACTURING EMPLOYMENT

U.S. manufacturing employment has declined steadily throughout the 1999 to 2009 period, as shown in Table 6. Overall, Montana manufacturing employment also declined during this period, but the rate of decrease was much less and there were even short periods of modest increases.

U.S. manufacturing employment decreased from 17.9 million workers in 1999 to 12.4 million in 2009, a drop of almost 30.0 percent. Manufacturing's share of total employment declined from 11.0 percent to 7.1 percent during the same period.

Montana manufacturing employment declined from about 25,000 workers in 1999 to about 20,600 in 2009, a decrease of about 18.0 percent. As was discussed earlier and also will be detailed in the next section, most of this decline was concentrated in wood and paper products. Even so, total Montana manufacturing employment remained approximately stable, with even a few small increases, between 2002 and 2007. Manufacturing's share of total statewide employment dropped from 4.6 percent in 1999 to 3.3 percent in 2009. In other words, the decline in relative importance was 1.3 percentage points in Montana as compared to 3.9 percentage points nationwide.

Table 6
Full and Part-Time Employment, Total and Manufacturing,
Montana and United States

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total, United States (Millions of Workers)	161.5	165.4	165.5	165.1	166.0	169.0	172.6	176.1	179.9	179.6	173.8
Manufacturing (Millions of Workers)	17.9	17.8	16.9	15.7	15.0	14.8	14.7	14.7	14.5	13.9	12.4
Percent of Total	11.0	10.7	10.2	9.5	9.0	8.8	8.5	8.3	8.0	7.8	7.1
Total, Montana (Thousands of workers)	543.8	555.0	560.4	568.1	575.3	589.0	603.4	622.5	640.6	651.4	625.5
Manufacturing (Thousands of workers)	25.0	24.7	24.4	23.2	22.1	22.3	22.6	23.4	23.9	23.2	20.6
Percent of Total	4.6	4.4	4.4	4.1	3.8	3.8	3.7	3.8	3.7	3.6	3.3

Note: Includes the self-employed.
Source: U.S. Bureau of Economic Analysis.

EMPLOYMENT BY INDUSTRY

The overall decline in manufacturing employment hides very different trends in specific sectors. As shown in Table 7, total manufacturing employment decreased by 4,359 workers. The largest declines were in wood products (3,050), primary metals refining (780), furniture and related (439), and nonmetallic mineral products (345). If these four industries are excluded, the remaining manufacturing industries actually posted a small gain in employment between 1999 and 2009.

The 3,050 worker decrease in the wood products industry can be attributed to both cyclic and longer run influences. The impacts of the Great Recession were disproportionately concentrated in housing and construction, leading to significant decreases in the demand for wood products during 2008 and 2009. The long-term decrease in the supply of timber from federal and some industrial land meant that inputs would not be available once demand bounced back. Consequently, many of the mill closures in 2008 and 2009 were permanent shutdowns. In addition, the state's major paper mill in Missoula also closed during early 2010.

The 780 worker decrease in primary metals refining reflects the shutdown of the refinery in East Helena and the gradual decline of the Columbia Falls Aluminum Company in Columbia Falls. The East Helena facility was a lead-zinc refinery that closed in 2002. The aluminum refinery gradually reduced production as the supplies of available electricity decreased. This facility is currently dormant with no employment or production, but could reopen if electricity supplies improved.

The 439 worker decrease in furniture and related occurred mostly in 2007, 2008, and 2009 and probably

reflects the decreased demand associated with the Great Recession. Nonmetallic mineral products includes the processing of sand, gravel, and related products, and the loss of 345 jobs in this industry reflects the overall trends of all construction related activity during this period. The 2010 data for paper will show a large decline as the Smurfit-Stone facility near Missoula closed early in the year.

The largest increase in manufacturing employment was the additional 408 workers in fabricated metal products. This category includes almost 200 small and medium sized firms producing a variety of products from metal barns and other buildings to machine shops making screw products.

The 200 worker increase in petroleum and coal products represents expansion and upgrading of the oil refineries near Billings and Great Falls. Only a few years ago, there was concern about these facilities due to changing sources of supply and chemical characteristics of the crude oil. The refinery owners have made significant capital investments and their future appears much more secure.

The high-tech firm, Semitool, located in Kalispell is classified in machinery manufacturing. The expansion of this company led to sizable industry growth in 2005, 2006, and 2007. Its recent sale to Applied Materials was followed by a smooth management transition and there have been announcements of further hiring.

REC Silicon located near Butte is another of Montana's high-tech manufacturing establishments. It has also had a recent change in ownership and a much more secure future.

Table 7
Full and Part-Time Manufacturing Employment, by Industry, Montana

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Change 1999-2009
Manufacturing	24,995	24,744	24,390	23,229	22,054	22,255	22,596	23,390	23,949	23,254	20,636	-4,359
Durable goods	16,537	16,374	16,330	15,209	14,183	14,068	14,395	14,898	15,270	14,494	12,252	-4,285
Wood product	6,308	6,163	5,911	5,802	5,324	5,296	5,290	5,214	4,957	4,399	3,258	-3,050
Nonmetallic minerals	1,284	1,226	1,090	1,015	1,138	1,109	1,112	1,106	1,169	1,087	939	-345
Primary metals	1,035	1,056	925	562	445	330	342	340	487	438	255	-780
Fabricated metals	1,496	1,494	1,601	1,497	1,512	1,541	1,583	1,783	1,985	2,049	1,904	408
Machinery manufacturing	1,330	1,311	1,904	1,493	1,310	1,285	1,427	1,572	1,566	1,514	1,139	-191
Computer and electronics	662	684	708	614	483	477	502	582	587	583	545	-117
Electrical equipment and appliances	(T)	(T)	143	137	134	197	201	217	232	253	211	(T)
Motor vehicles and parts	352	386	359	(D)	(D)	(D)	341	402	408	(D)	(D)	(D)
Other transportation equipment	(T)	(T)	229	(D)	(D)	(D)	238	220	222	(D)	(D)	(D)
Furniture and related	1,531	1,534	1,383	1,297	1,308	1,344	1,329	1,307	1,240	1,162	1,092	-439
Miscellaneous	2,268	2,245	2,077	2,228	2,010	1,948	2,030	2,155	2,417	2,376	2,349	81
Nondurable goods	8,458	8,370	8,060	8,020	7,871	8,187	8,201	8,492	8,679	8,760	8,384	-74
Food	2,751	2,671	2,585	2,629	2,499	2,746	2,760	2,903	2,988	2,951	2,855	104
Beverages and tobacco	805	776	780	816	824	826	800	854	773	764	745	-60
Textile mills	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	55	43	37	(T)
Textile product mills	(T)	(T)	239	252	248	239	215	221	255	249	218	(T)
Apparel	(T)	(T)	308	286	266	292	309	333	(D)	(D)	(D)	(T)
Leather and allied products	(T)	(T)	171	212	196	202	214	221	176	218	255	(T)
Paper manufacturing	769	794	(D)									
Printing and related	1,310	1,276	1,188	1,171	1,171	1,204	1,217	1,296	1,337	1,342	1,162	-148
Petroleum and coal	906	908	924	940	924	887	938	961	984	1,072	1,106	200
Chemical manufacturing	908	809	683	710	777	798	772	752	874	932	979	71
Plastics and rubber products	(T)	(T)	488	357	335	364	374	364	367	389	336	(T)

Note: Includes the self-employed. (T) and (D) denote not shown to avoid disclosure of confidential information.
Source: U.S. Bureau of Economic Analysis.

MANUFACTURING LABOR INCOME

Labor income for Montana manufacturing industries from 1999 to 2009 is presented in Table 8. These figures have been corrected for inflation by converting them to constant 2008 dollars. Labor income is the wages and salaries plus certain employer-paid fringe benefits (such as retirement and health insurance) paid to full- and part-time manufacturing workers.

It takes only a quick glance at the data in Table 8 to determine that the trends in labor income are very different from those in employment reported in Table 7. Instead of the sizable decline in manufacturing employment between 1999 and 2009, labor income decreased only 2.7 percent during the same period. Furthermore, the 2008 figure was well above the 1999 value.

The most important reason for the divergence in trends is that labor income incorporates the impacts of structural change and improvements in labor productivity. Therefore, labor income is more closely related to trends in the value of output and production rather than just labor input. These labor income data provide one more piece of evidence that the much discussed decline of manufacturing in Montana and the United States depends on the precise data examined.

Within Montana manufacturing, the trends tell the same story as employment. Wood products, nonmetallic minerals, primary metal, and furniture experienced the greatest decreases. The scale of the upgrades at the petroleum refineries is better pictured using labor income. Inflation adjusted labor income in petroleum and coal doubled between 1999 and 2009 while the number of employees increased only 20 percent.

Table 8
Manufacturing Labor Income, Montana (Thousands of 2008 dollars)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Change 1999-2009
Manufacturing	1,086,814	1,093,015	1,119,619	1,094,107	1,074,405	1,077,450	1,113,311	1,169,816	1,177,692	1,152,311	1,057,992	-2.7
Durable goods	693,891	703,491	690,916	657,731	623,393	625,416	650,578	667,447	685,173	638,111	535,574	-22.8
Wood product	292,200	292,347	274,039	270,064	252,741	255,472	254,373	243,902	233,393	203,572	151,374	-48.2
Nonmetallic minerals	56,576	55,106	50,130	45,516	54,390	51,665	52,448	48,842	53,566	51,142	45,266	-20.0
Primary metals	58,891	59,023	44,996	35,623	25,424	28,976	30,696	36,214	43,005	32,138	19,406	-67.0
Fabricated metals	51,961	52,697	57,654	57,804	58,181	58,426	62,000	71,079	80,627	84,224	77,173	48.5
Machinery manufacturing	58,317	61,294	91,931	77,530	66,688	67,269	75,028	85,904	80,162	77,833	62,791	7.7
Computer and electronics	32,247	33,794	30,647	26,916	22,466	21,668	28,204	25,746	27,840	26,959	25,195	-21.9
Electrical equipment and appliances	(T)	(T)	7,099	7,266	7,764	9,399	10,079	10,620	11,121	13,607	12,148	(T)
Motor vehicles and parts	15,682	18,059	16,846	(D)	(D)	(D)	16,673	19,257	19,952	(D)	(D)	(D)
Other transportation equipment	(T)	(T)	9,388	(D)	(D)	(D)	9,652	9,273	8,538	(D)	(D)	(D)
Furniture and related	41,886	42,968	39,076	38,506	37,850	38,051	38,140	38,695	36,999	34,088	28,559	-31.8
Miscellaneous	76,270	77,960	69,111	73,920	69,954	68,000	73,284	77,915	89,971	81,993	86,354	13.2
Nondurable goods	392,923	389,524	428,703	436,376	451,012	452,034	462,734	502,370	492,518	514,200	522,418	33.0
Food	97,400	94,031	97,655	98,584	96,837	105,467	104,066	108,555	108,031	107,740	106,328	9.2
Beverages and tobacco	31,751	30,662	35,941	33,158	35,503	35,624	33,302	33,545	28,984	29,921	30,825	-2.9
Textile mills	(T)	(T)	(D)	(D)	(D)	(D)	(D)	(D)	730	388	561	(T)
Textile product mills	(T)	(T)	7,216	6,632	5,433	6,415	6,387	5,591	5,964	6,007	6,067	(T)
Apparel	(T)	(T)	4,011	4,878	6,928	8,377	7,557	8,224	(D)	(D)	(D)	(T)
Leather and allied products	(T)	(T)	3,272	2,630	3,940	2,659	2,725	3,175	2,493	2,815	2,850	(T)
Paper manufacturing	56,264	54,837	(D)	(T)								
Printing and related	35,877	37,170	37,675	37,703	38,387	39,039	39,590	42,571	46,232	47,424	41,447	15.5
Petroleum and coal	100,214	100,027	137,256	146,944	152,635	137,173	150,414	186,599	170,235	189,092	205,043	104.6
Chemical manufacturing	47,415	47,371	45,904	44,423	50,735	54,815	56,943	51,676	62,714	64,761	67,341	42.0
Plastics and rubber products	(T)	(T)	10,057	9,754	9,125	10,283	10,883	12,029	13,452	13,480	13,380	(T)

Note: Includes the income of the self-employed. (T) and (D) denote not shown to avoid disclosure of confidential information.
Source: U.S. Bureau of Economic Analysis.

Table 9
Employment and Wages and Salaries per Worker, By Industry, Montana, 2009

	Wage and Salary Employment	Wages and Salaries Per Worker (Current Dollars)	Wages and Salaries Per Worker (Percent of U.S.)
Total, All Industries	451,829	33,918	74.0
Farm	4,802	43,691	135.4
Nonfarm	447,027	33,813	73.7
Forestry, Fishing, and Other	2,382	27,780	110.0
Mining	6,484	70,417	82.0
Utilities	3,064	74,043	85.4
Construction	25,076	39,868	79.9
Manufacturing	17,446	41,155	73.7
Durable goods	10,139	38,060	64.8
Wood products	2,879	37,470	103.1
Nonmetallic minerals	864	38,632	81.4
Primary metals	225	46,133	83.1
Fabricated metal products	1,589	37,301	78.0
Machinery	1,003	48,466	83.5
Computer and electronics	484	41,686	48.3
Electrical equipment and appliances	194	44,737	81.1
Motor vehicles and parts	(D)	(D)	(D)
Other transportation equipment	(D)	(D)	(D)
Furniture and related	707	29,632	78.9
Miscellaneous	1,715	34,335	65.2

	Wage and Salary Employment	Wages and Salaries Per Worker (Current Dollars)	Wages and Salaries Per Worker (Percent of U.S.)
Nondurable goods	7,307	45,448	88.7
Food	2,557	31,265	78.4
Beverage and tobacco	688	29,124	54.6
Textile mills	27	19,111	50.8
Textile product mills	198	23,162	69.1
Apparel	(D)	(D)	(D)
Leather and allied products	69	18,290	50.4
Paper	(D)	(D)	(D)
Printing and related	965	33,015	75.7
Petroleum and coal	1,097	92,625	100.6
Chemical	886	53,777	66.1
Plastics and rubber products	296	33,520	74.6
Wholesale trade	16,120	44,627	71.4
Retail trade	56,582	23,603	88.1
Transportation and warehousing	13,217	41,638	91.4
Information	7,479	40,024	55.3
Finance and insurance	16,571	47,114	58.4
Real estate and rental and leasing	5,619	25,649	59.8
Professional and technical services	18,849	48,185	63.9
Management of companies	1,570	59,894	64.1
Administrative and waste services	18,073	25,706	76.4
Educational services	5,285	21,061	58.2
Health care and social assistance	59,132	36,873	84.5
Arts, entertainment, and recreation	11,510	20,211	57.0
Accommodation and food services	45,966	14,722	79.0
Other services	21,007	23,828	81.5
Government	95,595	38,184	81.3
Federal, civilian	14,177	57,955	85.0
Military	8,004	36,911	78.5
State and local	73,414	34,505	78.7

EMPLOYMENT AND PER WORKER WAGES AND SALARIES

This section examines Montana employment and per worker wages and salaries in manufacturing and compares them to figures for other industries in the state and to corresponding nationwide data. Montana 2009 employment and per-worker wages and salaries for all industries are shown in Table 9. The employment numbers for manufacturing differ from those reported in Tables 6, 7, and 8 because they do not include the self-employed.

Wages and salaries directly measure the payments to workers and the amount they have available for current spending. Other measures of compensation (such as labor income) includes estimates of employer paid benefits that may not lead to current spending by workers.

The average Montana manufacturing workers earned \$41,155 in 2009, about 21.3 percent higher than the

Note: (T) and (D) denote not shown to avoid disclosure of confidential information.
 Source: U.S. Bureau of Economic Analysis.

average of \$33,918 for all workers. The highest wages in manufacturing (and indeed among all industries) were the \$92,625 received in the petroleum and coal products industry—these include mostly the oil refinery workers. The next higher were the \$53,777 earned in chemical manufacturing and the \$48,466 in machinery manufacturing. The lowest paying manufacturing jobs were in leather and allied products (\$18,290) textile

mills (\$19,111), both very small sectors employing less than 100 Montanans

Montana incomes are generally less than their respective U.S. averages, and this is true also for per worker wages and salaries. The overall average wages and salaries per worker in Montana was \$33,918 in 2009, about 74.0 percent of the U.S. figure. Montana manufacturing wages per worker were about 73.7 percent of the nationwide average. Within manufacturing, only wood products and petroleum and coal workers have average wages above the respective national average. The lowest figure was for computer and electronics workers, whose wages averaged only 48.3 percent of this industry's nationwide average.

MANUFACTURING EXPORTS

The longer term trends in Montana manufacturing exports are examined in Table 10 while the short-term impacts of the recession are presented in Table 11. In both tables the value of Montana manufacturing exports are compared to the value of shipments for the respective industries. The value of shipments data in Table 10 are taken from the Census of Manufacturing while the corresponding figures in Table 11 are reported in the Annual Survey of Manufacturers, which is less complete and not as detailed as the census numbers.

As shown in Table 10, Montana manufacturing exports rose from about \$290,417,000 in 2002 to \$880,704,000 in 2007, more than tripling in nominal

Table 10
Exports and Value of Shipments, 2002 and 2007 (Thousands of Current Dollars)

NAICS Code	Industry	- 2002 -			- 2007 -		
		Exports	Shipments	Exports as Percent of Shipments	Exports	Shipments	Exports as Percent of Shipments
n/a	Manufacturing	290,417	4,987,577	5.8	880,704	10,638,145	8.3
311	Food Products	13,218	482,611	2.7	28,651	741,151	3.9
312	Beverages and Tobacco	5	(D)		42	164,560	0.0
313	Textile Mills	235	(D)		114	(D)	
314	Textile and Fabrics	145	(D)		438	(D)	
315	Apparel	628	15,409	4.1	2,174	(D)	
316	Leather & Allied Products	416	(D)		1,320	(D)	
321	Wood Products	20,363	854,352	2.4	36,599	935,340	3.9
322	Paper Manufacturing	29,989	(D)		42,085	(D)	
323	Printing & Related	153	(D)		949	106,695	0.9
324	Petroleum & Coal Products	1,259	1,807,038	0.1	9,219	5,450,695	0.2
325	Chemicals	59,462	178,695	33.3	261,133	391,280	66.7
326	Plastic & Rubber Products	2,021	56,039	3.6	7,435	(D)	
327	Nometalic Mineral Products	27,794	167,927	16.6	43,400	291,377	14.9
331	Primary Metals	7,295	(D)		96,663	1,045,308	9.2
332	Fabricated Metal Products	3,027	198,579	1.5	7,274	278,351	2.6
333	Machinery	71,989	197,393	36.5	172,506	297,310	58.0
334	Computer & Elec. Products	17,042	(D)		24,287	(D)	
335	Electrical Equipment & Appliances	9,424	15,547	60.6	12,004	(D)	
336	Transportation Equipment	8,541	70,968	12.0	122,671	113,325	108.2
337	Furniture & Related	341	75,067	0.5	408	85,738	0.5
339	Miscellaneous	17,069	186,048	9.2	11,331	186,703	6.1

Note: (D) not shown to avoid disclosure of confidential information. N/A denotes "not available."

Sources: www.wisetrade.org (accessed April 4, 2011). U.S. Bureau of the Census, Annual Survey of Manufactures 2008.

Table 11
Exports and Value of Shipments, 2008 and 2009 (Thousands of Current Dollars)

NAICS Code	Industry	- 2008 -			- 2009 -		
		Exports	Shipments	Exports as Percent of Shipments	Exports	Shipments	Exports as Percent of Shipments
n/a	Manufacturing	1,093,952	12,710,891	8.6	876,500	8,294,197	10.6
311	Food Products	42,631	820,333	5.2	32,135	773,428	4.2
312	Beverages and Tobacco	505	(D)		28	(D)	
313	Textile Mills	406	(D)		401	(D)	
314	Textile and Fabrics	816	(D)		391	(D)	
315	Apparel	3,905	(D)		1,793	(D)	
316	Leather & Allied Products	2,078	(D)		2,855	(D)	
321	Wood Products	34,978	840,652	4.2	19,751	580,252	3.4
322	Paper Manufacturing	42,560	(D)		32,805	(D)	
323	Printing & Related	1,599	(D)		959	(D)	
324	Petroleum & Coal Products	35,207	7,091,602	0.5	22,800	4,117,780	0.6
325	Chemicals	353,237	(D)		302,928	(D)	
326	Plastic & Rubber Products	8,582	(D)		3,716	(D)	
327	Nometalic Mineral Products	43,730	(D)		39,500	245,291	16.1
331	Primary Metals	114,881	(D)		121,453	(D)	
332	Fabricated Metal Products	10,551	279,841	3.8	7,311	277,670	2.6
333	Machinery	185,656	257,537	72.1	156,425	195,022	80.2
334	Computer & Elec. Products	25,007	(D)		22,293	(D)	
335	Electrical Equipment & Appliances	21,423	(D)		16,305	(D)	
336	Transportation Equipment	151,368	(D)		76,731	(D)	
337	Furniture & Related	624	(D)		680	(D)	
339	Miscellaneous	14,207	348,569	4.1	15,239	205,714	7.4

Note: (D) not shown to avoid disclosure of confidential information. N/A denotes "not available."
Sources: www.wisertrade.org (accessed April 4, 2011). U.S. Bureau of the Census, Annual Survey of Manufactures 2008.

dollars. Overall, exports rose from 5.8 percent of shipments in 2002 to 8.3 percent in 2007.

The largest exporting Montana manufacturing industry is chemicals, with exports of \$261,133,000 in 2007; this is more than a fourfold increase from 2002 as measured in current dollars. The chemical industry includes REC Silicon, the polysilicon manufacturer near Butte, as well as fertilizer manufacturers. The second largest industry is machinery, with exports of about \$172,506,000 in 2007, up almost two and a half times from its 2002 level. The machinery industry includes Applied Materials (formerly Semitool), which sells its high-tech products to customers worldwide.

There appears to be an irregularity or error in the data for the transportation equipment industry (NAICS 337). Industry exports for 2007 were reported to be about

\$122,671,000 while the value of shipments was only \$113,325,000. Since the value of exports is based on a sample while the value to shipments is derived from a census, the error is more likely in the former rather than the latter.

With two minor exceptions, all manufacturing industries increased exports between 2002 and 2007, both in nominal dollars and as a share of shipments. Exports of the chemicals industry (which includes REC Silicon) doubled, from 33.3 percent of shipments in 2002 to 66.7 percent in 2007. Machinery industry exports (which include Applied Materials) rose from 36.5 percent of shipments in 2002 to 58.0 percent in 2007.

Montana manufacturing exports and shipments during 2008 and 2009 are presented in Table 11. The

manufacturing shipments data in this table are derived from the Annual Survey of Manufacturers and are less detailed than those in Table 10. Comparing the data for 2008 to that for 2007 (in Table 10) reveals that both manufacturing exports and shipments increased despite the fact that 2008 was officially classified as a recession year. But a closer look at the industries shows a mixture of trends. For example, the value of chemical industry exports rose almost 41 percent while the dramatic increase in petroleum and coal shipments was probably due to the escalation in energy prices.

The full brunt of the Great Recession was felt in 2009. The value of exports declined about 20 percent while shipments decreased about 35 percent. The fact

that shipments decreased by more than exports led to the paradoxical result that exports as a percent of shipments rose dramatically in 2009. With only a few minor exceptions, all manufacturing industry shipments and exports decreased between 2008 and 2009.

The upward trend in the relative importance of Montana manufacturing exports is confirmed by other data prepared by the U.S. Bureau of the Census. The data presented in Table 12 provide a somewhat broader picture of manufacturing exports. They include not only the value of the exports themselves but also the value of supporting activities. In addition, the employment associated with these exports is estimated. The value of manufacturing exports rose from 8.2 percent of total shipments in 2006 to 10.4 percent in 2008. Similarly, employment associated with these exports increased from 10.6 percent of total manufacturing employment in 2006 to 11.4 percent in 2008.

The destination of Montana manufacturing exports are identified in Table 13. Canada consistently ranks number 1 as the major destination for exports. Next are the four Asian economic giants: Japan, Taiwan, China, and Korea. The European countries of Germany and the United Kingdom consistently rank in the top ten. Exports to China increased more than tenfold between 2002 and 2009 and its rank has risen from 8th to 4th during the same period.

Table 12
Export-Related Shipments and Employment,
Montana, 2006 and 2008

	2006	2008
Shipments (Millions)	\$787.60	\$1,326.10
Percent of Manufacturing Shipments	8.2	10.4
Employment	1,800	2,100
Percent of Manufacturing Employment	10.6	11.4

Note: Export estimates include both "direct" exports (exports manufactured in the U.S. and consumed in foreign markets)
Source: U.S. Bureau of the Census. "Exports from Manufacturing Establishments," (Accessed April 4, 2011).

Table 13
Montana Manufacturing Exports, by Country, Selected Years
(Thousands of Current Dollars)

Country	- 2002 -		- 2005 -		- 2009 -		'02-'09 Percent Change
	Exports	Rank	Exports	Rank	Exports	Rank	
Total, All Countries	290,417	-	512,327		876,500		201.8
Canada	155,787	1	219,182	1	336,955	1	116.3
Japan	26,459	2	53,169	2	129,175	2	388.2
Taiwan	13,949	4	32,432	4	72,562	3	420.2
China	5,064	8	25,378	6	59,227	4	1,069.6
Korea	6,343	7	24,296	5	44,123	5	595.6
Belgium	3,370	24	1,877	25	24,640	6	631.2
Germany	22,784	3	48,957	3	24,601	7	8.0
United Kingdom	6,692	6	22,551	7	23,024	8	244.1
Mexico	4,232	18	7,461	9	20,395	9	381.9
Denmark	637	55	1,419	32	18,248	10	2,764.7

Sources: www.wisertrade.org (accessed April 4, 2011). U.S. Bureau of the Census, Annual Survey of Manufactures 2008