2020 MONTANA MANUFACTURING REPORT

ACKNOWLEDGMENTS

This report was prepared by the Montana State University Montana Manufacturing Extension Center and the University of Montana Bureau of Business and Economic Research under award 70NANB16H210 from the National Institute of Standards and Technology Manufacturing Extension Partnership, U.S. Department of Commerce. The statements, conclusions and recommendations are those of the author and do not necessarily reflect the views of the National Institute of Standards & Technology Manufacturing Extension Partnership or the U.S. Department of Commerce. The author is Robert Sonora. BBER would like to acknowledge the assistance of Jenni West, Paddy Fleming from MMEC and Joe Ramler from the Montana Department of Commerce. All errors or omissions are our own.

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MONTANA MANUFACTURING EXTENSION CENTER

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EXECUTIVE SUMMARY

This report is on the state of Montana manufacturing conducted for the Montana Manufacturing Extension Center (MMEC). The report and analysis was done by the Bureau of Business and Economic Research (BBER) at the University of Montana. This is the 24th year that BBER and MMEC have collaborated to produce reports on Montana's manufacturing climate. Unlike previous versions this year's report consolidates information previously provided in three separate reports. The three primary topics are: the state of manufacturing at the state and national level in a general economic context; a survey of Montana manufacturers about the state of Montana manufacturing; and an impact survey of firms which used MMEC's consulting services.

STATE OF MONTANA MANUFACTURING

Montana's manufacturing faces different challenges than the nation as a whole because the composition of manufacturing production is different and is primarily concentrated in nondurable production – the Bureau of Economic Analysis defines nondurable goods as goods that have an average life of less than three years. The two largest manufacturing sectors in Montana, petroleum and coal and wood product manufacturing, are not among the seven largest sectors nationally. Therefore, the Montana manufacturing sector differs substantially from the experience of the country as a whole.

Some summary facts about Montana manufacturing in 2019 are:

- Over 3,300 manufacturing firms are in operation in Montana, including sole proprietors;
- Manufacturing employs about 19,544 workers, not including the self-employed;
- Accounted for roughly 19% of Montana's economic base;
- Manufacturing jobs paid about $51,666 in earnings, compared to the state average of $49,747;
- Accounts for 5.1% of total private state income equaling $1.1 billion;
- Employs 4.5% of Montana's workforce, with about 21,000 employees;
- Pays an annual average wage of $51,200, which is 17% above the state average;
- Produced 6.3% of Montana's output with a value of $3.4 billion;
- Grew more than double the national average in employment, income, and output.

The ongoing COVID-19 recession will remain a challenge for the economy as a whole, and manufacturing is no different. Montana manufacturing has bounced back relatively quickly from the deep economic drop in the second quarter of 2020. Forecasts for Montana manufacturing show that this sector will recover more quickly than the economy as a whole. Nondurable manufacturing is estimated to return to pre-COVID levels with a year or so. Durable manufacturing is forecast to return to the long run trend a year or so later.

Montana manufacturers are active in global markets as well. The three largest export sectors for Montana in 2019 were: chemicals, beverages and tobacco, and machinery. By far the largest export market is Canada, accounting for 46% of Montana's manufactured exports. The remaining large export markets are all in Asia: China (2), Japan (3), South Korea (4) and Taiwan (5).

MONTANA MANUFACTURERS SURVEY

This section of the report presents the findings of the 2019 Montana Manufacturers Survey. The initial Montana Manufacturers Survey was conducted in 1999. Since then, the Bureau of Business and Economic Research at the University of Montana has conducted the survey each year. The purpose of the survey is to learn the manufacturers' assessment of their plant's economic performance in

2019 and their outlook for 2020. This year, the annual Montana manufacturers survey included a new section on the effects of tariffs and globalization on manufacturing. The survey was conducted before the mandated COVID-19 shutdown and therefore, does not reflect the impacts of the pandemic.

Manufacturing in Montana is predominantly performed by small businesses. The U.S. government reports 1,625 manufacturing firms with employees in Montana. The average size of a manufacturing establishment with employees is 18 workers. More than half of these establishments have less than five workers. Montana has no manufacturers with 500 or more workers.

Highlights from the 2019 manufacturing survey:

- Almost 50% of manufacturing firms saw an increase in total sales and profits from 2018;
- Ninety-five percent of firms did not reduce production capacity;
- A majority of firms (56%) maintained the same level of employment, but 27% had a significant shortage of workers at some time during 2019;
- Over 90% of Montana manufacturers did not experience a decline in exports because of retaliatory tariffs placed on exports, but 51% saw an increase in their imported input prices because of tariffs on foreign imports; and
- A majority of firms did not change their hiring or investment decisions because of trade frictions.

EVALUATION OF MONTANA MANUFACTURING EXTENSION CENTER

The Montana Manufacturing Extension Center works with manufacturers to create and retain jobs, innovate, reduce costs, increase profits and save time and money. MMEC employees typically make on-site visits to manufacturing clients to assess problems, suggest appropriate solutions and assist with implementation. MMEC closely monitors its performance by welcoming feedback and carefully following an evaluation procedure developed by the National Institute of Standards and Technology (NIST) and administered by an independent third party.

The primary NIST survey findings are as follows:

- Montana manufacturing clients were very satisfied and are very likely to recommend MMEC to other firms, with 73% of respondents saying they relied exclusively on MMEC as a business service provider;
- Staff expertise was the most important factor for firms to use MMEC services;
- The most important challenges facing surveyed MMEC clients were ongoing continuous improvement/cost reduction strategies, employee recruitment and retention, and product innovation/development;
- The 2019 survey respondents said that working with MMEC resulted in 417 new and retained manufacturing jobs and directly or indirectly added approximately $2,205,150 to Montana individual income tax revenue. Since 2013, MMEC visits have resulted in 3,041 created or retained jobs and $520 million in increased or retained sales;
- The Montana return on investment for MMEC during 2019 was about 4.9 to 1. The state received about $4.90 in income tax revenue for each dollar invested in MMEC; and
- MMEC clients paid approximately $490,864 in fees during 2019. Their return on investment in 2019 was approximately 12.9 to 1.

ECONOMIC EFFECTS OF COVID-19

The United States entered a recession on March 1, 2020. The recession was caused by the need to close the economy as the impacts of the COVID-19 pandemic began to ripple through the global economy. The pandemic brought an end the longest economic expansion in U.S. post-WWII economic history, lasting 10 1/2 years. COVID-19 and policy responses, both from an economic and health perspective, will lead to considerable uncertainty for some time to come. As of this writing, the U.S. has roughly 9.5 million cases of COVID-19, about 25% of global cases, and 235,000 deaths, 20% of the global total.

Economic data for the second quarter of 2020 was dire. Year on year from real GDP growth 2019 to 2020 was -9.5%, annualized quarterly growth was an eye-popping -32.9%. In dollar terms, the U.S. economy lost $2.0 trillion in output in 2020, or roughly all the economic gains made since 2015. At its' peak in April 2020, the headline unemployment rate was 14.7% and the number of new unemployment insurance claims peaked at over 6.9 million per week. By mid-summer of 2020, the unemployment rate had fallen to 10.2%, initial claims were about one million per week, but continued claims for unemployment insurance remained at over 15 million unemployed workers. To put these numbers in perspective, in normal economic times, new claims are about 200,000 and continuing claims are approximately 1.5 million per week.

In the U.S. on March 1, the Federal Reserve responded aggressively, cutting the policy target interest rate range, the federal funds rate, to between 0.0-0.25%, down from 1.5%. On Capitol Hill policy makers passed the Coronavirus Aid, Relief, and Economic Security Act (CARES), which provided about $2.2 trillion in economic stimulus. A rough breakdown of the act is: a $300 billion in one-time payments to individual taxpayers, $260 billion in unemployment benefits, an initial $350 billion for the Paycheck Protection Program to fund forgivable loans to small businesses (later increased to $669 billion), $500 billion in for large corporations, for example Boeing, and $339.8 billion to state and local governments. While not without issues, the CARES Act did provide support for households which lost jobs due to the pandemic.

While the 2020Q2 was the sharpest decline in economic, the economy is showing signs of recovery. From February to April 2020, 22 million nonfarm jobs were lost. Since April, 9 million have come back. There are currently about 5.9 million nonfarm job openings, up from 4.9 million in April, that leaves half of the COVID unemployed without a job opportunity.

Current forecasts for the U.S. economy show 2020Q3 to rebound. According to The Conference Board's forecast, the annualized 2020Q3 growth will be 26.1% with a slight contraction in 2020Q4 of -1.6% (https://conference-board.org/research/us-forecast). IHS Market anticipates third and fourth growth to be 17.7% and 5.1% respectively. However, IHS Market does not forecast real GDP returning to the pre-recession trend until 2026 or 2027. Furthermore, they believe that real GDP will not return to pre-recessionary levels until 2022. These forecasts underscore the need for the legislative and executive branches of the Federal government to finalize a stimulus program, should the effects of COVID not decline.

The impact on U.S. manufacturing has been considerable having already felt the impacts of an ongoing tariff war. Estimates have put the cost to the U.S. economy in the hundreds of billions of dollars per year. The effects of the COVID-19 pandemic have only worsened the economic environment. In March, the National Association of Manufacturers conducted a brief survey of the impacts of COVID-19 on the industry (https://www.nam.org/coronasurvey/). The survey found:

- 35.5% face supply chain disruptions;
- Over 53% of manufacturing firms anticipate a change in their operations in the coming months;
- 78.3% say that uncertainty associated with COVID-19 will likely have a negative financial impact; and
- Roughly half of respondents stated their business has an "emergency response plan."

ABOUT MANUFACTURING IN MONTANA

Manufacturing in Montana has remained a stable economic sector for the last decade. Between 2010 and 2019 manufacturing, as a share of total Montana employment, has risen slightly from 3.9% to 4.5% to 20,972. Similarly, manufacturing's labor income as a share of total rose from 4.8% to 5.1% to $1.1 billion in 2019. Average annual pay by Montana's manufacturers was $51.2 thousand in 2019. By 2019 manufacturing climbed to 6.3% of total state gross state product to $3.4 billion.

Compared to the state average, manufacturing employment and total income have outpaced the state average. Employment and income were 29% and 55% respectively, higher than they were in 2010. Over the same period, statewide employment and income were 12% and 46% higher. In terms of production, Montana manufactures produced 74.5% more output. This is the value of total production, in 2019 than in 2010, the most of any sector in the state, with growth averaging 6.4% per year. Durable manufacturing grew an average 6.8% per year since 2010 and produced 81% more in 2019 than in 2010. Construction followed producing 56% more in 2019. Overall average output was 39% higher in 2019 than 2010.

Montana manufacturing has been growing relative to the U.S. as a whole. Nationally, manufacturing output grew an average of 3% between 2010 and 2019 and was 31% higher in 2019 than 2010. Correspondingly, Montana manufacturing employment also grew faster than the national average. U.S. manufacturing employment grew an annual average of 1.2% and was 11.4% higher in 2019 than in 2010.

Montana manufacturing does not have the same composition as the U.S. as a whole. Industries that are important in Montana are not necessarily important nationwide and vice versa. Figure 1 presents the composition of manufacturing earnings in Montana and the United States in 2018. Throughout this report, the definition of "earnings" is the one used by the Bureau of Economic Analysis (BEA). The BEA defines earnings as the *sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income*. Put another way, it is income earned solely from labor. Changes in energy prices distort the value of output measures for certain industries, such as petroleum refining. Consequently, worker earnings are the best measure of the composition of manufacturing, because it is the amount earned by manufacturing workers in the state.

Manufacturing in Montana...

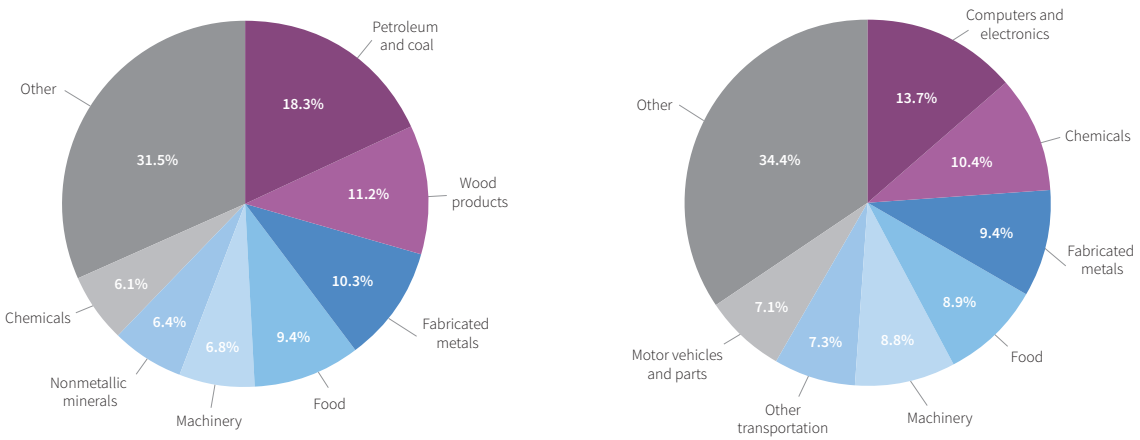
- *Accounts for 5.1% of total private state income equaling $1.1 billion.*
- *Employs 4.5% of Montana's workforce, with about 21,000 employees with an average annual pay of $51,200, which is 17% above the state average.*
- *Produced 6.3% of Montana's output with a value of $3.4 billion.*
- *Grew more than double the national average in employment, income, and output.*

The two largest Montana manufacturing industries in 2018 were associated with the processing of crude oil and forest resources. Petroleum and coal products (primarily oil refining) was the largest manufacturing industry accounting for 18.3% of total manufacturing earnings in 2018. The next largest industry was wood products and furniture, representing 11.2% of earnings. Fabricated metal, food, and machinery round out the top five accounting for 10.3%, 9.4%, and 6.8% respectively.

The largest component of U.S. manufacturing during 2018 continues to be computers and electronics, which accounted for 13.7% of total manufacturing earnings. The next four industries were chemical products (10.4%), fabricated metals (9.4%), food products (8.9%), and machinery (8.8%).

Compared to 2010, in 2019 statewide employment and incomes were 12% and 46% higher. Montana manufactures produced 74.5% more output, the most of any sector in the state, averaging 6.4% growth per year.

Figure 1. Composition of manufacturing in 2018 (percent of total manufacturing). Source: Bureau of Labor Statistics.



WORLD OUTLOOK: GROWTH HAMPERED BY CONTINUING UNCERTAINTY

Figure 2 shows forecasts from two international economic policy institutions. According to the International Monetary Fund (IMF), global economic growth is forecast decline dramatically throughout 2020 before slowly recovering in 2021 (Figure 2A). It is important to note that most forecasts for the majority of countries do not suggest a return to pre-COVID levels of output for the foreseeable future, with the exception of China. Figure 2B shows an index of inflation adjusted real gross domestic product (GDP), 2019Q1=100, for the U.S., China, advanced economies and the world. By 2020Q2, China is forecast to be about 4% above 2019 levels. The world economy returns to 2019 levels by the end of 2020. However, advanced economies and the U.S. are not forecast to return to 2019 levels until 2021Q4 and 2022Q2 respectively. The return to pre-COVID trend output is not unlikely to occur until 2025 or 2026.

By 2020Q2, China's economy is forecast to be about 4% above 2019 levels. The world economy returns to 2019 levels by the end of 2020. The U.S. is not forecast to return to 2019 levels until mid-2022.

The Organization of Economic Cooperation and Development's (OECD) June 2020 economic report, titled "The World Economy on a Tightrope," stresses the high level of uncertainty that plagues the world economy. Their report conducts two possible forecasts, a single and double hit. Figure 2C shows the growth trajectory for the combined 37 OECD member countries for each possible scenario. In both cases the annualized 2020Q2 growth rate is -43% followed by a recovery.

Nevertheless, the chances for a double dip recession are possible should the global economy require a second, or more, round of lockdowns. In this scenario, the OECD forecasts a second decline growth in 2020Q4. As of this writing, numerous European countries are facing partial shutdowns – including Germany, France, the United Kingdom and others – to slow the spread of COVID-19, as many countries are experiencing a sizable second wave of infections heading into the winter months.

Table 1 looks at how Montana's primary export markets are expected to do through 2022. The years 2020-22 are forecasts. 2020 will see considerable declines in real GDP growth for all non-Asian trading partners – six countries are estimated to decline by over 5% in 2020 – followed by relatively modest growth rates in 2021. Growth rates in 2021 and 2022 are not enough bring these economies back to pre-2020 trends. Ultimately how well these countries do depends on their ability to control the spread of COVID-19, which will continue to dominate the global economy for the foreseeable future.

Another factor impacting global markets will be how the ongoing trade war shapes up. The Trump administration has imposed numerous rounds tariffs on a variety of goods and services from around the world. These impact not only intermediate good prices but also the prices of American exports, because other countries impose retaliatory tariffs on U.S. goods and services. Much of the tariff uncertainty is unfortunately home grown. Receiving less attention than tariffs is the steady appreciation of the dollar to other currencies. Since 2018, the U.S. dollar has appreciated from 5-10% against many of its' largest trading partners, which should lead to decline in net exports as U.S. goods become more expensive. The effect of this appreciation should not be underestimated – a back of the envelope calculation reveals that a 1% dollar appreciation leads to 2.5% fall in net exports.

Figure 2A. Real GDP growth forecast. Source: International Monetary Fund.

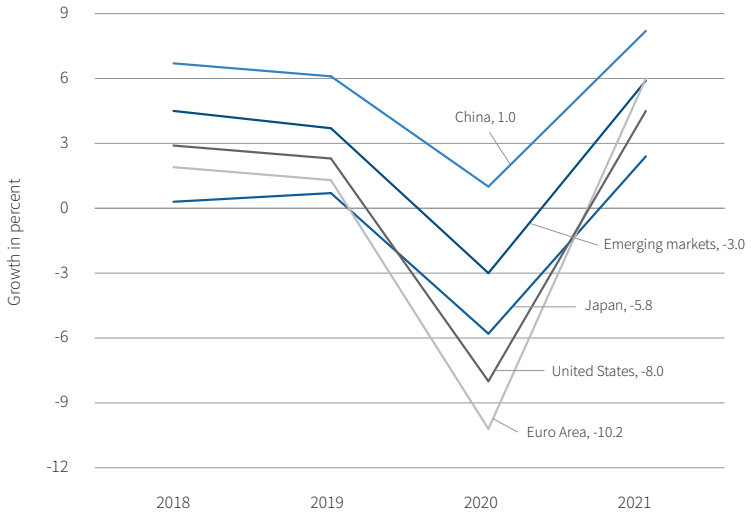


Figure 2B. Index of real GDP. Source: International Monetary Fund.

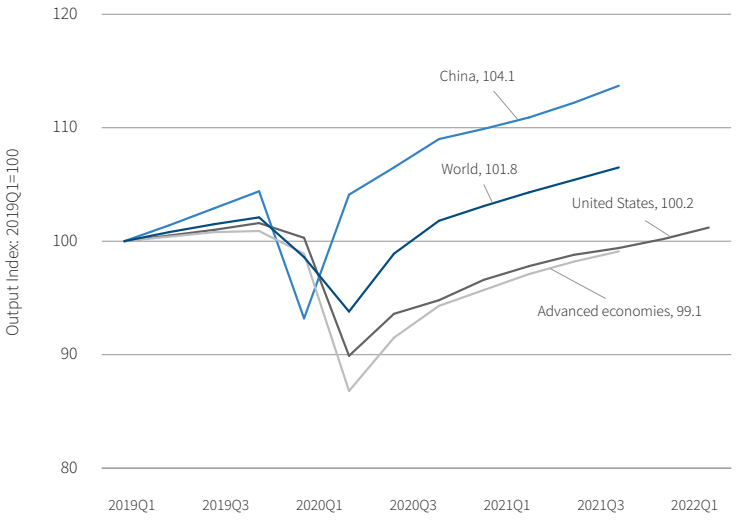


Figure 2C. Single and double hit scenario. Sources: International Monetary Fund and Organization of Economic Cooperation and Development.

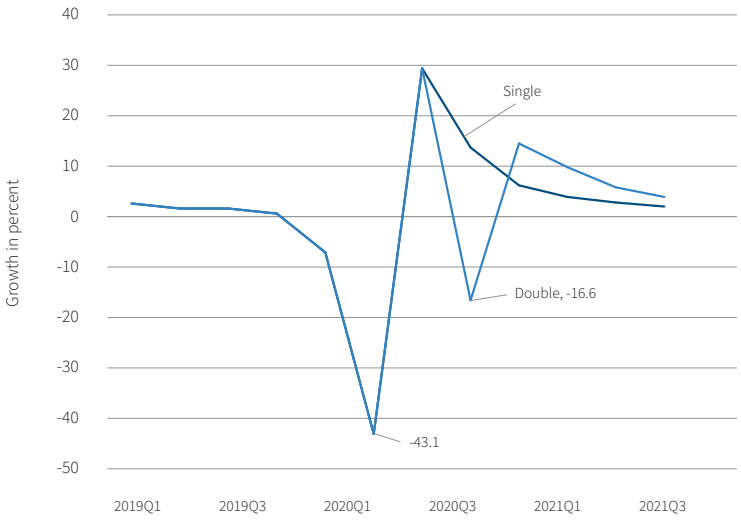


Table 1. Real GDP growth of ten Montana's largest trading partners, in percent. Source: International Monetary Fund, Economic Outlook 2020, October.)

Rank	Country	2019	2020	2021	2022
1	Canada	1.66	-7.14	5.18	3.40
2	China	6.11	1.85	8.24	5.80
3	Japan	0.67	-5.27	2.32	1.66
4	Korea	2.04	-1.88	2.87	3.11
5	Taiwan	2.71	0.05	3.22	2.15
6	Belgium	1.40	-8.26	5.35	2.67
7	Mexico	-0.30	-8.95	3.53	2.26
8	The UK	1.46	-9.76	5.92	3.17
9	Germany	0.56	-5.98	4.18	3.06
10	France	1.51	-9.76	6.03	2.86

Europe and the European Union

COVID-19 will continue to dominate the overall European economy. Without a blanket COVID policy, each country is adopting its own measures to slow the spread of the disease, much like the state specific polices in the U.S. Many countries are returning to some form of shutdown, which will lead to continued economic pain. Countries most impacted are those with relatively large leisure and hospitality sectors – such as Spain, Italy and Greece – because of their reliance on tourism.

A back of the envelope calculation reveals that a 1% dollar appreciation leads to 2.5% fall in net exports.

For European Union (EU) countries that have more robust social safety nets, universal health and child care, the COVID-19 recession did not have as significant of an impact on their economies as in the U.S. In addition, many European governments immediately introduced subsidized monthly income for all workers who lost their jobs because of COVID-19 associated economic shutdowns. For example, the UK government paid workers up to 80% of their incomes without having to jump through the same hoops as workers in the U.S. did.

These policies minimized the impacts of the COVID-19 recession on EU economies. For example, unemployment in Germany increased to 4.4% in July, up from 3.5% in January. French unemployment did not rise above 8% in 2020. Beyond COVID, uncertainty surrounding Brexit and U.S. tariff policy will be an ongoing concern until they are resolved.

Latin America and Canada – Tied to the U.S.

Like Europe, the fate of Latin American economies depends on how well they cope with COVID-19 and the effects of tariffs. Another wild card is political uncertainty, particularly in Brazil and Venezuela. 2020 real output growth is projected to be -5.8% and -25% respectively. Mexican growth is projected to -9% in 2020.

Canada's fate is also determined by the U.S. economy, which is its' largest trading partner. Positive news stems from the reduction of punitive tariffs on Canadian goods imported into the U.S. Also positive for Canadian exports is the relatively strong U.S. dollar. Low energy prices could be a drag on Canadian growth.

China, Asia, and the Pacific

China is a bright spot. China reports less than 100,000 total cases and about 5,000 deaths. More importantly, they are experiencing less than 100 new cases per day, allowing the economy to fully open. China's 2020 growth is expected to be positive. East Asia as a whole is projected to grow at 0.3%, the only region expected to have positive growth in 2020. Given Asia's rapid and universal response to COVID-19, the continent will likely see a return to pre-COVID levels by 2022.

Despite New Zealand's blameless response to COVID-19, its' economy is largely driven by food exports – 50% of exports are from dairy, meet, and wood. Because many of its' export markets are in recession, New Zealand's economy is expected to shrink by 6% in 2020. Estimated Australian real GDP in 2020 is about -4%.

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NATIONAL MANUFACTURING OVERVIEW

U.S. manufacturing is sometimes pictured as an anachronistic activity in the new knowledge-based economy. The true story is more subtle and complicated. New investments, often incorporating the latest technology, are particularly important for manufacturers as they constantly improve productivity and efficiency. In most cases, these new investments lead to more output being squeezed from a given amount of inputs or fewer inputs are required to produce a certain output.

Figure 3 shows an index, 2000Q1=100, of U.S. manufacturing and overall nonfarm employment as well as manufacturing labor productivity. We can see that overall nonfarm employment has trended upwards, with the declines associated with the 2007-09 recession. Manufacturing employment, on the other hand, has been in general decline since 2001. As the figure shows, declines in manufacturing have been offset by increases in productivity. The long-term decline in manufacturing employment is sometimes misinterpreted as an indicator of the poor overall health of the industry. Improvements in productivity and efficiency change the relationships between inputs and outputs. Decreases in employment do not necessarily mean less output is produced or a 10% growth in output may not be associated with an equivalent change in some or all of the inputs.

The third line in Figure 3 is an index of worker productivity in the manufacturing sector. This measure rose sharply between 2000 and 2010 but has remained unchanged at about 40% above 2000 levels. Since 2014, worker productivity has slowly fallen by about 6%. Changes in worker productivity are in line with changes in manufacturing capital intensity, a measure of how much capital per worker is used in industry. It is currently about 80% above 2000 levels, though this too has remained largely unchanged since 2010. All three series show the effects of the COVID-19 recession in the second quarter of 2020.

Figure 4 shows an index of capital intensity, defined as the ratio of physical capital to hours worked, 2007=100, for overall, nondurable and durable goods manufacturing. Nondurable refers to goods

Figure 3. U.S. nonfarm and manufacturing employment and manufacturing labor productivity. Source: Bureau of Labor Statistics.

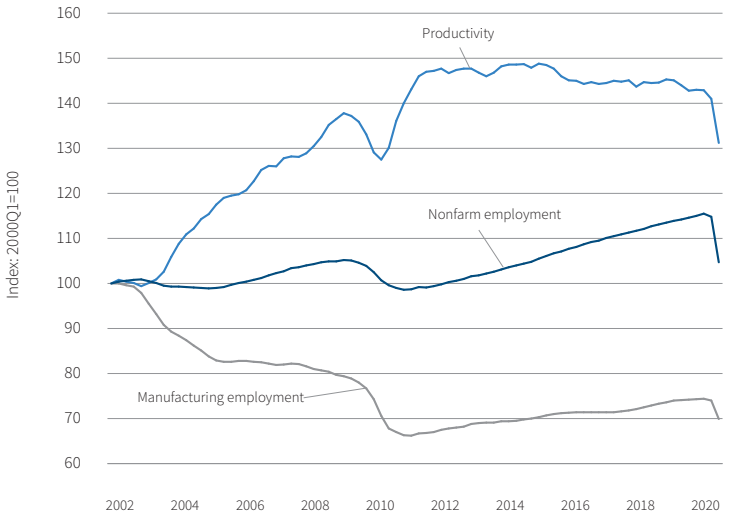


Figure 4. Capital intensity. Source: Bureau of Labor Statistics.

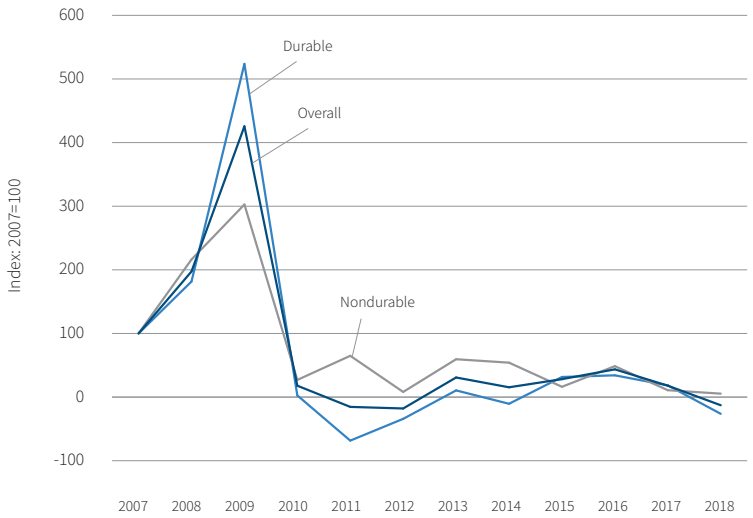
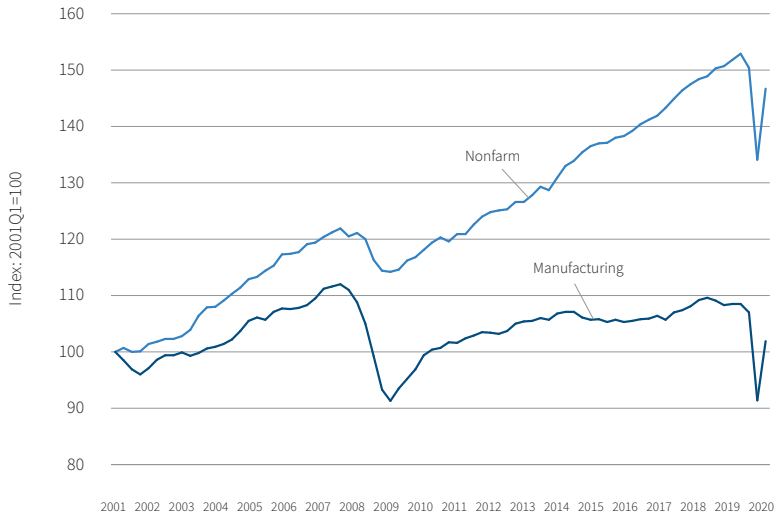


Figure 5. Manufacturing and all industries, output index. Source: Bureau of Economic Analysis.



produced that are expected to last less than three years, such as food, gasoline, and clothing. Durable goods last over three years, for example furniture, appliances and electronics.

The higher the ratio, the more capital is used to produce each unit of output. The effects of the recession are clear, manufacturing firms replaced workers with capital, which coincides with decline in manufacturing employment shown in Figure 4. The capital-labor ratio fell to below 2007, due primarily to rises in manufacturing wages (Figure 9). It is likely, given the current environment, we will see a similar increase in the data for 2020 and 2021.

Figure 5 presents indices of manufacturing and national nonfarm business production, adjusted for inflation, 2001Q1=100. It's a similar story to the discussion above, with output, total output and manufacturing output following a similar trajectory from 2005 to 2008 when overall output began to rise relative to manufacturing. We can see a large drop in nonfarm and manufacturing output during the 2008 recession with each beginning to recover in 2010. However, while nonfarm output resume its' pre-recessionary upward trend, the manufacturing sector's growth trend slowed. This reflects changes in how and what is produced in the U.S.

As discussed earlier, growing globalization and increasing competition has led many U.S. based firms to move production abroad. Tariffs passed in 2018 led a to a slight decline in manufacturing. Manufacturing has done relatively well coming out of the sharp decline in the second quarter of 2020. Inflation adjusted manufacturing output fell 11% from quarter one to quarter, but gained back 9% the following quarter, and now stands only about 2% below pre-2020Q1 levels.

Turning our attention to differences across durable and nondurable goods between 2005 and early 2020, Figure 6 shows the share

Figure 6. Manufacturing share of gross output. Source: BBER calculations using data from the Bureau of Economic Analysis.

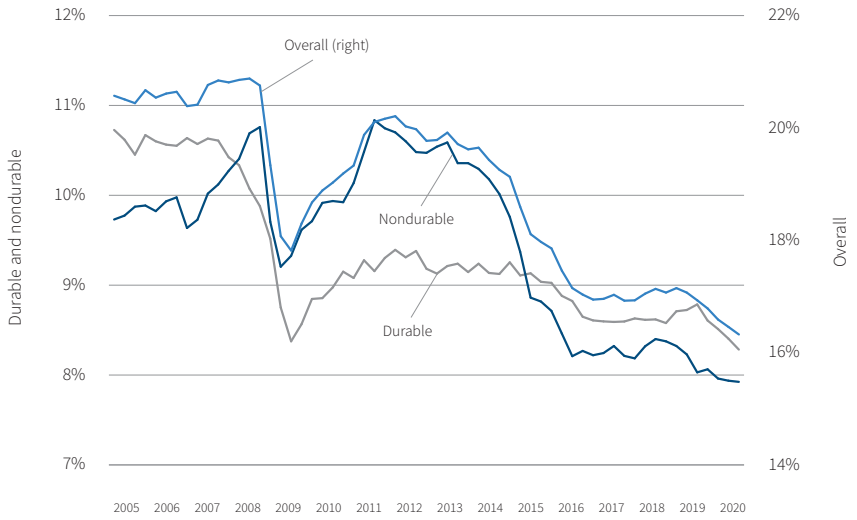
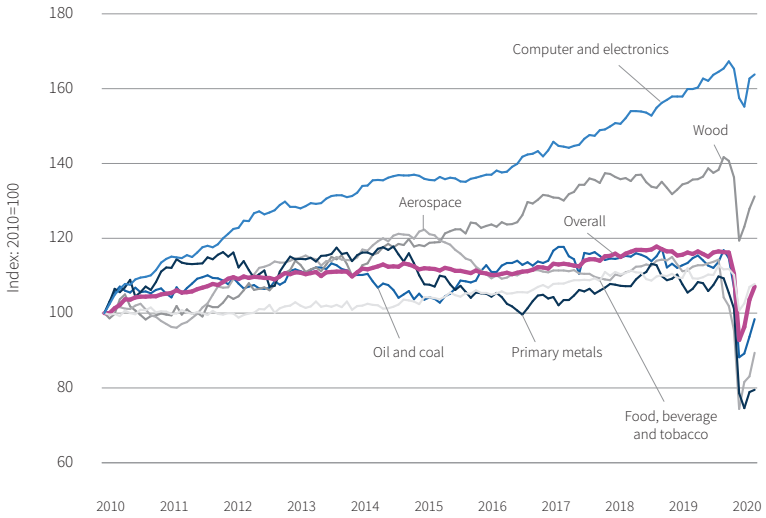


Figure 7. U.S. industrial production by manufacturing sector, 2010.01=100. Source: Board of Governors of the Federal Reserve.



of overall output to overall, durable, and nondurable manufacturing. The data shows that durable goods manufacturing fell further and recovered slower than nondurable manufacturing.

Industrial production indexes for seven manufacturing sectors since 2010 recession are illustrated in Figure 7. Overall manufacturing is in red. Only computers and electronics and wood production are significantly above where they were before 2010. Primary metal, furniture, wood products, and apparel and leather manufacturing have fallen, with apparel and leather about 60% below pre-recession levels. Food, beverages and tobacco remains, more or less, unchanged. As the data shows, the pandemic spreads a long shadow across the economy, though it has not impacted each sector symmetrically. Computer and electronics are weathering the storm reasonably well, while aerospace and primary metal production have taken a significant hit. It should be noted that the food and aerospace sectors have the most influence over the overall manufacturing index. Part of the issues for aerospace are the continued issues surrounding commercial airlines, in particular Boeing which entered the COVID-19 recession in a weakened position following problems with its' 737-MAX airline. Aerospace and primary metals have also been impacted by the ongoing tariff war.

Computer and electronics are weathering the storm reasonably well, while aerospace and primary metal production have taken a significant hit.

For those workers who remain in manufacturing, there are some positive signs. Figure 8 shows the national inflation adjusted average hourly wage for manufacturing workers, in 2012 dollars, and the manufacturing unemployment rate. Manufacturing wages got

Figure 8. Manufacturing real wage and unemployment. Source: Bureau of Labor Statistics and the Bureau of Economic Analysis.

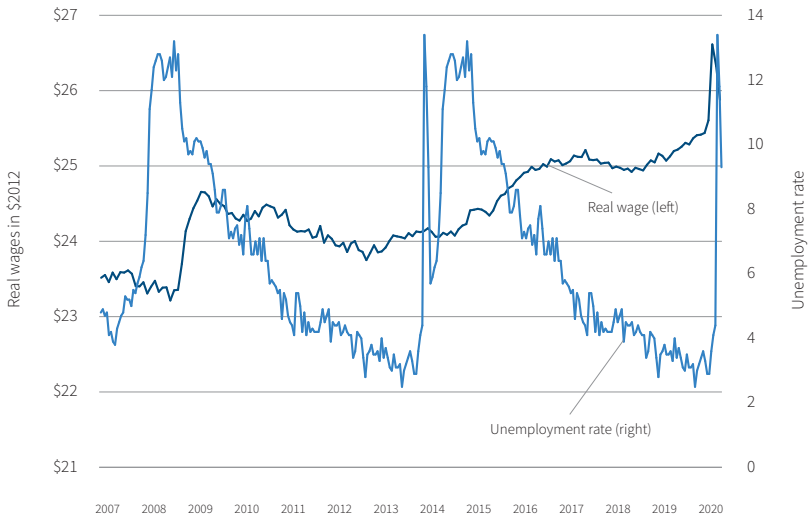
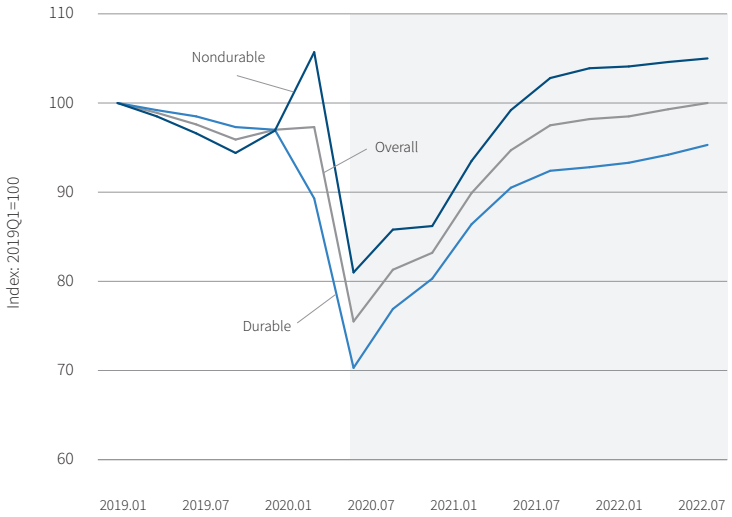


Figure 9. Manufacturing forecast. Source: BBER calculations using data from BLS, BEA and IHS Market.



a big boost coming out of the recession. Then between 2008 and 2014 they saw a decline in their spending power.

However, between 2013 and 2019 real wages increased to a pre-COVID level of about $25.50 per hour from $24.00. The jump in wages in 2020 is due to the $1,200 sent to individuals from the CARES Act. The manufacturing unemployment rate has been falling since 2009 and fell to 2.3% range prior to the recession. As with most industries manufacturing unemployment rose sharply in the first and second quarters of 2020, rising to a high of 13.2%, about 1.5% below the national average.

Between 2013 and 2019, real wages increased to $25.50 per hour, and the manufacturing unemployment rate has been falling since 2009 and fell to 2.3% range prior to the recession.

SUMMARY

Before we move onto Montana let's consider causes of the decline in manufacturing. First is the changing structure of the U.S. economy, which has been moving from a manufacturing based economy to a service based one for the past 40 to 50 years. In 1990, the ratio of manufacturing to service employees was about 0.21, but since 2010 the ratio has stabilized around 0.1, before falling below 0.1 in 2016. As discussed above, much of that has been due to changing production processes in manufacturing – capital intensity in manufacturing has risen about 175% since 1990, which increases worker productivity reducing the need for as many workers.

As services have replaced manufacturing as the dominant sectors of the economy, we have witnessed a slow decline in the economy. Some of this is explained by economic growth theory, but theories also demonstrate how changes in the structure of the economy can lead to changes in long term growth. For example, in 1990 there were about 0.28 workers engaged in financial activities to every manufacturing worker. This ratio began to rise sharply in 2000, which coincides with the second step down in capacity utilization and long run economic growth. By end of the Great Recession in 2009, this ratio had almost doubled to about 0.5 finance workers to every manufacturing worker, where it has remained.

Globalization has also played a role. Overall manufacturing has been shifting to foreign countries as predicted by the product life cycle. Manufacturing in the U.S. has matured and in an increasingly integrated world economy, which accelerated during President Ronald Reagan's administration, production has shifted abroad. This effect was heightened when China became of member of the World Trade Organization (WTO) in December 2001.

What is the future of manufacturing over the foreseeable future? Figure 9 shows a forecast of national level durable, nondurable and overall manufacturing output through 2022, indexed to 2019Q1. There is a 25% decline in overall manufacturing in the second quarter of 2020, however, durables face the largest contraction (about 30%). Nondurable production rebounds the fastest, reaching pre-COVID levels by mid-2021, while durable manufacturing does not rise to 2019 levels by the end of 2022. COVID-19 is not the only culprit explaining forecasted durable slow return to pre-COVID levels, manufacturing was already in decline, as discussed above.

MANUFACTURING AND THE MONTANA ECONOMY

According to 2019 data, Montana's economy is roughly in the same position as the U.S. as a whole. The 2019 unemployment rate averaged 3.5 percent and in constant 2012 prices real gross state product (GSP) averaged 2.1 percent. Manufacturing output growth averaged 1.3% in 2019, down from 13.6% growth in 2018 (Figure 10). As the figure also shows, real manufacturing output took a substantial hit during the Great Recession, falling roughly 30% compared to an overall decline in real GSP of 1.4%. As shown in Figure 11, manufacturing's share of Montana private nonfarm earnings has been growing since the end of the Great Recession in 2010, from about 5.2% to 5.7%. However, while manufacturing's share fell to roughly 5% during the Great Recession during the 2016 Montana economic downturn, manufacturing earnings as percent of total earnings increased slightly. Focusing on the relationship between Montana and overall nationwide manufacturing output (Figure 12A), since 2005, Montana's overall manufacturing has kept pace with the national economy, though with a higher degree of volatility. This volatility is expected because, as discussed above, what Montana's manufacturers produce is different from the national average. In particular, the value oil and coal manufacturing, nondurable goods, are subject to large swings because of global energy price changes.

Manufacturing's share of Montana private nonfarm earnings has been growing since the end of the Great Recession in 2010, from about 5.2% to 5.7%.

Montana durable goods manufacturing has mirrored patterns in the national average (Figure 12B). Nondurable manufacturing is presented in Figure 12C. Because oil and coal manufacturing is the largest share of manufacturing overall, about 18% (see Figure 1), the role energy prices can be seen in nondurable manufacturing. Between 2008 and 2009 and again between 2014 and 2016, oil price fell sharply helping spur manufacturing in this sector. Echoes

Figure 10. Montana economy and manufacturing. Source: BLS and BEA.

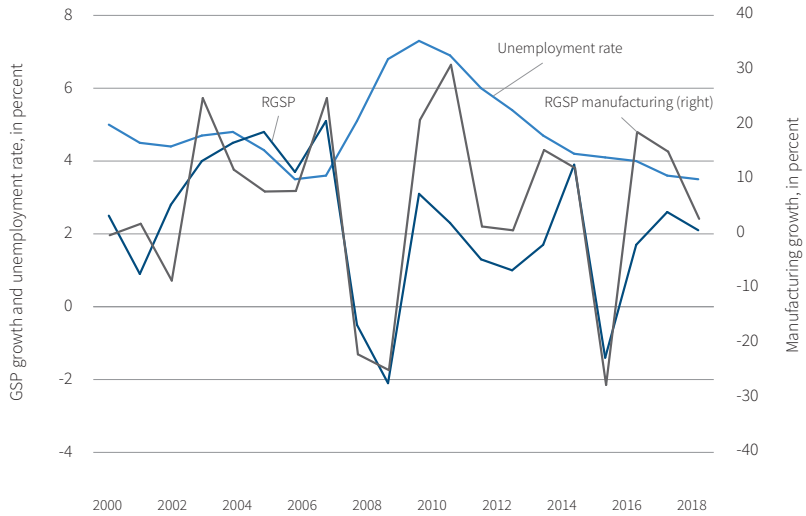


Figure 11. Manufacturing share of total private nonfarm earnings. Source: Bureau of Economic Analysis.

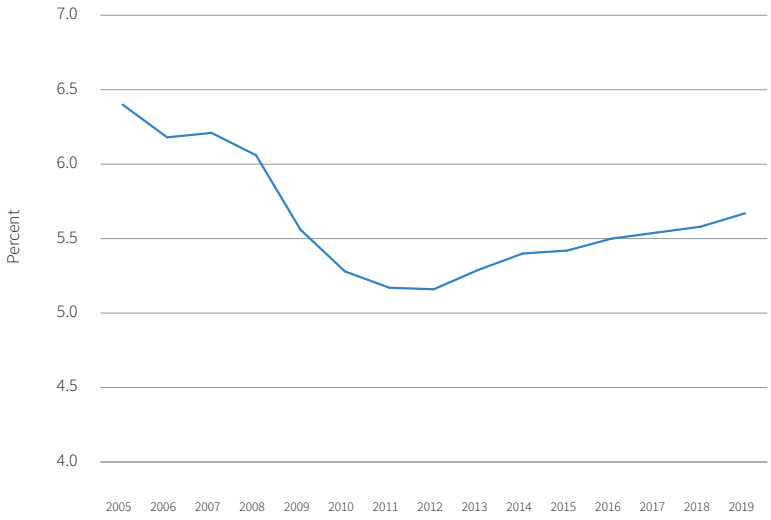


Figure 12A. Overall U.S. and Montana manufacturing production. Source: Bureau of Economic Analysis.

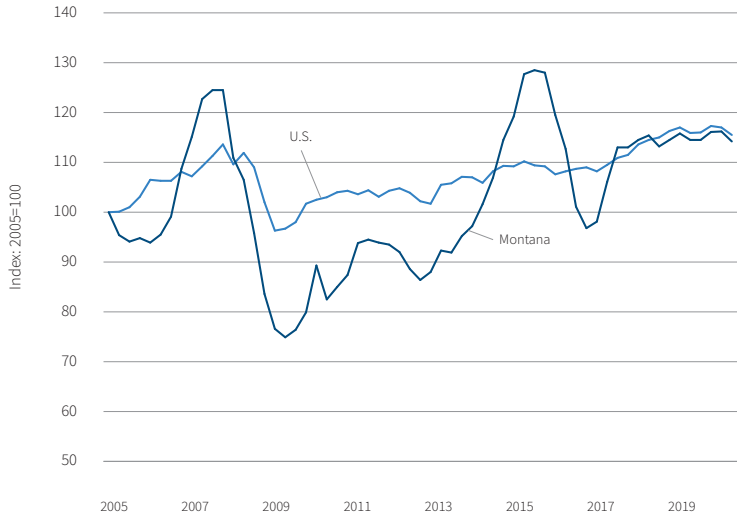


Figure 12B. Durable U.S. and Montana manufacturing production. Source: Bureau of Economic Analysis.

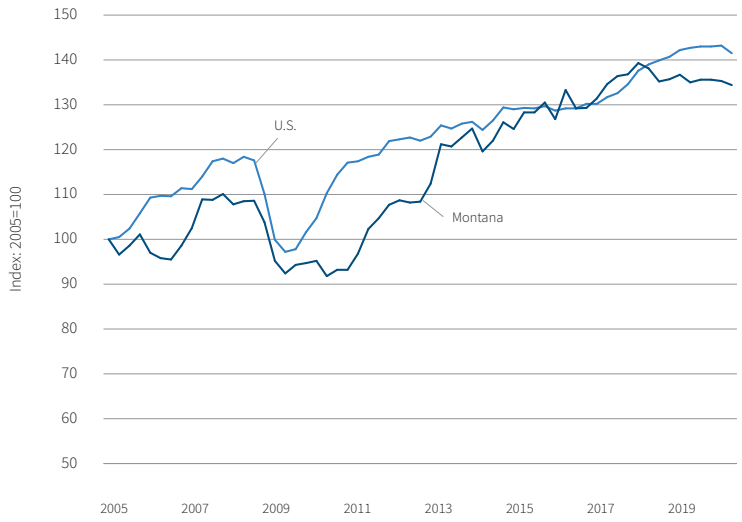


Figure 12C. Nondurable U.S. and Montana manufacturing production. Source: Bureau of Economic Analysis.

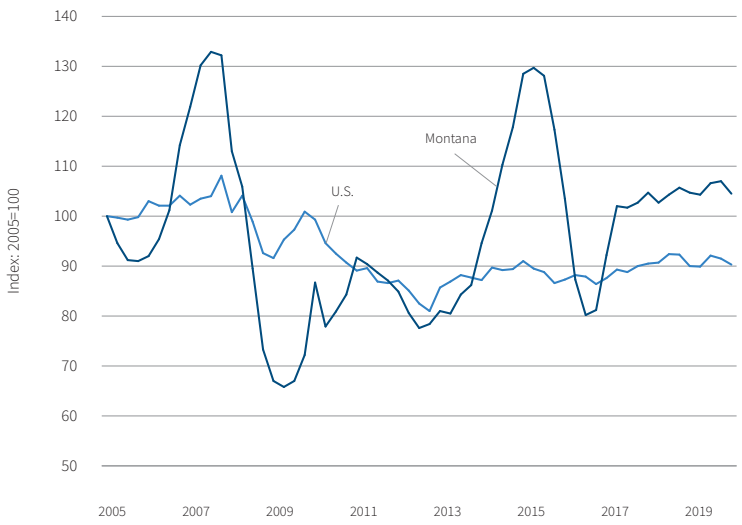
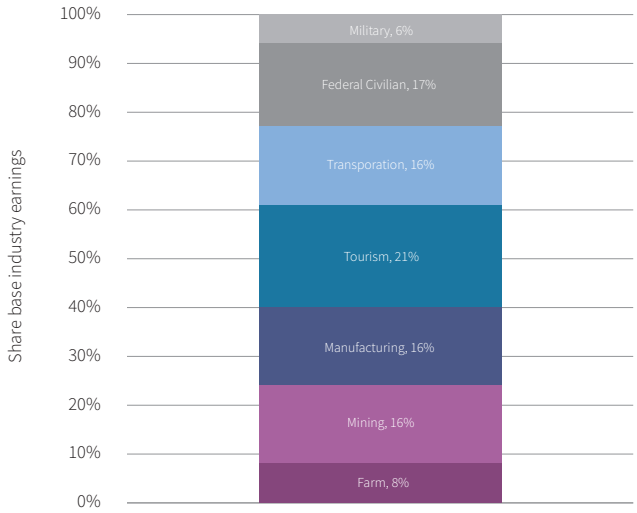


Figure 13. Share of basic earnings in Montana, 2009-19. Source: Bureau of Labor Statistics and the Bureau of Economic Analysis.



of these price drops show up within a year or so in mineral manufacturing bubbles. This increase is also reflected in the rise of overall manufacturing shown in Figure 12A.

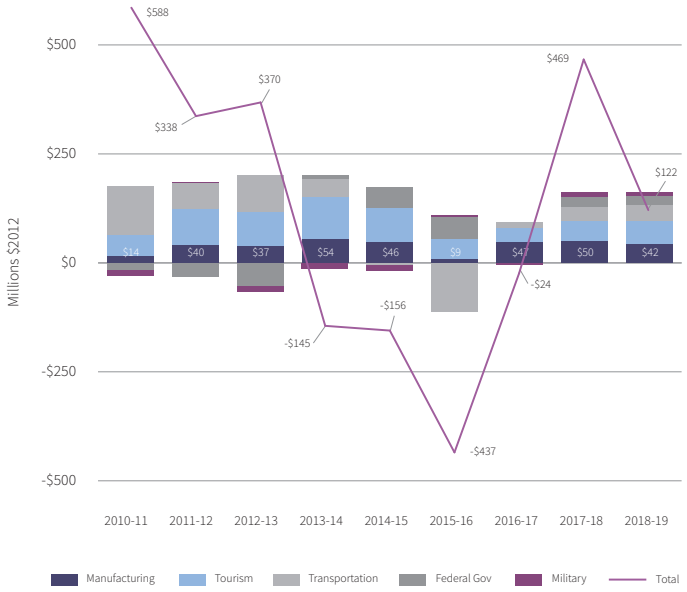
Trends in the Montana economy are primarily determined by base industries. Base industries are those located in a state, but sell most of their products elsewhere or are otherwise influenced by factors beyond the state's borders. Base industries inject new funds into the state economy and are responsible for creating further income and jobs. To quantify the role base industries play in the Montana economy we consider labor earnings for each sector.

Sharp declines in energy prices led to a surge in oil and coal manufacturing within a year or so.

Gross state product data is not well-suited to analyze trends in manufacturing from one year to the next. The disadvantage of GSP data is that it is not available prior to 1997 and the most current figures are several years old or do not provide detail for specific sub-sectors within manufacturing.

Labor earnings data is more appropriate for analyzing trends from one year to the next and for periods of a decade or more. Recall that earnings is defined as the sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income. The share of basic earnings over the period 2009-19 in each of Montana's basic industries are shown in Figure 13 – both military and federal civilian shares are federal government earnings. Collectively, the federal government accounts for about 23% of base industry earnings, just above tourism at 21%. Manufacturing accounts for about 16% of total base earnings, which is similar to mining and federal civilian earnings. Farming provided about 8%

Figure 14. Change in nonfarm basic earnings, excluding agriculture and mining, in millions. Source: Bureau of Economic Analysis.



of total basic earnings over 2009-19. Note, these shares are pre-COVID and it is likely that tourism's share of base industry earnings will be somewhat lower in 2020.

Manufacturing contributes to recent economic trends in Montana despite accounting for a relatively modest portion of the economic base. It is worth noting that manufacturing earnings grew each year after the recession trough. This importance is illustrated by the data in Figure 14, which presents the year-to-year changes in nonfarm basic earnings by base industry from 2010 to 2019 in inflation adjusted 2012 prices. Agriculture and mining are excluded as earnings in these industries is highly dependent on prevailing global market conditions and can vary widely. Total gains/losses to these industries is represented by the gold line. The value of the change in earnings for manufacturing is also shown. Overall, we see a U-shaped trend for the data presented, with the bottom in 2015-16 at -$437 million, when the state as a whole experienced a minor short-lived recession.

MANUFACTURING ESTABLISHMENTS

According to the Bureau of Labor Statistics, there were 1,498 Montana manufacturing establishments in 2019 that have employees. Dunn and Bradstreet lists over 3,300 manufacturers in Montana. This latter number includes single proprietor, as well as those with employees. To get a better sense of structural changes in Montana manufacturing we look at the average and the average annual growth rate over 10 years for manufacturing firms in the state for the period 2005 to 2019 (see Table 2). The minimum and maximum growth rates are also included. The table is organized by NAICS code with the fastest growing sector over 10 years the top. Looking at the annual 10-year average is a better way of gauging each sector as global market conditions can change considerably year to year, particularly in the food and energy markets. Moreover, sectors such as petroleum and oil require relatively large capital investments making a large number of changes to the number of firms less likely.

Manufacturing accounts for about 19% of total base earnings similar to mining and federal civilian earnings. Base industries are those located in a state, but sell most of their products elsewhere.

By far the fastest growing sector is Beverages and Tobacco (312) with an average 10-year growth rate of 11%, over twice that of the second fast growing sector, Fabricated Metals (332). Much of this growth has occurred in breweries, wineries and distilleries. Some of Montana's traditional industries, such as wood products, have been retreating over this period. Wood and furniture manufacturing has averaged 10-year average growth rates of -2.1% and -0.2% respectively. Rounding out the bottom is primary metals, losing an average of 4% of firms every year over a 10-year period.

Manufacturing in Montana has followed, more or less, the same trajectory as the U.S. as whole. Montana's manufacturing firms tend to be small businesses. Table 3 shows the breakdown of firm size by the number of employees.[1] As the table shows, most busi-

The fastest growing sector is Beverages and Tobacco (312) with an average 10-year growth rate of 11%. Much of this growth has occurred in breweries, wineries and distilleries.

[1] *Data from the Census Bureau in Table 2 is for 2017 and the data in Table 3 is for 2019, so there are some discrepancies.*

*Table 2. Growth of manufacturing establishments, 2005-2019. Source: Bureau of Labor Statistics, * = nondurables.*

			Annual mean growth over 10Y			***Annual mean growth over 1Y***		
NAICS		**Firms 2019**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
312	Beverages-Tobacco*	149	10.9%	7.7%	13.2%	9.8%	-2.6%	23.2%
332	Fabricated Metals	284	4.3%	3.6%	4.8%	4.6%	-4.8%	9.9%
316	Leather*	30	3.5%	1.1%	7.2%	4.3%	-19.0%	33.3%
325	Chemicals*	64	3.3%	1.8%	4.9%	3.7%	-8.5%	16.7%
315	Apparel*	14	3.1%	-5.6%	13.3%	4.1%	-56.3%	55.6%
334	Computer & Electronic	62	2.9%	0.9%	6.5%	3.7%	-19.5%	18.2%
333	Machinery	60	2.0%	-1.6%	5.1%	0.9%	-15.4%	34.0%
336	Transportation Equipment	50	1.0%	-1.0%	3.1%	1.5%	-11.4%	22.9%
327	Nonmetallic Mineral	102	0.9%	-0.1%	2.0%	1.2%	-8.3%	12.8%
339	Miscellaneous Durable	190	0.8%	0.2%	1.9%	1.0%	-6.9%	8.3%
324	Petroleum & Coal*	9	0.5%	-2.8%	2.5%	0.8%	-25.0%	37.5%
326	Plastics & Rubber	22	0.4%	-1.7%	3.1%	-0.4%	-28.0%	35.3%
337	Furniture & Related	135	-0.2%	-0.9%	0.7%	-0.1%	-10.5%	7.5%
311	Food*	167	-0.6%	-0.8%	-0.4%	-0.6%	-3.0%	1.3%
321	Wood	146	-2.1%	-2.6%	-1.5%	-1.1%	-13.7%	10.2%
331	Primary Metals	14	-4.0%	-5.2%	-2.7%	-1.8%	-23.8%	19.0%

*Table 3. Firms by number of employees in 2017. Source: U.S. Census, County Business Patterns, 2018, * = nondurables.*

NAICS	**Industry**	**N<5**	**5-9**	**10-19**	**20-49**	**50-99**	**100-249**	**>249**	**Total**
311	Food*	67	31	26	20	5	3	–	152
312	Beverage and Tobacco*	47	30	21	13	3	–	–	114
313	Textile Mills	4	–	3	–	–	–	–	7
314	Textile Product Mills	21	3	4	–	–	–	–	28
315	Apparel*	6	–	–	–	–	–	–	6
316	Leather and Allied*	16	3	3	–	–	–	–	22
321	Wood	53	26	28	17	6	7	–	137
323	Printing and Related	51	22	12	6	–	–	–	91
324	Petroleum and Coal*	–	–	–	–	–	–	3	3
325	Chemicals*	16	8	11	7	–	–	–	42
326	Plastics and Rubber	8	–	4	4	–	–	–	16
327	Nonmetallic Mineral	36	18	22	9	3	–	–	88
331	Primary Metals	8	–	–	–	–	4	–	12
332	Fabricated Metals	124	33	33	22	3	–	–	215
333	Machinery	24	15	5	9	–	–	–	53
334	Computer and Electronic	11	3	–	5	3	–	–	22

nesses (51.6%) have less than five employees. Firms with less than 20 employees account for roughly 85% of all manufacturing business in Montana. The largest number of firms are in Fabricated Metals (332) and over half are small scale operations. There are only three manufacturing businesses with over 249 employees and all in Petroleum and Coal (324).

Firms with less than 20 employees account for roughly 85% of all manufacturing businesses.

MANUFACTURING EARNINGS

Table 4 provides insights to sector earning growth using the same one and 10-year annual averages as in Table 2. Price volatility in some sectors distort the value of output measures, such as GSP, for certain industries, such as petroleum refining. Consequently, worker earnings is the best measure of the composition of manufacturing, because it is the amount earned by manufacturing workers in the state.

While the Beverage and Tobacco (312) industry is the fastest growing in terms of number of firms, due to relatively low entry costs, it is leather that has experienced the fastest earnings growth. It should be noted, however, that leather makes up a small share of total earnings, in 2019 leather manufacturing accounted for $562 thousand in earnings. The largest sectors in terms of earnings were petroleum and wood products, with 2019 earnings of $47.8 million and $33.2 million respectively. However, average annual earnings growth over 10 years was 5.7% and -2.0%.

Leather manufacturing has experienced the fastest earnings growth. Fabricated Metals (332) averaged 7.2% growth per year between 2009 and 2019.

Montana's third largest, by earnings, sector in 2019 was Fabricated Metals (332) which grew a rapid 7.2% per year over a 10-year period. Miscellaneous Durable production (339), with $22.4 million in earnings, grew 3.8%.

MANUFACTURING EMPLOYMENT BY INDUSTRY

Finally, we turn our attention to manufacturing employment in Table 5. Again, the table is arranged from fastest growing over the past 10 years to the slowest. Given the fast growth of firms in beverages and tobacco it is not surprising that this industry (312) leads in terms of longer-term growth trends. Longer term average growth in this industry is 5.9% and year-on-year average growth is 6.1%. Fabricated Metals (332) is also averaging a healthy 10-year growth rate of 5%.

*Table 4. Growth of manufacturing earnings, 2005-2019. Source: Bureau of Labor Statistics, * = nondurables.*

			Annual mean growth over 10Y			*Annual mean growth over 1Y*		
NAICS		**2019 Earnings (thousands)**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
316	Leather*	$562	7.4%	5.5%	9.9%	7.5%	-16.5%	50.4%
326	Plastics & Rubber	$6,273	7.2%	4.0%	9.8%	10.5%	-26.8%	56.8%
332	Fabricated Metals	$32,126	7.2%	4.6%	10.0%	8.0%	-13.5%	39.1%
327	Nonmetallic Mineral	$18,516	6.9%	5.5%	8.5%	6.9%	-20.0%	148.9%
336	Transportation Equipment	$11,562	6.4%	3.4%	11.6%	8.1%	-33.1%	110.0%
324	Petroleum & Coal*	$47,799	5.7%	4.7%	7.4%	6.4%	-10.8%	23.1%
334	Computer & Electronic	$13,358	5.6%	-1.9%	9.9%	6.1%	-43.4%	40.2%
312	Beverages-Tobacco*	$10,144	4.7%	1.5%	7.5%	5.4%	-21.1%	21.6%
339	Miscellaneous Durable	$22,438	3.8%	0.6%	5.8%	5.0%	-31.9%	65.5%
325	Chemicals*	$17,505	3.3%	1.2%	5.3%	5.8%	-41.0%	38.9%
311	Food*	$25,807	2.3%	2.1%	2.5%	2.5%	0.3%	5.5%
333	Machinery	$20,088	1.9%	-0.5%	5.9%	3.5%	-38.3%	31.0%
337	Furniture & Related	$7,319	0.8%	-0.5%	3.2%	0.7%	-22.5%	24.5%
321	Wood	$33,176	-2.0%	-4.5%	2.5%	-1.6%	-32.1%	11.1%
331	Primary Metals	$3,249	-5.1%	-9.7%	4.4%	6.6%	-77.0%	63.3%
315	Apparel*	$413	-14.2%	-14.2%	-14.2%	26.4%	-11.0%	80.0%

Table 5. Growth of manufacturing employment, 2005-2019. Source: Bureau of Labor Statistics.

			Average 10 Y growth			*Average 1 Y growth*		
NAICS		**Employees**	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
312	Beverages-Tobacco	1610	5.9%	1.8%	9.0%	6.1%	-17.4%	32.7%
332	Fabricated Metals	2544	5.0%	3.3%	6.9%	5.4%	-10.4%	27.2%
326	Plastics & Rubber	545	4.4%	1.7%	7.0%	6.2%	-16.3%	56.6%
316	Leather	80	2.8%	1.2%	4.5%	2.5%	-18.2%	32.2%
325	Chemicals	1161	2.8%	1.4%	3.5%	4.3%	-26.5%	27.5%
334	Computer & Electronic	774	2.7%	-0.7%	5.6%	2.8%	-18.9%	30.4%
327	Nonmetallic Mineral	1255	2.6%	1.4%	4.3%	2.3%	-20.5%	69.1%
324	Petroleum & Coal	1314	2.4%	1.5%	3.4%	2.5%	-4.7%	14.4%
336	Transportation Equipment	813	2.2%	0.2%	5.6%	3.8%	-34.6%	58.7%
339	Miscellaneous Durable	1927	1.8%	0.5%	2.8%	1.8%	-9.1%	12.5%
311	Food Manufacturing	2601	0.0%	-0.2%	0.2%	0.2%	-1.6%	3.1%
333	Machinery	1174	-1.5%	-3.3%	2.2%	-0.1%	-30.2%	13.0%
337	Furniture & Related	659	-2.1%	-3.6%	-0.3%	-2.5%	-19.3%	14.7%
321	Wood Products	2745	-4.3%	-6.3%	-0.1%	-3.6%	-28.6%	8.8%
331	Primary Metals	305	-4.9%	-8.5%	3.4%	2.7%	-68.0%	47.5%
315	Apparel	37	-14.3%	-14.3%	-14.3%	14.4%	-25.2%	42.9%

The largest sector in terms of number of employees continues to be Wood Products (NAICS 321), despite losing about 1,800 jobs since 2007, employment in this sector has been averaging -4.3% per year over a ten-year horizon. Second is Miscellaneous (339) with 1,927 employees, but with positive medium growth of 1.8%. As the name implies, this category contains a number of firms producing a wide variety of products. The two most notable subcategories are sporting goods and equipment, and medical equipment and supplies (including dental labs). The fastest shrinking sector is Apparel (314), though the number of employees is relatively small implying that a loss of one or two jobs has large implications for growth rates.

As discussed above growth has been robust in breweries, wineries and spirits. This has been the engine behind the fast pace of growth in the Beverage and Tobacco (312) sector. The second fastest employment growth is Fabricated Metals (332). Another notable sector is Computer and Electronics (334) with 774 employees.

Miscellaneous durable goods has 1,927 employees, the two most notable subcategories are sporting goods and equipment, and medical equipment and supplies (including dental labs).

Another notable sector is Computer and Electronics (334), which has been relatively recession proof and will likely to continue to expand at a steady pace.

This sector has been growing at 2.7% and 2.8% over 10-year and one-year horizons respectively. This sector has been relatively recession proof and has proven to be adaptable to changes in work force patterns, for example, working from home. This sector is likely to continue to expand at a steady pace.

MONTANA'S MANUFACTURING EXPORTS

Montana manufacturers, like all U.S. firms, have lost some competitiveness in international markets because of the appreciation of the dollar over the past two years. After burst of growth in the mid-2000s, the value of Montana exports has remained relatively stable since the end of the Great Recession. Nevertheless, recent volatility in worldwide economic trends and policies have already had an impact on Montana exports. The trend in Montana manufacturing exports adjusted for inflation from 2005 to 2019 is presented in Figure 15 using an index, 2005=100. They are compared to real Montana gross state product and total real per capita income, also indexed in 2012 dollars. Income here is defined as labor earnings plus any other source of income, such rent or interest. In 2018, Montana exports were about 120% above their 1997 level. The clearest takeaway is that exports in Montana have been growing considerable faster than overall output and per capita income.

Exports were flat between 2013 and 2017, but grew above 10% in 2018, before tailing off in 2019. In last year's report we speculated

Figure 15. Montana inflation adjusted manufacturing exports, GSP, and per capita income. Source: USA Trade, U.S. Census Bureau, via Montana Department of Commerce.

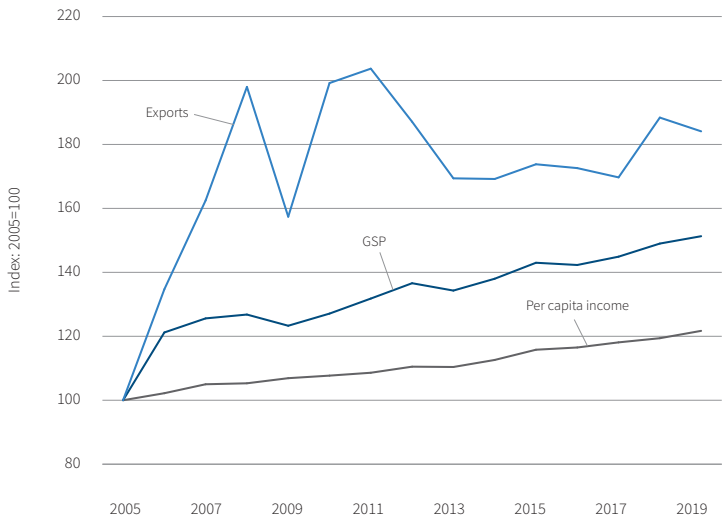


*Table 6. Manufacturing exports by sector ranked, 2010-19 (millions of 2012 dollars). Source: USA Trade, US Census Bureau, * = nondurable goods.*

Rank	NAICS	Description	2010	2015	2019	Growth 2018-19	Share 2019
1	325	Chemicals*	$385.9	$316.6	$269.0	-6.3%	24.4%
2	312	Beverages & Tobacco*	$8.1	$123.9	$216.6	-21.3%	19.6%
3	333	Machinery, Except Electrical	$230.7	$150.0	$156.7	8.4%	14.2%
4	336	Transportation Equipment	$145.6	$58.0	$120.2	67.3%	10.9%
5	327	Nonmetallic Mineral	$62.1	$82.9	$62.3	-5.5%	5.6%
6	311	Food*	$34.1	$49.6	$46.1	54.7%	4.2%
7	334	Computer & Electronic	$23.9	$45.9	$40.6	-1.1%	3.7%
8	324	Petroleum &Coal*	$61.9	$39.3	$39.2	-25.4%	3.6%
9	335	Electrical Equipment & Components	$18.5	$16.0	$31.5	53.8%	2.9%
10	321	Wood	$26.9	$35.2	$28.5	-9.0%	2.6%
11	331	Primary Metals	$129.6	$44.2	$27.3	-44.3%	2.5%
12	339	Miscellaneous	$21.0	$34.3	$25.5	1.2%	2.3%
13	332	Fabricated Metals	$11.8	$19.5	$17.4	136.9%	1.6%
14	316	Leather &Allied	$2.1	$4.1	$7.1	17.4%	0.6%
15	326	Plastics & Rubber*	$3.1	$4.9	$6.2	-0.4%	0.6%
16	315	Apparel & Accessories	$2.0	$3.6	$2.3	-9.4%	0.2%
17	322	Paper	$1.5	$0.5	$1.9	-55.2%	0.2%
18	337	Furniture & Fixtures	$1.2	$1.7	$1.3	-31.7%	0.12%
19	313	Textiles & Fabrics*	$0.6	$1.2	$1.1	-34.2%	0.10%
20	314	Textile Mill*	$0.6	$0.7	$0.9	211.1%	0.08%
21	323	Printing & Publishing	$1.1	$1.8	$0.6	-3.8%	0.05%
		Total	**$1,172.6**	**$1,033.9**	**$1,102.6**	**-2.0%**	**100.0%**

To ensure the passage of the USMCA trade agreement, a modest reboot of NAFTA, the U.S. reduced tariffs on Canada and Mexico, ultimately benefiting Montana exports.

that the tariffs would have an impact on Montana manufacturing exports, while numerous factors contribute to the 2.2% decline, tariffs arguably play a role because they contribute a stronger dollar and retaliatory tariffs. Also, if we consider country specific issues, Canada's capacity to import American goods may be undermined by relatively weak energy prices and both Canada and China, the U.S.'s two largest trading partners, have been in the sights of America's import tariffs. To ensure the passage of the USMCA trade agreement, a modest reboot of NAFTA, the U.S. reduced tariffs on Canada and Mexico, ultimately benefiting Montana exports.

Montana manufacturing exports by industry are reported in Table 6, ranked by export value in constant 2012 dollars. The last two columns are the growth of exports from 2018-19 and the share of total exports in 2019. The detailed data in Table 6 must be interpreted carefully. The value of exports is calculated using the port of exit rather than by state of origin. For example, Montana wheat exported to Asia leaves through Portland, Oregon giving Oregon the credit for exports and not Montana. According to statistics Oregon exported more wheat than it produced.

The first thing that we can see is that there was a decline in exports from 2018, overall falling about 2%, as discussed above. The largest decline was in primary metal manufacturing, -44%, though it only accounted from 2.5% of total manufacturing exports. It appears the ongoing trade conflicts are an impact on sectors which rely more heavily on imported inputs. The largest export growth was in Textile Mill (314), though this represents less than 0.1% of total exports. Transportation Equipment (336) export growth was over 67% and accounted for 11% of total exports.

The largest export sector continued to be Chemicals (NAICS 325) in 2019, accounting for one-quarter of Montana exports, closely followed by Beverages and Tobacco (312), with an export value of $217 million, a 21% decline from last year. Next was Machinery (333) accounting for about 14% of total exports. These three sectors combined for almost 60% of all manufactured exports.

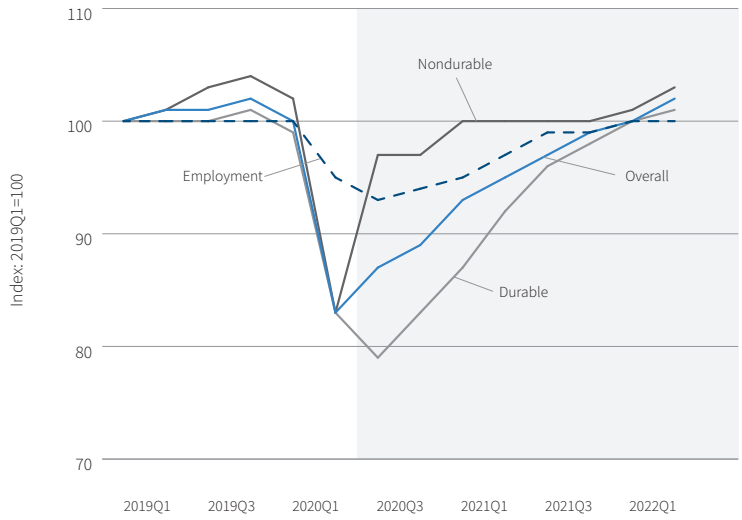
Table 7 identifies the top 10 destinations of Montana manufacturing exports, which account for about 80% of Montana exports. Canada is consistently the primary export destination, with almost 50% of Montana exports. After Canada, four of the remaining nine export destinations are in Asia and four in Europe and Mexico. China now ranks a distant second with a 7.8% share. Moreover, exports to China are down 7% from last year. Nevertheless, the growth of China as a destination for Montana manufacturing exports has been dramatic. During the 15 years from 2002, the first year China was a member of the World Trade Organization (WTO), to 2019 the average increase was 13.5% per year. This is a potential concern as China is posed have the strongest recovery over the next few years.

Transportation Equipment (336) export growth was over 67% and accounted for 11% of total exports between 2018 and 2019.

Table 7. Top 10 destinations for Montana manufacturing exports (millions 2012 dollars). Source: USA Trade, U.S. Census Bureau via Montana Department of Commerce.

Rank	Partner Country	2010	2015	2018	2019	Growth 2018-19	Share 2019
1	Canada	$449.46	$437.11	$527.15	$503.86	-4.4%	45.7%
2	China	$99.27	$103.27	$92.20	$85.71	-7.0%	7.8%
3	Japan	$114.68	$50.41	$41.95	$56.64	35.0%	5.1%
4	South Korea	$110.45	$68.56	$69.53	$55.15	-20.7%	5.0%
5	Taiwan	$97.41	$33.32	$46.84	$51.05	9.0%	4.6%
6	Belgium	$23.57	$35.39	$46.15	$48.51	5.1%	4.4%
7	Mexico	$21.28	$33.50	$26.54	$42.13	58.8%	3.8%
8	United Kingdom	$38.81	$23.06	$27.07	$34.61	27.8%	3.1%
9	Germany	$26.11	$29.52	$17.46	$29.18	67.1%	2.6%
10	France	$9.34	$13.25	$13.95	$16.26	16.5%	1.5%
	Top 10 Total	**$1,172.56**	**$1,033.94**	**$1,125.02**	**$1,102.56**	**-2.0%**	**100.0%**

Figure 16. Overall, durable, and nondurable manufacturing earnings and manufacturing employment in Montana. Sources: BBER estimates using data from IHS Markit, BLS, BEA.



We can also see the effects of the trade war with Canada, China, and Korea are having an effect on Montana exports to those countries. South Korean exports fell 21% from 2018 to 2019. Montana exports are up in the remaining countries, with Germany, Mexico, and Japan seeing the largest growth over the past year. Nevertheless, those three countries only account for about 11% of all Montana exports.

MANUFACTURING OUTLOOK IN MONTANA

As with the national economy, the short-term severity of the COVID-19 recession requires that we look to the future to gain insight about current economic conditions will affect manufacturing in the years to come. Figure 16 shows the forecasted index of overall, durable, and overall manufacturing earnings from 2019Q1 to 2022Q2. As we can see, overall and nondurable manufacturing will fall almost 20%, at an annual rate in 2020Q1, while durable manufacturing will continue to fall into 2020Q3 before beginning to recover. By the end of 2022, manufacturing is estimated to recover to 2019Q1 levels. Manufacturing employment does not drop as sharply as earnings, but there is an approximately 8% decline in employment. However, while less pronounced than overall manufacturing earnings, employment recovery growth is relatively slow and by 2022Q2 returns to 2019Q1 levels, while earnings are slightly above 2019 levels.

By the end of 2022, manufacturing is estimated to recover to 2019Q1 levels.

An important caveat is that the years ahead remain far more uncertain than in previous recessionary environments. Above we discussed two possible scenarios were considered by the OECD, a single and double hit recession. The forecast analysis presented in this report factors in only the single hit recession. Global cases of COVID-19 continue to increase unabated and several countries, which had been successful at mitigating the spread of the virus are experiencing a resurgence, such as the U.S., Japan, the Netherlands, Australia, South Korea, and Greece. In addition, there has been confusing economic policy leadership, which has been adding to the uncertainty.

MANUFACTURER'S OUTLOOK SURVEY

Montana manufacturers are a diverse group of small- to medium-sized firms producing everything from beer to high-tech products. With these differences, it is difficult to summarize the outlook with a simple equation or economic forecasting model. Instead, the Bureau of Business and Economic Research surveys manufacturers each winter and queries them about their outlook for the next year. This section summarizes the responses to the 2019 Manufacturers Survey. Detailed survey responses by NAICS code are available by request from the MMEC.

Montana manufacturers were queried about a number of indicators and whether they thought the indicator would increase, decrease or stay the same during 2020. The tables report the percentage of respondents who said the indicator would increase or remain unchanged in 2019. The value for decrease is not reported but can be calculated. Also, reported is the percentage of respondents who expected an increase in response to the same question in the previous year's survey. It should be noted that the survey was conducted before the COVID-19 pandemic which will clearly impact future expectations. The pandemic will have an impact on manufacturing that could be either negative or positive, e.g. transportation equipment will likely see a sharp decline, whereas food manufacturing may see a boost.

The survey also asked manufacturers about expectations about the future. The survey was conducted before the onset of the global pandemic rendering these forecasts moot. An appendix provides a brief discussion and tabulates some of the expectation responses.

YEAR IN REVIEW

Montana manufacturers were asked to report on their plant's performance in 2019. Survey respondents were queried about a number of indicators and whether it increased, decreased, or stayed the same during 2019. Montana manufacturers reported that 2019 was a moderately positive year, almost 50% of firms reported a better year than previously and 20% seeing a decline. Question 1 asked how Montana manufacturing fared vis-à-vis 2018 (Table 8). Overall, we can see that in 2019 about 80% of firms saw no change or an increase in their sales, production, and profit compared to 2018

In 2019, about 56% of firms made no new major capital investment (Table 9). This could be for a number of reasons. First, and most obvious, for many Montana manufacturing firms, there was no need for new equipment. Secondly, overall business expectations are rising (Figure 17). Figure 17A shows the OECD Business confidence index (BCI) which peaked in mid-2018 in the U.S. Confidence declined throughout 2019 which frequently leads to less investment. Throughout 2019 uncertainty surrounding bi-lateral trade agreements and a rising federal funds rate may have contributed to the decline. Production capacity remained at 2018 for almost all of the state's manufacturers. Fully 95% of respondents reported that no production capacity was eliminated during the year.

50% of firms increased production capacity and 43% had higher profits in 2019.

The employment for Montana's manufactures was more positive (see Table 10). The number of firms hiring more workers was larger than those that were downsizing, 28% as compared to 16%. Most firms stayed the same. Notable too is that the majority of firms did not experience any significant shortage of workers in 2019, Q7.

Just over half of Montana manufacturing firms had no payroll changes, but almost three-quarters experienced a shortage of workers at some time during 2019.

Table 8. Year in review survey responses.

Q1A. For calendar year 2019, did your plant's GROSS SALES increase, stay about the same, or decrease from 2018?

Decrease	*Stay same*	*Increase*	*Total*
20.1%	31.9%	48.0%	279

Q1B. For calendar year 2019, did your plant's PRODUCTION increase, stay about the same, or decrease from 2018?

Decrease	*Stay same*	*Increase*	*Total*
20.1%	30.7%	49.1%	283

Q1C. For calendar year 2019, did your plant's PROFITS increase, stay about the same, or decrease from 2018?

Decrease	*Stay same*	*Increase*	*Total*
20.4%	36.4%	43.3%	275

Table 9. Investment and production.

Q2. By the end of 2019, did your plant make any major capital expenditure in facilities or equipment during the year?

	No	*Yes*	*Total*
Total	56.0%	44.0%	277

Q5. By the end of 2019, did your plant permanently eliminate production capacity during the year?

	No	*Yes*	*Total*
Total	95.1%	4.9%	284

Table 10. Employment.

Q4. By the end of 2019, did plant's number of employees

	Decrease	*Stay same*	*Increase*	*Total*
Total	15.8%	56.1%	28.1%	285

Q7. Did your plant have a significant shortage of workers at any time during 2019?

	No	*Yes*	*Total*
Total	72.7%	27.3%	282

TRADE AND TARIFFS

For the first time, the BBER manufacturing survey asked questions related to tariffs and trade. The implementation of tariffs on numerous imported goods had impacts on all facets of the national and state economy. The survey asked firms the extent this policy had on the manufacturing industry. Table 11 shows the response to these questions.

For most firms, 66%, foreign competition is not important to production in Montana. This is explained by the sectors and what is produced here in Montana for export – relatively unique manufactured goods. Chemical and beverage and tobacco exports comprise almost 50% of Montana exports (Table 6) and there is considerable name recognition in many of these exports, wine, beer, and spirits in particular.

Montana manufacturers did not experience the effects of retaliatory tariffs, unlike Kentucky's experience with bourbon, which saw an increase of 25% tariffs on imports to China as the Chinese targeted specific states. However, a slight majority of firms did experience an increase in the price of inputs from U.S. imposed tariffs on imported intermediate goods. This rise in costs coupled with the continued competition, which holds down retail prices hints at why less than half of businesses did not see profits rise. A clear majority of businesses did not experience any impact of tariffs on their input decisions. Ten point five percent plan to reduce new capital investment in 2020. Hiring was largely untouched by the tariffs.

49% of Montana manufactures experienced an increase in input prices because of U.S. tariffs on imports in 2019, but less than 10% saw a decline in exports because of retaliatory tariffs.

Table 11. Foreign competition and tariffs.

Q18G. How important is foreign competition?

	Very or somewhat unimportant	*Very or somewhat important*	*Total*
Total	65.8%	26.7%	281

Q24. Over the past 12 months, from November 2018 until now, did your firm experience a decline in exports because of retaliatory tariffs placed on U.S. goods by other countries?

	No	*Yes*	*Total*
Total	92.1%	7.9%	279

Q25. Over the past 12 months, from November 2018 until now, did your firm experience an increase in the prices of your inputs as a results of U.S. tariffs placed on foreign goods?

	No	*Yes*	*Total*
Total	48.7%	51.3%	273

Q26. Over the past 12 months, from November 2018 until now, did your firm increase or decrease your hiring decisions based on tariffs or retaliatory tariffs, or was there no impact?

	No impact	*Decreased*	*Increased*	*Total*
Total	95.4%	3.9%	0.7%	280

Q29. Will tariff policy increase or decrease your firm's investment decisions in 2020, or will there be no impact?

	No impact	*Decreased*	*Increased*	*Total*
Total	83.5%	10.5%	6.0%	266

Observations from MMEC...

- *Manufacturers that are suppliers to the commercial airline industry are struggling with a significant decline in demand.*
- *Microbreweries that do not bottle or can are struggling, as they are limited to only what can be sold in their tap rooms and in kegs to taverns.*
- *Manufacturers that supply the oil fields are struggling, because the low price of oil has curtailed operations in the oil fields.*
- *Most of the manufacturers that pivoted and began producing PPE have since quit producing the PPE. This seems to be because they couldn't keep up with their core business or the PPE demand significantly declined. Manufacturers of outdoor, leisure and pet products are seeing record sales, because people are spending their money on these products in lieu of other activities like travel.*
- *Manufacturers of travel products are seeing a significant decline in demand as travel has declined.*
- *Manufacturers in the Department of Defense supply chain are seeing consistent and strong demand.*
- *Food manufacturers are doing well and many pivoted their production from food service products to retail products.*
- *Manufacturers in the construction industry supply chain continue to see strong demand.*
- *Most manufacturers are looking to de-risk their supply chain which can involve on-shoring some or all of their supply chain*
- *All manufacturers continue to struggle with finding qualified employees. As a result, manufacturers are starting to consider automation as a solution. Manufacturers also seem to be investing in training their employees as a result.*

THE MONTANA MANUFACTURING EXTENSION CENTER

MMEC serves the manufacturers of Montana by helping them assess and improve their manufacturing operations, providing trainings and workforce development, and leveraging research and technological developments to keep manufacturing competitive in the state.

Established in 1996, MMEC is housed in the Norm Asbjornson College of Engineering at Montana State University in Bozeman, with remote offices in Billings, Missoula, Kalispell, Great Falls and Butte. Its expertise includes staff with a combined experience of hundreds of years in manufacturing.

MMEC is also part of the National Institute of Standards and Technology's Manufacturing Extension Partnership (MEP) National Network. NIST is a non-regulatory agency of the U.S. Department of Commerce that promotes U.S. innovation and industrial competitiveness. The MEP National Network is a unique public-private partnership with centers in all 50 states and Puerto Rico dedicated to serving only small and medium-sized manufacturers, who pay fees for services provided.

Since 2000, MMEC's clients have reported project impacts to their businesses through an independent third-party survey. Results of these surveys show that MMEC has strengthened Montana's manufacturing economy by generating:

- **$328 million** in new investments.
- **$1.3 billion** in new and retained sales.
- **6,186** new and retained jobs.
- **$160 million** in cost savings.

EVALUATION AND ECONOMIC IMPACT OF THE MONTANA MANUFACTURING EXTENSION CENTER

The MMEC evaluation process follows guidelines developed by the National Institute of Standards and Technology (NIST) as part of its management information reporting procedures. NIST specifies the timing of the evaluation and provides a standardized questionnaire distributed to manufacturing firms served by MMEC. The analysis of the surveys and a written report are provided by an independent analyst.

Manufacturing clients are asked to evaluate the effectiveness of MMEC and to quantify the economic impact of MMEC's activities on their business and its effects on the Montana economy. Clients are surveyed six months after a project is complete and asked about their satisfaction with the services they received. These respondents are also asked to quantify certain economic impacts and outcomes associated with the MMEC project. MMEC sent the independent analyst preparing this report the questionnaires for the 2019 evaluation period. After careful review, one was judged to be incomplete or otherwise unusable because none of the questions were answered. Consequently, there were 63 questionnaires in the 2019 evaluation. These questionnaires provided the largest sample size since the evaluations began, eclipsing the 58 responses in 2018.

OVERALL SATISFACTION

Manufacturing clients said they relied heavily on MMEC and were very satisfied with the services received. In 2019, about 27% percent of the respondents said they relied on services other than MMEC, and this is statistically significant (Table 12). But roughly 73% did rely on MMEC services exclusively. This is a significant turnaround from 2018 when 57% of respondents used MMEC exclusively. Indeed, this is the highest no response in 10 years.

Client Comments...

The NIST questionnaire provides a number of opportunities for Montana manufacturers to provide suggestions and comments to MMEC. These responses were edited slightly to preserve anonymity and grouped by topic. They are presented in Table 5. These comments provide insight into the many ways manufacturers are benefited by MMEC services. The vast majority of the comments are highly positive and detailed. As in the past, respondents made several specific suggestions concerning ways in which MMEC may further tailor its services in the future.

Professionalism and Relevance

"Great resource with a strong commitment to help grow and sustain the manufacturing sector of Montana."

"We have been very pleased with the outcome of the work we have done with MMEC. And we look forward to continuing in the future."

"The Montana Manufacturing Extension Center is an extremely valuable service available to all businesses around the state. My relationship with our partner was such that I could call anytime to discuss a procedure he suggested or to bounce an idea off him."

"The team at Montana Manufacturing Extension Center continues to remain an important resource for Jelt. It is critical to have this resource available to a company like ours that is working very hard to keep manufacturing in Montana USA. As we continue to grow we will be finding new ways to leverage the expertise and assistance through the center."

"MMEC provides excellent knowledge resources and guidance in a professional manner. Manufacturers in Montana would be wise to utilize their services and can benefit greatly."

Suggestions for MMEC

"Keep focusing on assistance for food manufacturers. Assist local manufacturers of all types and sizes to meet on a regular basis to share knowledge and challenges."

"Need more help with robotics and automation."

"Better follow-up after the next year or two. One expert involved from start to finish would help even if the other players might change. Weren't able to build & maintain a relationship with one person. Spent a lot of time catching the new person up. They weren't there from the beginning to know our ultimate goal & starting point."

Our responses to this survey are not going to accurately illustrate the value that MMEC provided to our company. However, circumstances with our business (lack of funds leading to a major layoff and restructuring) have canceled out most if not all the benefits we should have gained for the long-term. That said I have a strong belief that most of the trainees are adding value elsewhere in the community.

Table 12. Have you used any external providers for business performance services?

	Frequency	*Percent*	*Cumulative*
No = 0	46	73.0	73.0
Yes = 1	17	27.0	100.00
Total	63	100.00	

Table 13. How likely would you be to recommend MMEC to other clients?

Response (1-10 scale)	*Frequency*	*Percent*	*Cumulative*
8	4	6.7	6.7
9	7	11.7	18.3
10	49	81.7	100.0
Total	60	100.00	

Between 2009 and 2013, more respondents said they were using additional providers. Between 2014 to 2017 values were in the 54-61% range ending the downward trend. In 2018, about 57% of the respondents said they relied only on MMEC and not on other external providers. This is down slightly from the peak in 2017 of 61%, but still above the average since 2009.

Montana manufacturers were asked if they would recommend MMEC to other potential clients. They were asked to rate the likelihood of a positive recommendation with one being the least likely and 10 being the most likely. As shown in Table 13, about 82% of 2019 respondents chose 10, and the remaining 18% chose either eight or nine. None of the respondents chose a value of less than eight. Given that no respondents chose less than eight, we do not present the Net Promoter Score as was done in previous reports.

WHY MMEC WAS CHOSEN

The NIST questionnaire provided eight reasons for choosing MMEC and the respondents were asked to identify the two most important. The 63 responses are reported in Table 14. About 70% of the respondents mentioned staff expertise of MMEC as the most important reason, about the same as in 2018. The second most important factor for firms choosing MMEC was the MMEC's costs with about 37 % of the respondents mentioned this factor, which is up from 2018 when 24% responded positively. Third is fair and unbiased advice, with 25% responding yes. Reputation for results dropped to the fourth position, with 18% responding positively, down from 31% in 2018, and roughly in line with 2016's results. Eleven percent of respondents mentioned knowledge of the respondent's industry, placing it fifth, down from 29% in 2018. About 8% percent of respondents stated that MMEC provided specific knowledge that was not available from other providers while 10% responded that they used MMEC because of no other nearby providers were available. Staff expertise has been solidly in first place all 10 years.

FUTURE CHALLENGES

The NIST questionnaire provided two opportunities for the respondents to identify future challenges they may face. The first opportunity instructed the respondents to pick three of nine categories of potential future challenges and the second was an open-ended question.

As shown in Table 15 in descending order of 2019 responses, the most often mentioned future challenges were ongoing continuous improvement/cost reduction strategies (72%). Employee recruitment and retention was second (53%) and product innovation/development was third (40%). The least mentioned were exporting/global engagement (7%) and financing (12%).

Since the beginning of the survey, the most important reported challenges have stayed relatively stable, with continuous improvement/cost reduction strategies consistently ranked among the top two challenges. Again in 2019, we see that this remains the top priority. Several other challenges have risen or declined in importance over the business cycle. Personnel issues (employee recruitment and retention) has consistently climbed since 2009 and ranked second in 2019, giving further evidence of a tightening labor market. Closely following recruitment in 2019 was product innovation, with 43% identifying this as a concern, up from 40% in 2018. The global economy as a concern moved up to 13% from 7% in 2018, reflecting uncertainty in global trade as U.S. tariff policy is reciprocated. Similarly, there were again fewer respondents who mentioned financing as a future challenge, with the percent mentioning this challenge matching its record low of 12%.

The NIST questionnaire also provided an open-ended question that allowed each respondent to identify challenges not on the list. Eight open-ended responses were given in 2018, they were: "ownership transition," "raw material supply," "facility footprint availability," "plant startup," "project completion for retail sales," logistics/transportation," succession planning," and "training development program."

QUANTITATIVE ESTIMATES OF MMEC VISIT OUTCOMES

The NIST survey asked Montana manufacturers to quantify certain outcomes of the MMEC visit. They were asked the number of new and retained jobs, the amounts of cost savings, new and retained sales, capital and workforce investments and avoided unnecessary investments. Starting in 2009, the respondents were queried further about four detailed investment categories. Table 16 shows the results for the 2019 responses to the quantitative outcomes. 2019 respondents said that there were 317 new or retained jobs as a result of working with MMEC. New and retained sales were about $39.2 million. Cost savings totaled approximately $6.1 million and capital and workforce investments were roughly $15.5 million. Avoided unnecessary investment totaled about $1.3 million. The final column totals all the survey responses from 2013 to 2019.

A caveat is required when we look at this data. Unfortunately, year-to-year volatility in the reported outcomes mask trends and other patterns. An examination of the responses revealed a number of cases where the value of the estimated outcomes was dominated by a few (mostly one, but at most two very large) responses. These few responses can skew the analysis. Typically, large responses accounted for one-fifth to one-half the reported total.

Given the volatility of data from year to year, we removed the upper outliers from the data. This edited version is presented in the third column. For example, for the category "Total jobs saved/retained," the data as reported was 317 jobs. However, one firm was able save and/or retain 60 of these jobs, roughly 16% of all the jobs saved or retained. Because this observation heavily skews the data it is observation is removed in the edited category. A second justification for doing so is there is little or no correlation between the quantitative outcome categories over time. All of the outcome categories had one characteristic; sizable increases from recession lows and then stabilization within a range. Investment and hiring practices can vary considerable over the business cycle adding to the volatility of the data.

Montana manufacturers reported that working with MMEC resulted in 317 new or retained jobs and almost $40 million in new or retained sales.

Table 14. Important factors for your firm choosing MMEC.

Factor	*Mean*
Center staff expertise	69.8%
Cost price of services	36.5%
Fair and unbiased advice services	25.4%
Reputation for results	17.5%
Knowledge of your industry	11.1%
Specific services not available from other providers	7.9%
Lack of other providers nearby	9.5%
Other	11.1%

Table 15. Important future challenges facing your business.

Challenge	*Mean*
Ongoing continuous improvement cost reduction strategies	71.4%
Employee recruitment and retention	46.0%
Product innovation development	42.9%
Identifying growth opportunities	36.5%
Has your company used other external resources	27.0%
Sustainability in products and processes	20.6%
Managing partners and suppliers	20.6%
Exporting/global engagement	12.7%
Technology needs	12.7%
Financing	11.1%

Table 16. Total sales, costs, investments and jobs earned or saved in 2019.

	As reported	Edited	Total: 2013-19
Retain jobs amount	224	148	–
Create jobs amount	93	42	–
Total jobs saved/retained	317	190	3,041
Increase sales amount	$10,869,000	$3,894,000	–
Retain sales amount	$28,322,000	$10,572,000	–
Total sales increased/retained	$39,191,000	$14,466,000	$520,001,061
Cost savings amount	$6,122,654	$2,662,954	$49,992,826
Increased investment	$3,908,600	$2,258,600	$7,424,995
Invest human capital	$582,218	$300,718	$4,852,655
Invest plant or equipment	$4,778,790	$2,623,790	$51,863,720
Invest information systems/software	$463,566	$206,566	$4,302,091
Invest other areas	$5,784,041	$1,541,922	$90,502,268
Avoid unnecessary investments	$1,304,421	$486,421	$8,276,007

Table 17. Economic impacts of MMEC services, 2019.

Sector	*Jobs*	*Wages*	*Montana individual income taxes*
Manufacturing	317	$16,378,122	$810,717
Other industries	818	$28,170,370	$1,394,433
Total	1,135	$44,548,492	$2,205,150

ECONOMIC IMPACTS OF MMEC VISITS AND SERVICES

MMEC clients were queried about the number of new jobs created and the number of jobs retained as a result of working with MMEC. The 2019 respondents said that there were 168 new jobs created and 253 jobs retained for a total of 317 jobs.

The preliminary data suggest that average wages for Montana manufacturing jobs were about $51,666 in 2019, compared to the state average income of $49,747, up from $50,194 in 2018. Total wages associated with the new and retained jobs were approximately $16,378,122. Using an average tax rate of 4.95%, the new and retained workers paid approximately $810,717 in Montana individual income taxes.

The Montana Department of Labor and Industry estimates that the employment multiplier of manufacturing is 3.58. This suggests that about 2.58 new jobs will be created in other sectors as a result of one new manufacturing job. This agency also reports that the wage multiplier is 2.72, implying that an additional $1.72 in wages is created elsewhere in the Montana economy for each $1 in new manufacturing wages.

Calculations based on employment and wage multipliers are reported in Table 17. The 317 new and retained jobs associated with MMEC visits reported in 2018 led to a total of 1,135 (317 X 3.58 =1,134.9) new jobs in Montana and approximately $44,548,492 ($16,378,122 X 2.72 = $44,548,492) in statewide wages. The additional wages generated roughly $2,205,150 ($44,548,492 X .0495 = $2,419,959) in Montana individual income tax revenue.

RETURN ON INVESTMENT AND FEES

MMEC is a public-private partnership that was awarded $540,000 in 2019 from the National Institute of Standards and Technology with a match requirement. In 2019, MMEC matched the federal funds with $450,000 from the state of Montana and $490,864 in project fees that were charged to Montana manufactures who requested MMEC services. The benefits of these investments may be estimated by calculating a return on investment (ROI) for each. The ROI for the state of Montana is calculated by comparing the estimated increase in Montana individual income tax payments associated with the reported jobs created or saved due to working with MMEC. The ROI for MMEC clients is estimated by comparing the cost savings, plus avoided unnecessary investment, plus a portion of the increase sales to the amount paid by clients.

As shown in Table 17, MMEC projects generated approximately $2,205,150 in Montana individual income taxes from both direct and indirect jobs. Based on $305,000 calendar year funding for MMEC, Montana's return on investment during 2018 was approximately 4.9 to 1 ($2,205,150 ÷ $450,000 = 4.90). Therefore, the public dollars invested in MMEC provide Montanans a considerable rate of return.

As presented in Table 9, MMEC clients reported $6,122,654 in costs savings, $1,304,421 in avoided unnecessary investments and $32,000,000 in new or retained sales. Assuming a modest 10 percent gross margin, the net gain to clients of the new or retained sales was $3,200,000 (32,000,000 X 0.1 = $3,200,000).

MMEC's return on investment to the Montana taxpayer was 4.9 to 1. ROI for private firms was 12.9 to 1.

Cost savings + avoided investments + gross margin associated with new and retained sales equals $6,349,375 ($2,662,954+ $486,421+ $3,200,000 = $6,349,375). Based on the $490,864 in fees paid by MMEC clients, their return on investment in 2019 was approximately 13.0 to 1 $6,349,375 ÷ $490,864 = 12.9). Therefore, the fees paid by MMEC clients similarly provide them an excellent return.

APPENDIX: EXPECTATIONS ABOUT THE FUTURE

Clearly, the COVID-19 pandemic will have an impact on expectations for 2020. The annual survey was completed before the pandemic was declared, so none of the responses reflect the new economic reality. However, as was shown in Figure 16, business confidence is rising. It is worth noting, however, that there is still considerable uncertainty about the foreseeable future.

The U.S. Congress has yet to pass a CARES Act 2.0 and there is considerable argument about the size and extent of the package. At the 2020 National Business Economists conference, Federal Reserve Chairman Jerome Powell, on October 6, warned that a stimulus package is needed to head off an economic downward spiral. However, the same day, the president issued a statement stalling discussions about a coronavirus aid package until after the election. Financial markets responded immediately, the fell 1.34% after the announcement. This decision, coupled with the ongoing pandemic, will have lasting impacts on the national and global economy.

Given rising uncertainty and the impacts of the pandemic thus far, the responses regarding future expectations are more of a time machine about the state of Montana manufacturing and reflect the economic environment before 2020.

Results of the 2019 manufacturing expectations survey are in Table A1. As the table shows, most Montana manufacturers were enthusiastic about 2020. Most (over 60%) expected the revenue side of the balance sheet to rise, production, sales and profits to rise. Given that less than half expected prices of their output to rise, this is attributed to increased volume of sales, which 69% expect to rise. Fifty-four percent anticipated a rise in costs. These responses led to an overall outlook that was positive for 55% of respondents..

Table A1. Expectations for the future.

Q9. Looking ahead to calendar year 2020, what do you anticipate will happen to your plant's production in 2020?

	Decrease	*Stay same*	*Increase*	*Total*
Total	3.2%	35.6%	61.2%	278

Q10. What do you anticipate will happen to the prices you receive for your plant's products in 2020?

	Decrease	*Stay same*	*Increase*	*Total*
Total	1.8%	50.5%	47.7%	277

Q11. What do you anticipate will happen to your plant's gross sales in 2020?

	Decrease	*Stay same*	*Increase*	*Total*
Total	*2.6%*	*29.0%*	*68.4%*	*272*

Q12. What do you anticipate will happen to your plant's profit in 2020?

	Decrease	*Stay same*	*Increase*	*Total*
Total	4.8%	35.7%	59.5%	269

Q15. What do you anticipate will happen to the cost of your major inputs in 2020?

	Decrease	*Stay same*	*Increase*	*Total*
Total	3.2%	43.2%	53.6%	278

Q16. Considering all factors, how would you rate the overall outlook for your plant for 2020?

	Worse	*Same*	*Better*	*Total*
Total	2.5%	42.4%	55.0%	278

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