SUMMER 2011

OKLAHOMA 21st Century
Research Foundation Affiliate of The State Chamber

THE STATE CHAMBER OF OKLAHOMA
LEGISLATIVE ADVOCATES FOR BUSINESS

Oklahoma OEDC
Professional Economic Development Council

ECONOMIC IMPACT OF THE OKLAHOMA MANUFACTURING SECTOR

Southwestern Oklahoma State University
Center for Economic & Business Development
Prepared by: Fui Ting Phang

SWOSU™
Southwestern Oklahoma State University

Oklahoma
OEDC
Professional Economic Development Council

THE STATE CHAMBER OF OKLAHOMA
LEGISLATIVE ADVOCATES FOR BUSINESS

OKLAHOMA
21st Century
Research Foundation Affiliate of The State Chamber

Prepared for:
The State Chamber of Oklahoma
Oklahoma Professional Economic Development Council
Oklahoma 21st Century

Special Thanks to Pelco Products, Inc., The Goodyear Tire & Rubber Company, and Kimray Inc. for images

Executive Summary

The State Chamber of Oklahoma has approached the Center for Economic and Business Development at Southwestern Oklahoma State University to conduct an updated study of the manufacturing sector's economic impact upon the State of Oklahoma. The full report is commissioned by the State Chamber of Oklahoma, Oklahoma Professional Economic Development Council and Oklahoma 21st Century (A Research Foundation Affiliate of the State Chamber).

The primary focus of this report is to forecast the total economic impact and implications arising from the manufacturing sector on Oklahoma's economy. To analyze the economic impact, the study used the REMI model, a dynamic input-output, multi-equation model that was specifically developed for Oklahoma and its six primary regions. Employment data obtained from the Oklahoma Employment Security Commission (OESC) has served as the primary input to measure this broadly-defined sector.

The economic impact of manufacturing is measured in terms of Gross Regional Product, Consumption, Real Disposable Personal Income, Output, Population, Labor Force, Employment, Capital Stock, Proprietors' Income and Income Tax.

The study found that the economic impact of the manufacturing sector is substantial and would compound exponentially into the future as it ripples through the regions and the state's economy.

Below is a snapshot of manufacturing's average economic impact on the statewide economy, 2011- 2031:

State Output Impact would account for $99.675 billion
Gross State Product Impact would account for $41.826 billion
Real Disposable Personal Income Impact would account for $27.077 billion
Employment Impact would account for 308,417 net new jobs

Table of Contents

Executive Summary 3
Manufacturing at a Glance 5
Project Information:
Economic Impact Analysis Methodology 7
Project information & Assumptions 13
Statewide Economic Impact (Block 1 - Output Variables):
Gross State Product 15
Real Disposable Income 16
State Output 17
Statewide Economic Impact (Block 2 - Labor & Capital Demand Variables):
Employment 18
Capital Stock 19
Statewide Economic Impact (Block 3 - Population & Labor Supply Variables):
Labor Force 20
Population 21
Statewide Economic Impact (Block 4 - Wages, Prices & Cost Variables):
Proprietors' Income 22
Income Taxes 23
Conclusion 24
Regional economic impact:
Northwest Oklahoma 25
Northeast Oklahoma 27
Southwest Oklahoma 29
Southeast Oklahoma 31
OKC MSA 33
Tulsa MSA 35
References 37

Manufacturing at a Glance

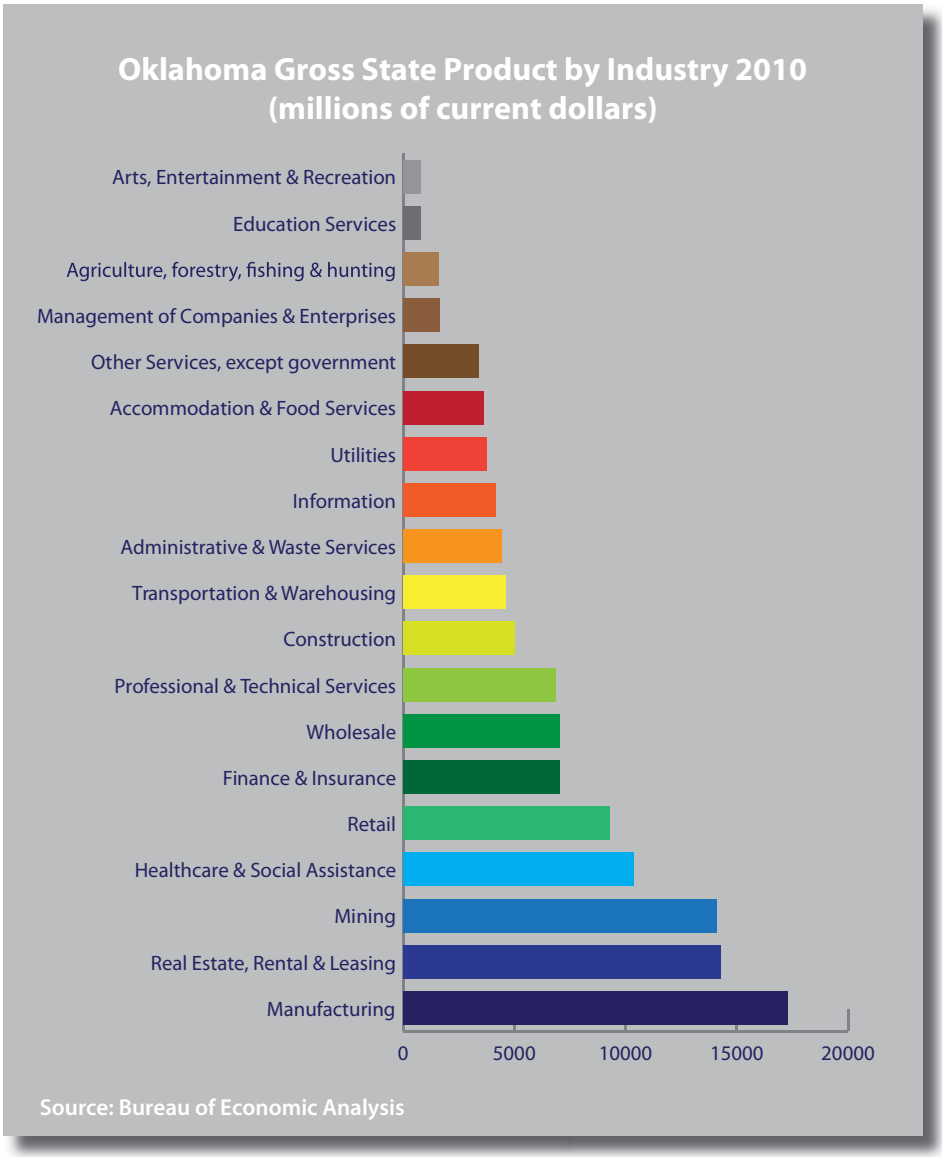
Manufacturing today has evolved dramatically since its earliest days, from a traditional paradigm to a much more complex taxonomy. It is characterized by strong exports, high productivity, skilled-labor and advanced technology, innovation and growth, which has served as the underpinning for the state's economy in every facet.

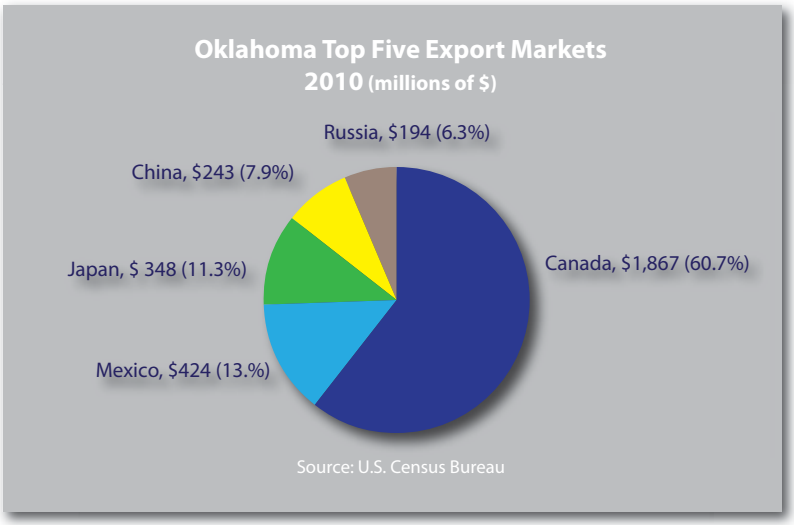
Recent economic turmoil has challenged the nation in the past years and spreads across a wide range of industries. Since the nation emerged from recession in late 2009, the manufacturing sector has been a key driver of the economy's recovery. According to the Bureau of Economic Analysis, durable-goods manufacturing and retail trade were among the leading contributors to the upturn in U.S. economic growth in 2010.[1]

> *Manufacturing value added—a measure of an industry's contribution to GDP—rose 5.8 percent in 2010, a sharp return to growth after declining two consecutive years. Durable-goods manufacturing turned up, increasing 9.9 percent after declining 12.7 percent in 2009. Nondurable-goods manufacturing rose 0.8 percent, after declining 3.4 percent in 2009.*[1]

Growing competition and advanced technology have also yielded higher productivity. The news released by the Bureau of Labor Statistics stated that, in 2009, the United States had the largest productivity increase of 7.7 percent among the 19 countries (including Australia, Belgium, Canada, U.K., Japan, Germany and Spain to name a few).[2] The observed sharp increase in productivity portrays a higher Gross Domestic Product (GDP) growth rates.

According to the Bureau of Economic Analysis, every $1 of final demand spent for a manufactured good generates $0.55 of GDP in the manufacturing sector and $0.45 of GSP in non-manufacturing sectors.[4] Looking at Gross State Product (GSP) in 2010, manufacturing stayed strong, contributing the largest share of14.4 percent ($17,269 million) to Oklahoma's total GSP, which represented an 11.1 percent increase from 2007.[3] This increase was made possible by tremendous advances in manufacturing productivity. By comparison, the 'Real Estate, Rental and Leasing' sector closely followed the manufacturing sector, which accounted for $14,284 million in GSP, while the 'Mining' sector settled for third place, which contributed $14,109 million in terms of GSP (see graph).





Oklahoma manufacturing jobs had fallen by 13.9 percent in 2009 from 2007, and the state's total establishments had slipped 1.7 percent during the same period of time.[5] Between May 2010 and May 2011, however, employment growth in manufacturing has outpaced other sectors with 8,700 jobs added to the state and growing by 7.1 percent.[6]

Manufacturing jobs are among the highest paying in the state. According to the National Association of Manufacturers, manufacturing compensation is nearly 50 percent higher than other nonfarm employers in the state.[7]

Situated in the heartland of the nation, Oklahoma is among the top states for logistic centers. In the latest statistic, Oklahoma ranked 25th in the nation of the "Top States for Business 2011".[8] The ranking is based on a number of factors that include the cost of business, quality of life, economy, technology and innovation, education, access to capital, and cost of living. In addition, it was ranked 3rd in the nation in 2010, as one of the best states in terms of the "Cost of Doing Business".[8] The state is also regarded as one of the most business-friendly states, ranking 7th lowest in the nation on tax burden in 2011.[9]

An export boom and strong inventories have placed manufacturing at the forefront of the economic recovery. From 2009 to 2010, Oklahoma's exports grew 21 percent, accounting for $5.4 billion, with products shipped to over 170 countries.[10] With this figure, the top five commodities exported made up 39 percent of total exports, which is comprised of 'Civilian Aircraft, Engines and Parts', 'Medical and Surgical related Instruments and Appliances', 'Tires', 'Crude Oil', and 'Parts for Boring or Sinking Machinery'.[11] According to the Oklahoma Department of Commerce, exporters provide 27,000 jobs in Oklahoma.

U.S. manufacturing exports to the recent Free Trade Agreement (FTA) partners were 10.5 percent higher in 2010 when compared to our overall export growth since each agreement was signed.[12] Oklahoma's primary export markets are Canada, Mexico, Japan, China and Russia (see chart). Canada is the state's largest export market, with export sales totaling $1,867 million in 2010; followed by Mexico ($424 million); Japan ($348 million); China ($243 million); and Russia ($194 million). Oklahoma was ranked 6th in the nation by volume of exports to Russia.[10] Between 2009 and 2010, Oklahoma goods exported to Russia more than doubled. According to the State Chamber of Oklahoma, international trade now supports nearly one in every five American jobs, and workers in globally engaged companies earn more than the average wage.[13]

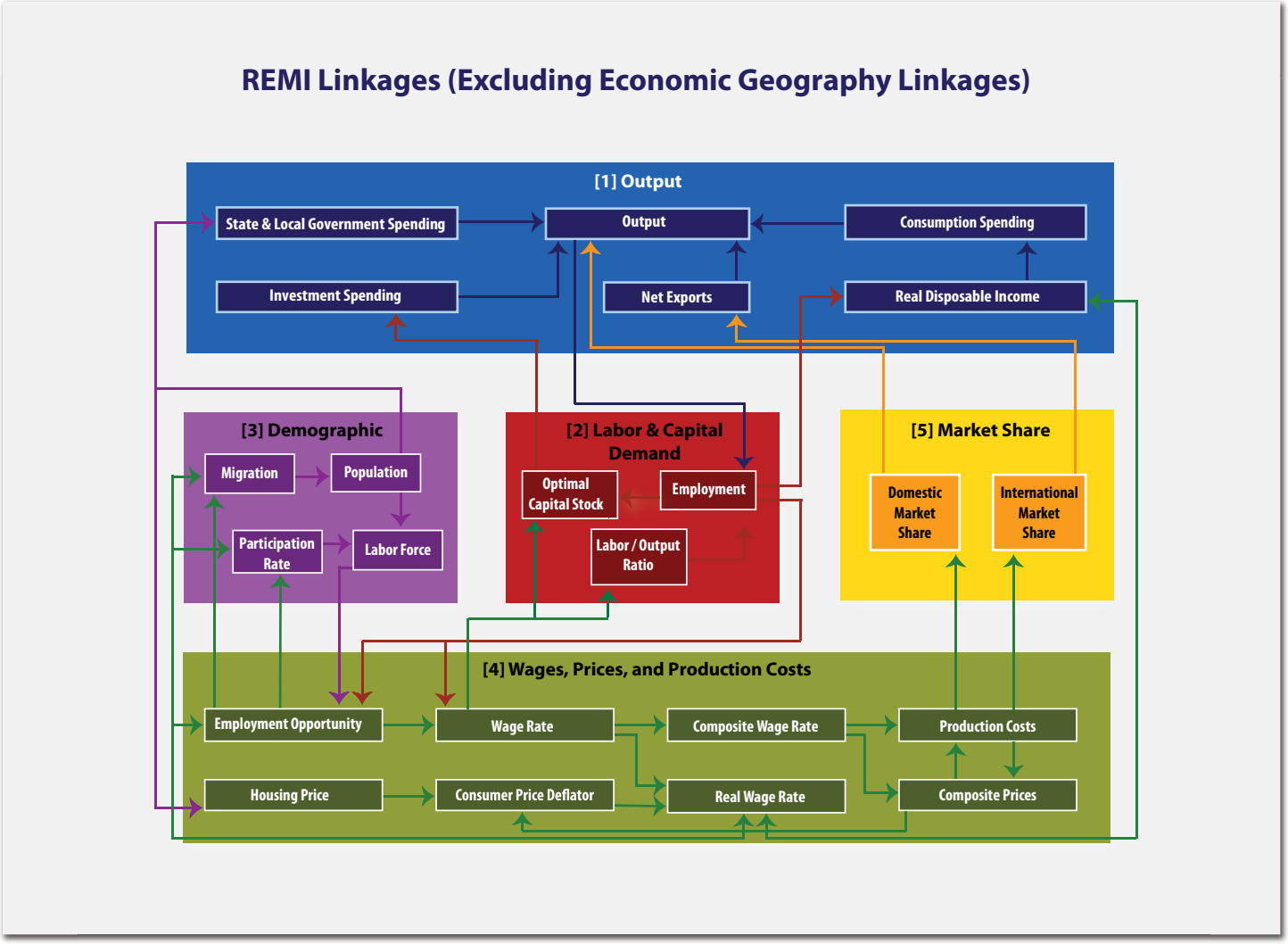
Understanding the value and the potential economic impact of this diverse sector is essential as we move towards the economic recovery. Positive spillover of manufacturing will benefit the state's economy in many ways.

Economic Impact Analysis Methodology

Regional Economic Models, Inc. (REMI), based in Amherst, MA, produces economic modeling software that enables users to answer "what if questions" about their respective economies. Each REMI model is tailored for specific geographic regions by using data, including employment, demographic, and industry data, unique to the modeled region. The Center for Economic & Business Development uses the Oklahoma REMI model, which is a six region, 70 sector REMI model, to forecast how a given economic activity or policy change occurring in one region would affect that region, a group of regions, and/or the state.

The REMI simulation model uses hundreds of equations and thousands of variables to forecast the impact that an economic/policy change would have upon an economy. Basically, the REMI model measures this economic impact by first forecasting the region's performance as if there were not any changes (the control forecast), and then forecasting the region's/state's performance if the economic activity occurred (the alternative forecast). The difference between the two forecasts represents the economic impact of the economic activity upon the region, group of regions, and/or the state. It is this economic impact that will be reported in the Economic Impact Analysis section of this report. A basic graphic representation of some of the linkages in the economic modeling software is presented below.

As can be seen, the REMI model contains five "blocks". Each block has its own variables and interactions so that changing any one variable in the model not only affects other variables in its



own block, but also variables in other blocks. For example, if XYZ Corporation expanded its operations in Oklahoma City by hiring an additional 100 new employees, then that initial employment increase would ultimately affect output, population, migration, wage rates, etc. It is through the model's linkages and interactions that employment's (in Block 2) direct effects upon optimal capital stock (Block 2), employment opportunity (Block 4), and real disposable income (Block 1), that the employment gain works its way through the model to affect each of the other variables.

Commenting first on employment's positive effect upon optimal capital stock, this variable will increase from an employment gain because (1) some new employees will demand newly constructed houses, and (2) physical capital will be required to assist the labor to produce output. Optimal capital stock interacts with actual capital stock (not shown) to affect the level of investment (Block 1) in the model which ultimately increases Oklahoma City's output (Block 1). Higher optimal capital stock when compared to actual capital stock spurs investment in the region since the difference represents unfulfilled demand for physical capital. And output (Y) increases since it is equal to the sum of personal consumption (C), state & local government spending (G), investment (I), net exports from the region (X-M) as well as demand for intermediate inputs.

Commenting next upon employment's effect upon employment opportunity, this variable increases because 100 new jobs have been created in the economy. An increased employment opportunity will positively affect wage rates (Block 4) if the region's employment is growing faster than the region's labor force (Block 3). Wage rates interact with the consumer price deflator, which is an adjustment factor accounting for differing inflation rates in various regions, to affect real wage rates (Block 4). Higher real wage rates in one region compared to another region serve as an incentive for people to move between geographic regions; thus real wage rates affect migration (Block 3).

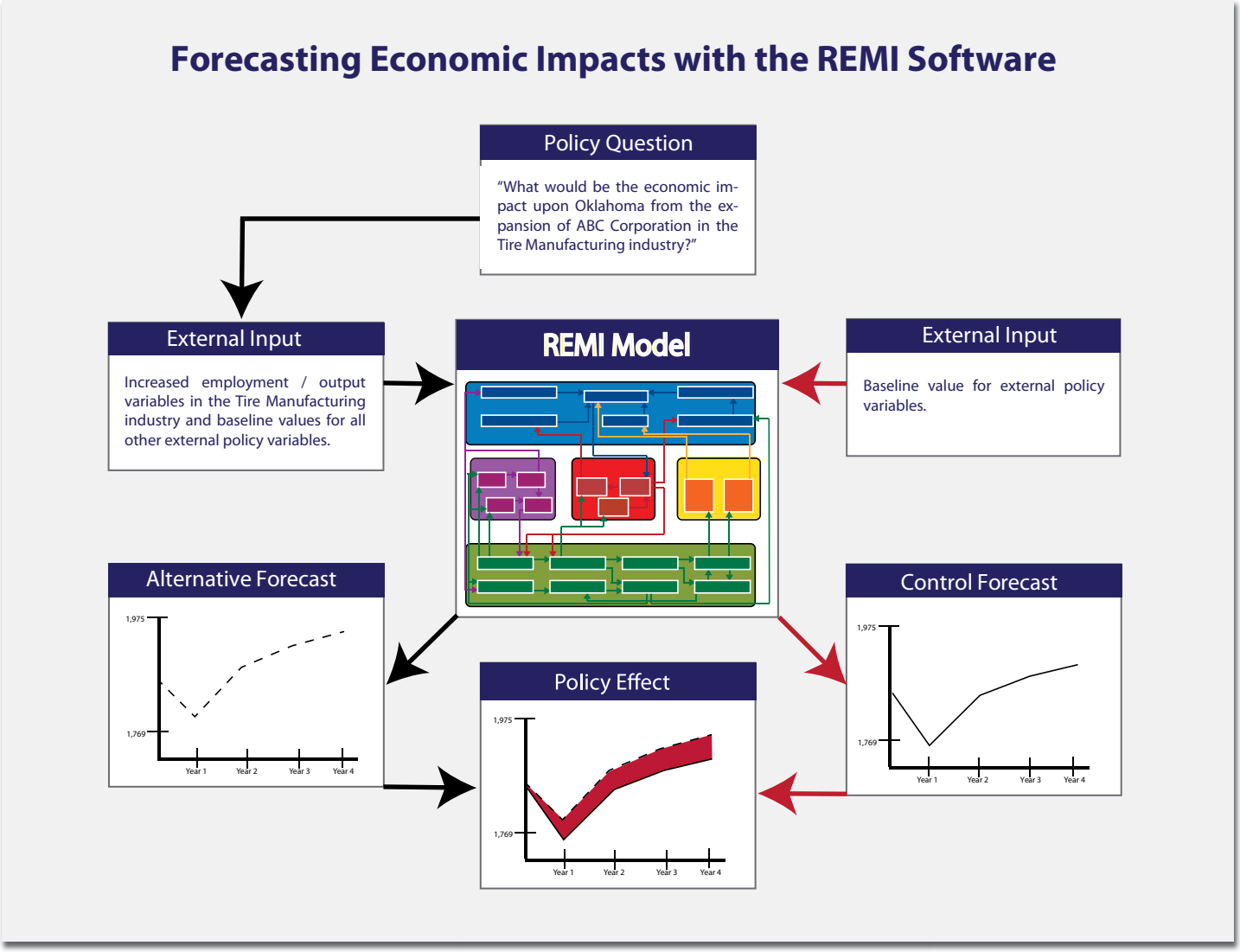
Commenting last upon employment's effect upon real disposable income (Block 1), as jobs are created, income paid to the new employees also increases. The newly employed will save a portion of their income and spend a portion of their income on consumer goods, the latter of which increases consumption (Block 1). As a component of output, increased personal consumption produces a subsequent rise in output.

Obviously, the previous example is only a simple illustration of a more complex model. For more information about the REMI model and its equations, please read Regional Economic Modeling by George Treyz (Kluwer Academic Publishers, 1993.)[14]

Given the previous basic illustration of the REMI model, the process that the REMI model uses to forecast the economic impact of a policy change can be illustrated. The process begins with a policy question and concludes with a comparison between a control forecast and an alternative forecast. The accompanying diagram assists with the illustration.

A control forecast, which uses current data regarding the economy, is generated by the REMI model. The control forecast represents the projection of the economy into the future *ceteris paribus*. This means that future economic growth will follow similar patterns in the future as had been experienced in the past.

The alternative forecast allows the user to input variable changes to occur in future time periods. Only those variables that would be affected by the policy change being measured would be changed in the alternative forecast. The REMI model then forecasts economic performance based upon the policy variable changes. The difference between the alternative and the control forecasts, measured by the distance between the two forecast lines, represents the economic impact of the policy change upon the economy. If the alternative forecast is greater than the control forecast, then a positive economic impact results for the economy. A negative economic impact results should the alternative forecast be less than the control forecast.

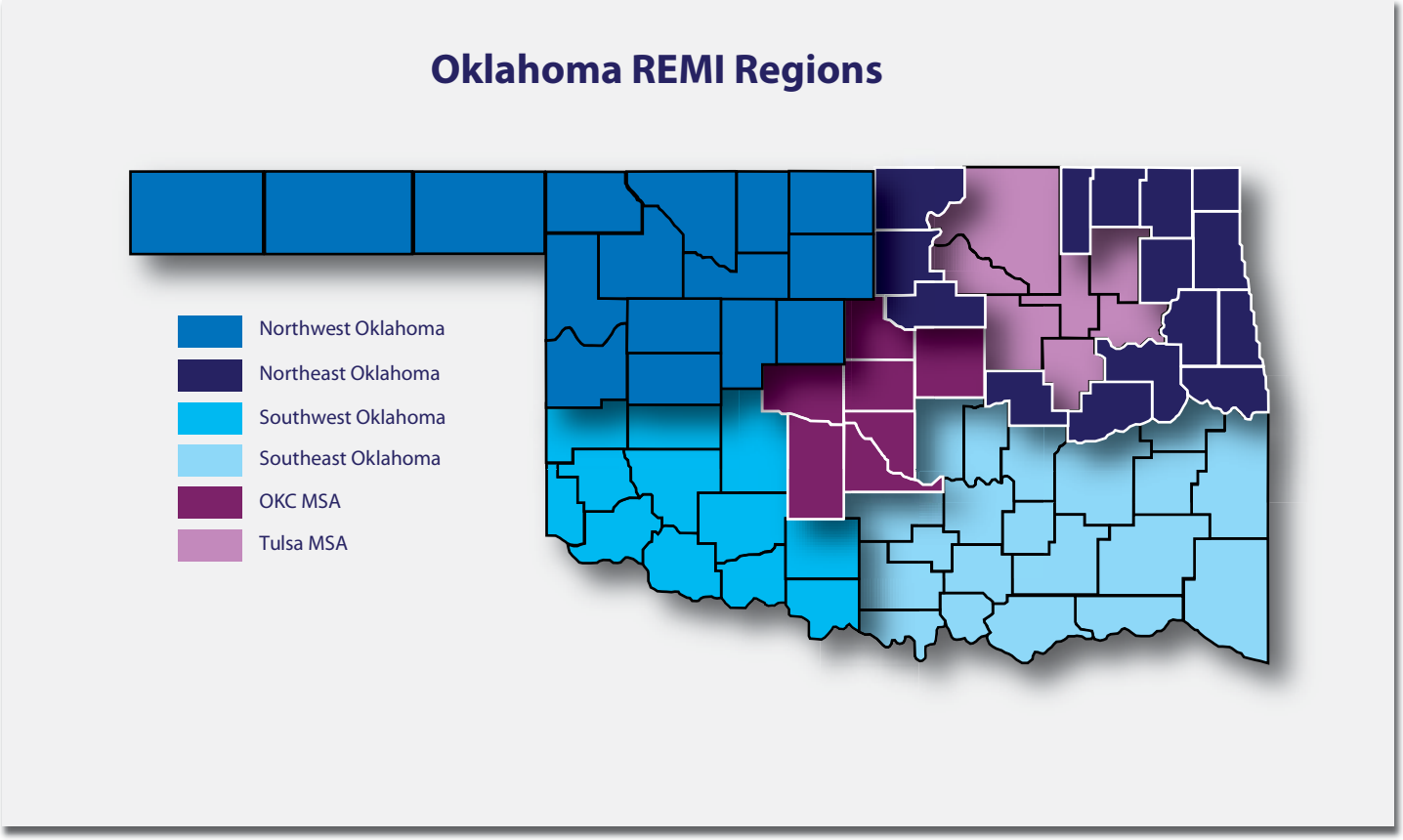


As is observable from the accompanying map, the state of Oklahoma is divided into six regions in the REMI model used by the CEBD. They are: Northwest Oklahoma, Northeast Oklahoma, Southwest Oklahoma, Southeast Oklahoma, the Oklahoma City metro area, and the Tulsa metro area. The Oklahoma City metro area and the Tulsa metro area correspond to the Metropolitan Statistical Areas (MSAs) defined by the Office of Management & Budget.

The Office of Management & Budget (OMB) defines metropolitan areas in the United States based upon the size of the economies and commuting patterns. The two largest MSAs by population in Oklahoma are Oklahoma City MSA and Tulsa MSA. As defined by the OMB, the Oklahoma City MSA is comprised of seven counties (Canadian, Cleveland, Grady, Lincoln, Logan, McClain, and Oklahoma counties), and the Tulsa MSA is comprised of seven counties (Creek, Okmulgee, Osage, Pawnee, Rogers, Tulsa, and Wagoner counties).[15]

Additionally, any of the regions may be combined with any combination of the other regions to produce a user-defined region for the purposes of measuring economic impact. For example, if an economic impact were to be quantified for Eastern Oklahoma, then the three regions of Northeast Oklahoma, Southeast Oklahoma and the Tulsa metro area would be combined to be reported as Eastern Oklahoma.

This report delineates the economic impact of the Oklahoma Manufacturing sector on the state of Oklahoma and the six sub-state regions (see map below) of Oklahoma.



It is important to note that while economic impact analysis is a valuable tool for economic development, economic impact analysis does have limitations. Resource Systems Group, Inc. identified some of the limitations of their economic impact analysis tool. Those limiting factors that pertain to REMI-modeled economic impact analysis are:

- Economic impact analysis cannot determine whether a new economic activity/project is economically feasible or profitable. It is possible that projects with very large favorable economic impact may be unprofitable.[16]

- Economic impact analysis cannot identify the specific individuals or the location of individuals or businesses impacted. For example, the analysis may show that a specific number of jobs will be generated in the trucking industry, but it cannot determine if those jobs will be filled from a specific town.[16]

- Economic impact analysis cannot determine whether the outcomes of an economic activity are socially or environmentally beneficial.

Regarding the first point, the purpose of economic impact analysis is not to determine whether a new economic impact activity is profitable. Rather, the purpose of economic impact analysis is to quantify the impact of the new economic activity upon an economy. Other assessment tools, like market feasibility studies or cost/benefit analyses, can help decision-makers determine whether an economic activity/project is profitable.

Regarding the second point, although the economic impact cannot identify a specific company or city, the REMI model can forecast the region in which the economic impact will occur. With the state divided into six regions, the level of detail is greater in the REMI model than with other economic impact analysis models.

Regarding the final point, Resource Systems Group, Inc. reported that economic impact analysis "can only deal with impact that is easily quantifiable in dollars or employment. Environmental, health, or social impacts are not normally assessed, even though they may have economic implications."[16] While this may be a limitation of IMPLAN-modeled economic impact analysis, this is not a limitation with REMI-modeled economic impact analysis. Admittedly these externalities are not easily quantifiable, but they may still be quantified through the use of well-formed surveys. With a quantifiable amount associated with the externality, its impact may then be modeled through an additional simulation.

There is at least one other limitation when measuring the economic impact upon a region not mentioned in the Resource Systems Group, Inc. report. That limitation relates to using aggregated industry data to measure economic impact. Most economic impact tools use historical data to model future events. Some of the historical data is aggregated in order to make the modeling tool more affordable and user-friendly. Using aggregate industry data to model the economic impact of a specific company requires the assumption that the specific company is a good sample of the aggregate of the whole industry.

Lastly, it should be noted that economic impact analysis is not the same tool as a cost-benefit analysis. A cost-benefit analysis quantifies all of the costs, including social and environmental costs, and all of the benefits associated with a project, and if the ratio of benefits to costs is greater than 1.0, then this becomes the basis for approving a project. Economic impact analysis does not have any threshold associated with the tool. Rather, the REMI-modeled economic impact analysis will forecast quantifiable amounts of employment, population, income, etc. over a range of years for any region. These quantifiable forecasts can then be used with other tools, including cost-benefit analyses and feasibility reports to assist in the decision-making process.

Separate from the limitations of economic impact analysis, there are unique limitations to the REMI model. Every economic impact model attempts to simulate real world conditions, and every economic impact model has its own unique weaknesses. The primary weakness of our REMI model is that the geographic regions in the model cannot be disaggregated further. This means that our version of the REMI model cannot forecast the economic impact upon smaller regions. Specifically, the six regions cannot be broken into the counties comprising their respective region. The reader should bear in mind that every model has its weaknesses, and while it is not the purpose of this report to list the relative strengths and weaknesses of each of the economic impact models, we want to be as transparent as possible regarding the REMI modeling software used by the CEBD.

One of the key features differentiating the REMI simulation model from other economic impact measurement tools is the fact that REMI uses several economic impact methodologies to predict impact upon an economy. Whereas other tools rely upon one methodology to predict economic impact, REMI combines several economic impact methodologies, which has the effect of minimizing the weaknesses of any one methodology. Methodologies included in the REMI model are input-output, econometric equations, economic-base, and it also includes aspects of computable general equilibrium.

An additional strength of the REMI model involves its dynamic nature. Whereas economic impact models relying solely on input-output are only able to make static one year forecasts, the REMI model is able to forecast the economic impact over a number of years.

Also differentiating the REMI model from other economic impact models is its ability to report the economic impact with a myriad of economic and/or demographic variables. This means that not only will traditional economic impact variables (for example, employment, income, gross regional product, etc.) be reported by the REMI model, but the model is also able to report other economic and socioeconomic variables (for example, capital stock, economic migrants, population by age/gender, etc.) as well. By forecasting nontraditional economic and socioeconomic variables, the REMI model provides a more complete picture of the impact a given scenario would have upon an economy.

Project Information and Assumptions

This section documents key scenarios and assumptions that serve as primary inputs into the REMI model for the purposes of estimating incremental impact of Manufacturing on Gross Regional Product (GRP), Output, Employment, Income, Taxes and more.

The REMI model is a dynamic input-output modeling software that generates forecasts based on historical data. The primary national, state, and county data came from the Bureau of Economic Analysis (BEA). Other major sources of historical data were obtained from the U.S. Census Bureau, Bureau of Labor Statistics (BLS), State Employment Security Agencies (ESAs), Energy Information Administration and other related sources that serve as the foundation upon which to forecast future economic and socioeconomic variables.

In order to model the economic impact of a business that presently exists in the economy, it is necessary to remove data associated with that business from the modeling software in the current year and the projected future years. As a result, the subsequent forecast produces negative impact when compared to the control forecast. This approach is known as a "Counterfactual Modeling". In order to explain the positive impact that the business would have upon the economy, the results obtained were multiplied by negative one, which later refers to as a "counterfactual positive" simulation. This type of simulation assumes any dollars/ jobs removed from the model will not be re-spent or re-employed elsewhere in the economy.

Employment data used as inputs into the REMI model were supplied by the Oklahoma Employment Security Commission (OESC). The employment data we obtained and used to run the simulation are reported in 3-digit NAICS codes. Due to the recent changes made to the REMI model, employment input of the 'Transportation Equipment Manufacturing' industry was further disaggregated into 2 sub-categories of 4-digit NAICS codes, which are 'Motor Vehicle, Vehicle Body and Parts Manufacturing' and 'Other Transportation Equipment'. (See Table 1.1)

The employment numbers of manufacturing included workers covered by the State Unemployment Insurance (UI) laws and federal civilian workers covered by the Unemployment Compensation for the Federal Employees (UCFE) program. The total manufacturing employment of 130,001 represents the total job count of federal, local and private non-farm employment. This number was grouped by six sub-state regions: with 5,811 jobs in the Northwest region; 18,831 jobs in the Northeast region; 7,351 jobs in the Southwest region; 18,473 jobs in the Southeast region; 32,750 jobs in Oklahoma City MSA; and 46,785 jobs in Tulsa MSA. Total manufacturing employment in 2009 declined by 13.9 percent compared to total manufacturing

Table 1.1

NAICS	Category	Employment
311	Food Manufacturing	16,143
312	Beverage and Tobacco Product Manufacturing	2,776
313	Textile Mills Manufacturing	187
314	Textile Product Mills Manufacturing	649
315	Apparel Manufacturing	968
316	Leather and Allied Product Manufacturing	267
321	Wood Manufacturing	2,294
322	Paper Manufacturing	2,717
323	Printing and Related Support Activities Manufacturing	3,262
324	Petroleum and Coal Product Manufacturing	2,540
325	Chemical Manufacturing	2,742
326	Plastics and Rubber Product Manufacturing	9,782
327	Nonmetallic Mineral Product Manufacturing	7,765
331	Primary Metal Manufacturing	3,936
332	Fabricated Metal Product Manufacturing	20,845
333	Machinery Manufacturing	26,254
334	Computer and Electronic Product Manufacturing	6,079
335	Electrical Equip't, Appliance & Component Product Manufacturing	3,118
3361-3363	Motor Vechicle, Vehicle Body and Parts Manufacturing	6,021
3364-3369	Other Transportation Equipment Manufacturing	6,021
337	Furniture and Related Product Manufacturing	1,660
339	Miscellaneous	3,975
	Total	130,001

employment in 2007 in the previous study.

The data obtained from OESC was grouped by FIPS codes. FIPS codes refer to the Federal Information Processing Standards Codes. It is created for states and counties to name populated places. For special cases, unique FIPS codes such as FIPS 995 and FIPS 998 are assigned to specific businesses. FIPS 995 is defined as statewide, locations in more than one county, or no primary county. To explain this, it refers to establishments that have locations in more than one county, or for which a primary location has not been determined or cannot be assigned by the State. FIPS 998, on the other hand, is defined as out-of-state locations. Generally, employers reported under FIPS 998 must have UI accounts in all states in which they have permanent worksites or in which they have ongoing business operations, such as construction, which usually lack a fixed worksite. While most out-of-state worksites will be of a temporary nature, there are a few rare cases where an employer may maintain a worksite outside the state in which UI coverage is based that could be classified with county code 998.

The study included FIPS 995 employment as data inputs into the REMI model, but not the employment data reported in FIPS 998, since the economic activities in FIPS 998 occurred in out-of-state regions. The study further assumed that employment numbers of FIPS 995 were proportionately distributed to the six distinct regions of Oklahoma. (See map on pg 7)

To forecast the possible economic impact, the study employed a more conservative approach, assuming the number of total employment inputs remains unchanged over the entire forecasted time period. Two variables, 'Sales Employment' and 'State and Local Government Employment', were used to project the economic impact driven by the manufacturing sector. Using the employment data, seven complementary scenarios (OKC MSA, Tulsa MSA, Northwest Oklahoma, Northeast Oklahoma, Southwest Oklahoma, Southeast Oklahoma and FIPS 995) were built and modeled as "counterfactual positive" simulations, based on a forecast time frame from 2011 to 2031.

As previously mentioned, the REMI model relies on historical data to forecast the economic impact. This data was obtained from different sources and each of these sources use different measurements to report the monetary figures. BEA has reported Gross Domestic Product (GDP) and its aggregate final demand components in chained real dollars, while BLS uses fixed real dollars for data that are at the most 'detailed' level. In order to reconcile these two sets of variables, all real dollar concepts used in the model are based on fixed weights. This allows the industry value added and final demand totals to remain balanced.

To avoid any confusion, all monetary figures of the economic impact reported are present in 'current' dollars. Current dollar is the value of a dollar at the time at which it is measured.

Looking at the body in this report, the former half of the report discusses the possible economic impact of manufacturing on the state's economy, and the latter half addresses the same issues, but focuses on a regional level on the six sub-state regions. The graphs shown from page 14 to page 22 represent the aggregated economic impact (direct, indirect, and induced impact) of the manufacturing sector on Oklahoma's economy.

The control forecast predicts the economic and demographic variables into the future, if nothing changes (*ceteris paribus*) in the economy. The alternative forecast predicts the same variables for the economy with a given economic stimulus, which in this case are the manufacturing employment data inputs. The difference between the two (control forecast and alternative forecast) concludes the economic impact that the stimulus has upon the state and the regional economies. The aggregated economic impact is an estimate of what would have occurred in the study region over the study time period, if manufacturing had been the only stimulus that occurred in the economy and ceteris paribus.

The economic impact of the manufacturing sector, hereafter is referred to as "Manufacturing".

Gross State Product

Gross State Product (GSP) As a value added concept is analogous to the national concept of Gross Domestic Product. It is equal to output excluding the intermediate inputs. It represents compensation and profits. Affected By: Consumption, Net Exports, Investment, State & Local Government Spending Affecting: Commodity Access Index, Change in Local Supply, Employment, Output

Gross State Product (GSP) is analogous to the nation's Gross Domestic Product (GDP), and to the region's Gross Regional Product (GRP). It is the total value of all goods and services produced within a region during a given time period. In general, it can be used as a barometer to gauge a region's economic well being.

GSP is predicted to account for $146.305 billion if nothing changes in the state's economy in 2011. With the addition of Manufacturing, this amount would grow to as much as $171.170 billion, representing a 17 percent increase or $24.865 billion of GSP impact. By 2031, the GSP impact is predicted to equate $65.402 billion, which would result in an upsurge of total GSP to reach to an estimate of $412.181 billion.

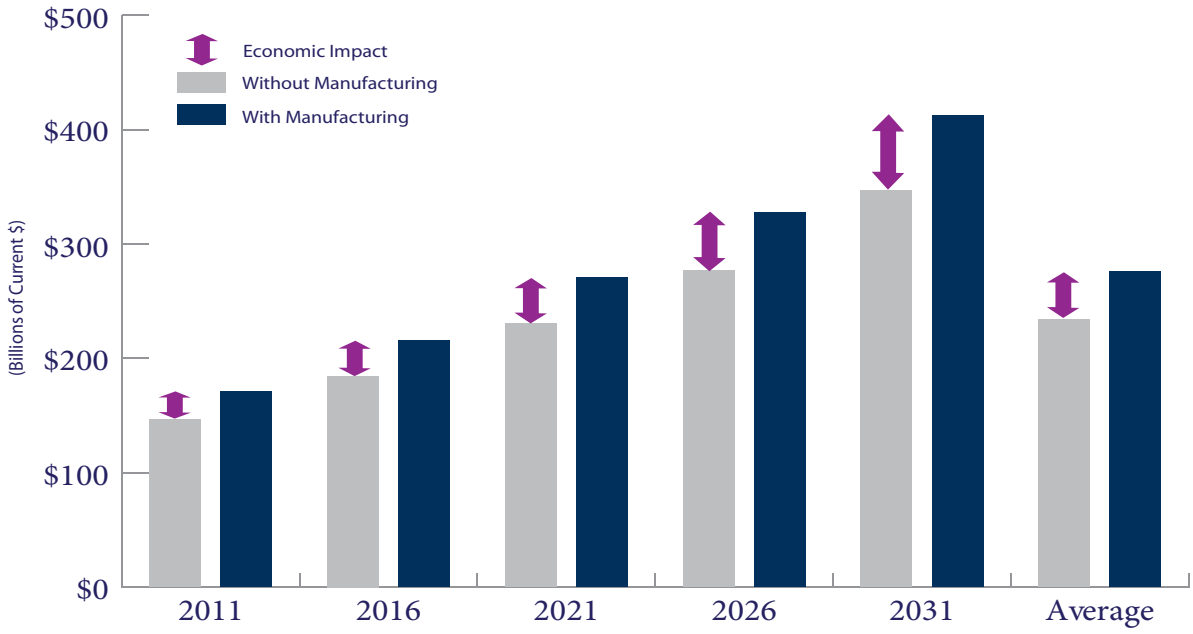
Over the years, average Manufacturing GSP impact is projected to match $41.826 billion annually, mirroring a 17.9 percent increment from the baseline.

Average Manufacturing Consumption Impact	
Category	**Millions of Current $**
Vehicles & Parts	$983.593
Computers & Furniture	$1,950.226
Other Durables	$706.295
Food & Beverages	$2,298.690
Clothing & Shoes	$818.649
Gasoline & Oil	$606.736
Fuel Oil & Coal	$7.225
Other Non-Durables	$1,868.008
Housing	$2,660.550
Household Operation	$1,183.201
Transportation	$575.205
Medical Care	$3,660.313
Other Services	$3,738.331
Total	**$21,057.022**

Manufacturing activities would stimulate GSP impact to grow by roughly 5 percent yearly, on average, throughout the study time period.

Looking at Manufacturing impact across all industries, the 'Other Services' category would make up 17.8 percent ($3,738.331 million) of the average total consumption impact, while the 'Fuel Oil and Coal' category would account for 0.03 percent or $7.225 million of the average total consumption impact.

Graph 1.1: Economic Impact of Gross State Product



	2011	2016	2021	2026	2031	Average
Economic Impact	$24.865	$31.267	$40.227	$50.831	$65.402	$41.826
Without Manufacturing	$146.305	$184.494	$230.406	$276.563	$346.779	$234.237
With Manufacturing	$171.170	$215.761	$270.633	$327.394	$412.181	$276.063

Real Disposable Personal Income

Real Disposable Personal Income: Disposable personal income deflated by the PCE-Price Index (the personal consumption expenditure price index). Affected By: Employment (Block 2), Commuter Income or Outflow, Property Income Transfers, Taxes, Social Security Payments, Compensation (Block 4), Consumer Prices (Block 4) Affecting: Consumption, Optimal Residential Capital Stock (Block 2)

Real Disposable Personal Income represents the after tax, inflation adjusted income that can be spent or saved by income earners. Real Disposable Personal Income is directly affected by Disposable Personal Income, so a change in Real Disposable Personal Income will lead to a change in Personal Consumption.

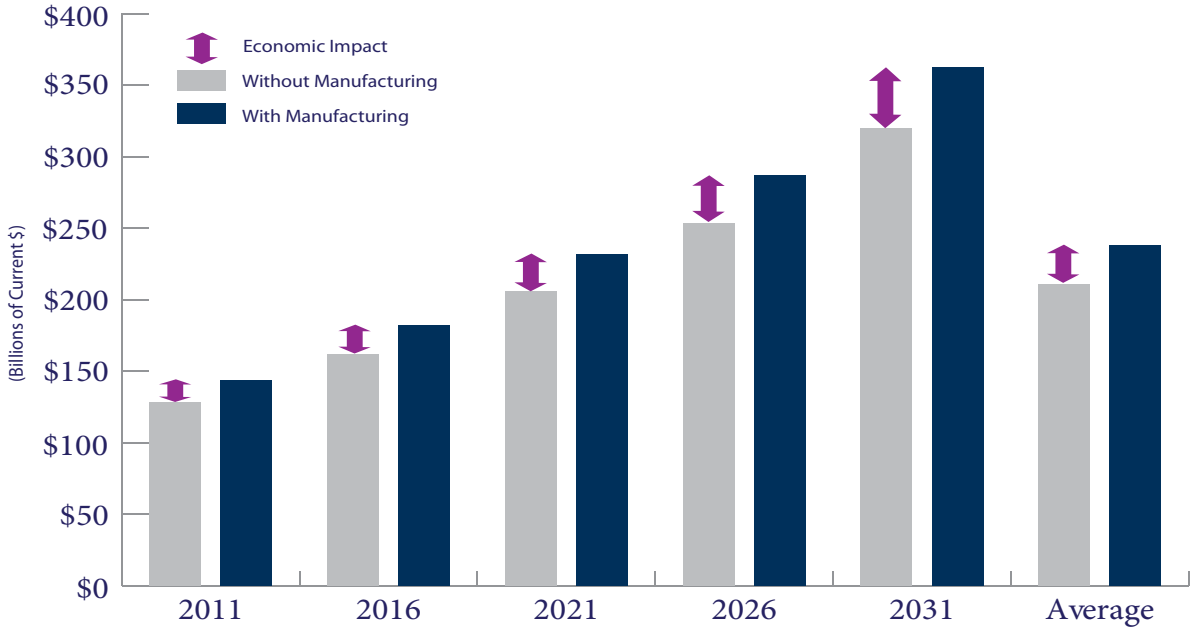
In REMI's term, Real Disposable Personal Income equals Disposable Personal Income deflated by the PCE-Price Index. Briefly, an increase in real disposable personal income can be caused by an increase in disposable personal income or a decrease in the PCE-Price index.

Manufacturing's Real Disposable Personal Income impact is projected to surge considerably and would leap 178.5 percent from $15.439 billion in 2011 to $42.999 billion in 2031. By 2031, total Real Disposable Personal Income above the baseline would build up to an estimated $362.613 billion.

Compared to the previous study from 2008, the predicted average impact that Manufacturing would have on Real Disposable Personal Income would have contracted 17.5 percent, down from the initial estimates of $32.834 billion to $27.077 billion. Despite this, Manufacturing continues to generate substantial impact on the statewide Real Disposable Personal Income.

Mirroring the Manufacturing in the economy, the economic impact on Real Disposable Personal Income is projected to grow by an average rate of 5.3 percent annually. Average impact on Real Disposable Personal Income is predicted to rise to $27.077 billion per year throughout the entire forecasted time period.

Graph 1.2: Economic Impact of Real Disposable Personal Income



	2011	2016	2021	2026	2031	Average
Economic Impact	$15.439	$20.075	$25.993	$33.180	$42.999	$27.077
Without Manufacturing	$128.321	$162.143	$205.909	$253.585	$319.614	$211.044
With Manufacturing	$143.760	$182.218	$231.902	$286.765	$362.613	$238.121

State Output

State Output The amount of production in dollars, including all intermediate goods purchased as well as value-added (compensation and profit). Can also be thought of as sales (Output= Self-Supply + Export + Intraregional Trade + Exogenous Production. Affected By: Consumption, International Exports, Investment, State and Local Government Spending, Intermediate Inputs, Share of Domestic Markets Affecting: Commodity Access Index, Change in Local Supply, Employment, Intermediate Inputs

State output, reflecting broader economic activities that include the amount of production, is comprised of all the intermediate goods purchased as well as value-added (compensation and profit). Briefly, it is the sum of Gross State Product plus intermediate goods and services.

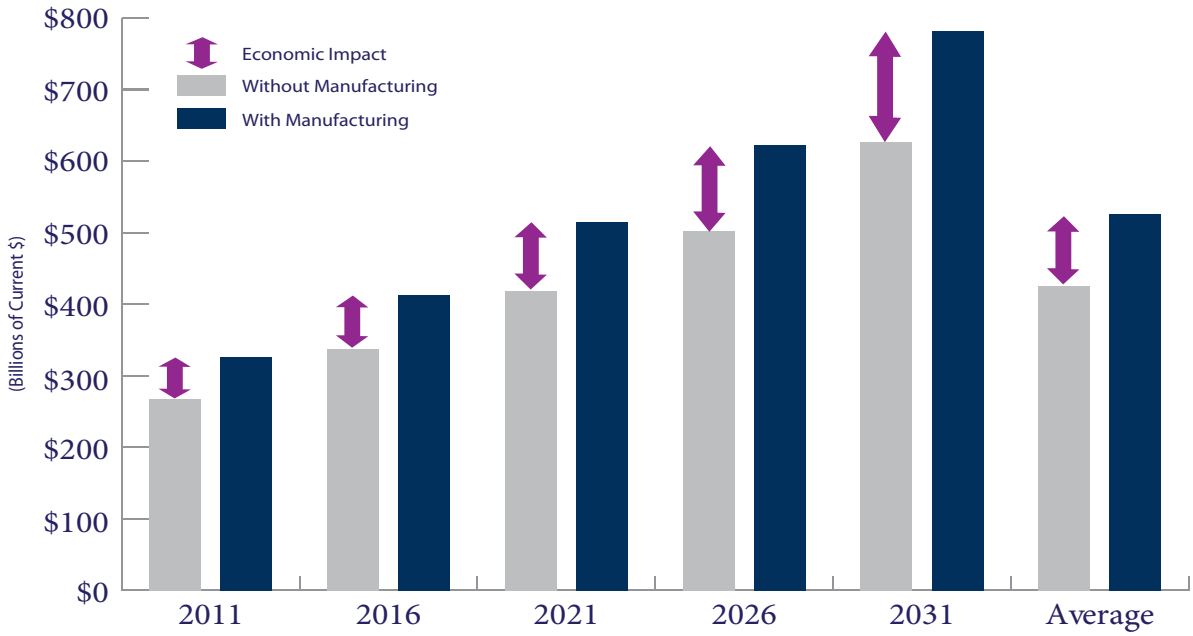
Output is affected by changes in industry demand in all regions in the nation, the home region's share of each market, and international exports from the region. Variables affecting and affected by the state output are the same variables affecting and affected by GSP, except that state output includes the measurement of intermediate inputs.

In 2011, state output is anticipated to be $267.565 billion, if nothing changes in the economy. This amount would surge to $326.615 billion if Manufacturing is brought into the state, which would render an estimated of $59.050 billion in state output impact that is driven by Manufacturing's activities.

State output impact will continue to grow in the subsequent years at an average speed of 5 percent annually, and the average output impact is projected to be $99.675 billion per year. Over the years of the forecasted time frame, the aggregated impact on state output would account for approximately $2,093.168 billion.

REMI predicts the state output (without Manufacturing) to be $419.368 billion and $627.302 billion, in 2021 and 2031 respectively. However, if Manufacturing were to be added to the economy, this impact would appreciate to nearly $515.403 billion and $782.274 billion respectively, portraying a 22.9 percent increment in 2021 and 24.7 percent increase in output impact by 2031.

Graph 1.3: Economic Impact of State Output



	2011	2016	2021	2026	2031	Average
Economic Impact	$59.050	$74.810	$96.035	$121.198	$154.972	$99.675
Without Manufacturing	$267.565	$338.062	$419.368	$502.163	$627.302	$426.351
With Manufacturing	$326.615	$412.872	$515.403	$623.361	$782.274	$526.026

Employment

Employment: Bureau of Economic Analysis (BEA) concept based on place of work; includes full-time and part-time employees. Affected By: Labor / Output Ratio, Output (Block 1), Labor Productivity Affecting: Capital Stock, Real Disposable Income (Block 1), Employment Opportunity (Block 4), Wage Rate (Block 4)

Employment includes the number of full-time and part-time jobs by place of work, with full-time and part-time jobs carrying equal weight in the REMI model. While employees, sole proprietors, and active partners are included in the estimate, unpaid family workers and volunteers are not included.

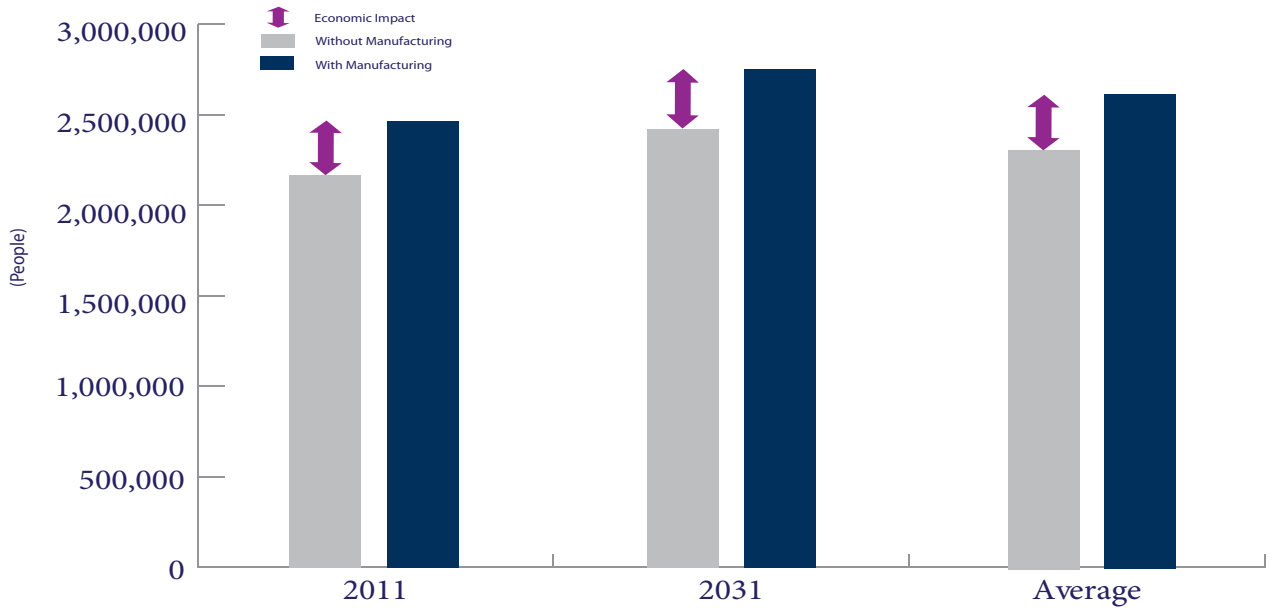
Manufacturing has an employment multiplier of 2.4 on the statewide economy. Generally speaking, with every 100 jobs created by Manufacturing, statewide employment would increase by an additional 240 jobs. The calculation of the employment multiplier is done by taking the number of projected average employment impact (308,417 jobs) divided by the number of manufacturing employment input (130,001 jobs).

As noted in the graph, the existence of Manufacturing in the economy would drive the statewide employment to increase to 2,465.527 thousand jobs from the initial 2,166.238 thousand jobs in 2011. By 2031, the employment impact is projected to total 2,750.785 thousand jobs, which indicates a 13.7 percent increase, or an additional 328,540 net new jobs added to the state.

Average Employment Impact	
Category	**Net New Job**
Natural Resources, Mining, Utilities, Construction	22,215
Manufacturing	129,347
Trade	31,034
Transportation, Information, Finance, & Accounting	3,489
Services	76,196
State & Local Government	46,137

On average, the statewide employment impact is estimated to increase 308,417 net new jobs per year. Of this figure, the estimated private non-farm employment impact would stand at 85 percent. Manufacturing would account for the largest impact, supporting nearly 129,347 of statewide employment.

Graph 2.1: Economic Impact of Employment



	2011	2031	Average
Economic Impact	299,289	328,540	308,417
Without Manufacturing	2,166,238	2,422,245	2,313,741
With Manufacturing	2,465,527	2,750,785	2,622,158

Capital Stock

Capital Stock The amount of capital stock existing in the economy. It is further divided into Residential Actual Capital Stock and Non-Residential Actual Capital Stock Affected By: Cummulative effects of Investment Affecting: Gap betwen Actual & Optimal Capital Stock, Investment

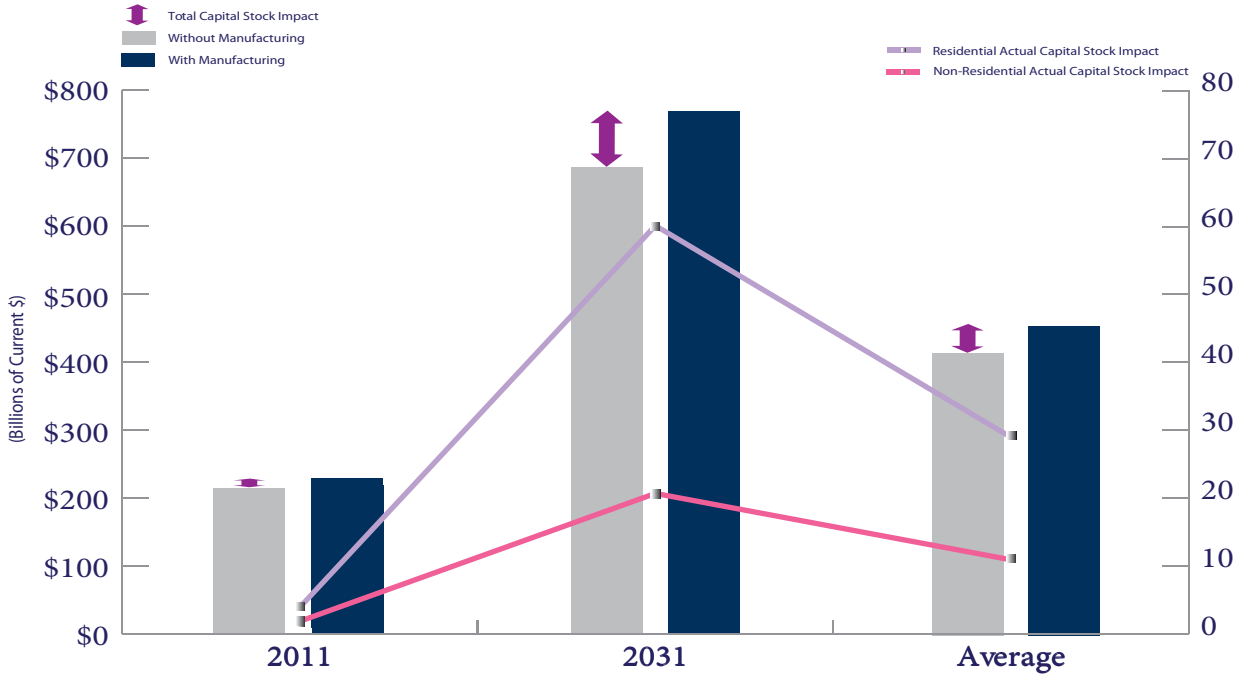
As noted before, Capital Stock is divided into three major categories. These include Residential Capital Stock, Non-Residential Capital Stock and Utility Capital Stock. Each of these categories is further disaggregated into actual or optimal capital stock. However, recent changes have omitted the reporting of Utility Capital Stock, therefore, this report will focus on the findings of Residential Actual Capital Stock and Non-Residential Actual Capital Stock. As a reminder, all reported Actual Capital Stock is the *cumulative* impact that would occur in the state, which is triggered by the jobs supported in Manufacturing.

In 2011, the state's total Actual Capital Stock is forecasted to grow by an additional $5.823 billion. This amount would ramp up to as much as $80.837 billion by 2031. The average impact brought about by Manufacturing would equate to $39.907 billion per year.

Oklahoma Residential Actual Capital Stock is the amount of residential capital (housing structures) in the region accumulated over time net of depreciation. Oklahoma Residential Actual Capital Stock is affected by changes in residential investment. The economic impact upon the statewide Residential Actual Capital Stock is predicted to grow from $3.941 billion in 2011 to $60.130 billion in 2031, resulting in an average impact of $28.972 billion annually.

Oklahoma Non-Residential Actual Capital Stock is the amount of non-residential capital (non-housing structures) in the region accumulated over time net of depreciation. In 2011, the statewide Non-Residential Actual Capital Stock impact is forecasted to be $1.882 billion and would eventually increase to $20.707 billion by 2031. The average impact spillover on the statewide economy would equal $10.935 billion per year.

Graph 2.2: Economic Impact of Capital Stock



	2011	2031	Average
Total Capital Stock Impact	$5.823	$80.837	$39.907
Without Manufacturing	$214.836	$688.070	$415.421
With Manufacturing	$220.659	$768.907	$455.328

Labor Force

Labor Force: The number of people in the labor force, i.e., employed or seeking work; calculated with participation rates by age-gender-racial cohort. Affected By: Population and Participation Rate Affecting: Employment Opportunity (Block 4), Wage Rate (Block 4)

Labor force includes the total number of people employed and those who seek employment in a given region, calculated with the participation rates and age cohort.

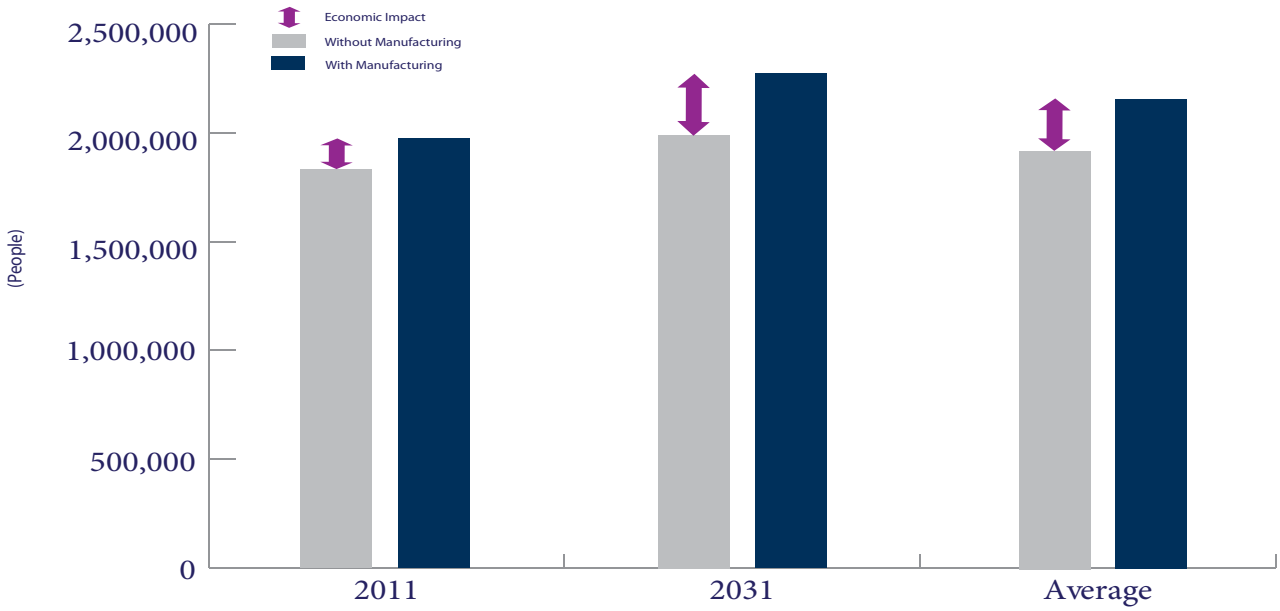
Calculation of the labor force is derived by taking the total population multiplied by the participation rate. An increase in population or participation rate will result in an increased labor force in the region, and vice versa.

As can be seen in the graph, the labor force is predicted to total 1,833.830 thousand people in 2011, if nothing changes economically. This figure is projected to escalate to 1,975.783 thousand people if Manufacturing's activities were injected into the region, suggesting an increase of 7.7 percent or 141,953 people in terms of the labor force impact.

By the end of 2031, the economic impact of Manufacturing on labor force is estimated to add an additional 282,532 people onto the baseline projection of 1,992.313 thousand people.

The average impact on the labor force would grow by 238,698 people per year. With this number, the White population has the largest share (73.3 percent or 174,978 people) of the average labor force impact; followed by the 'Others' population (12.5 percent or 29,767 people); the Hispanic population (7.5 percent or 18,110 people); and lastly, the Black population (6.6 percent or 15,843 people).

Graph 3.1: Economic Impact of Labor Force



	2011	2031	Average
Economic Impact	141,953	282,532	238,698
Without Manufacturing	1,833,830	1,992,313	1,923,377
With Manufacturing	1,975,783	2,274,845	2,162,075

Population

Population Mid-year estimates of population, including survivors from the previous years, births, special populations, and three types of migrants (economic, international, and retired). Affected By: Total Migration, Special Population, Natality Rates, and Survival Rates Affecting: Potential Labor Force, Labor force, Local / state Government Spending (Block 1), Consumption Spending (Block 1), Housing Price (Block 4)

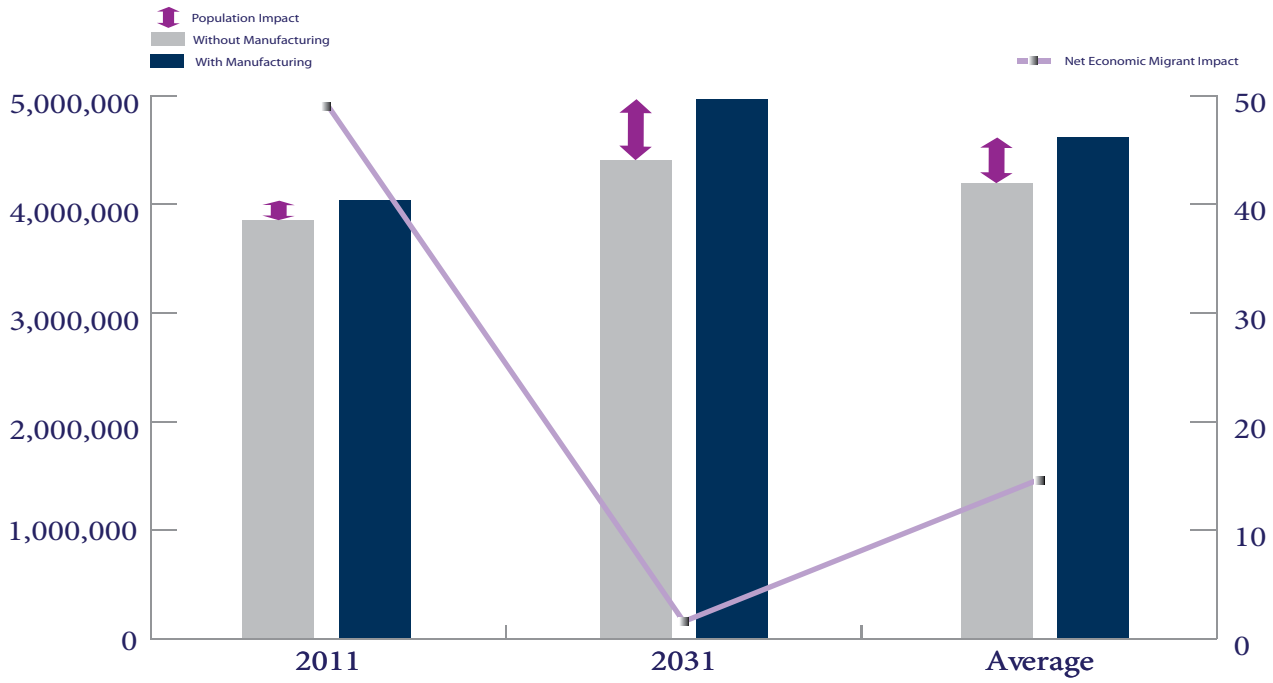
Population reflects the mid-year estimates of people, including births, special populations, survivors from the previous year, economic migrants, international migrants, and retired migrants. It is affected by changes in total migration, special populations, natality and survival rates.

Population appears not only as a determinant of Real Disposable Personal Income Per Capita, but also as a determinant of Consumption, State and Local Government Spending, and the Relative Housing or Land Prices. A change in Population will result in a change of these variables.

The major determinant of Population itself is Economic Migration. Economic migrants are migrants under age 65 (who were part of the civilian population the preceding year) who respond to economic and amenity factors. Increased amenity factors translate into a higher economic migrant impact with more people moving into the region. A positive economic migration becomes indicative of the growing population impact. It should be noted that economic migrants present in the graph are non-cumulative impact. As can be seen, the number of economic migrants would eventually taper off over time as the stimulus (Manufacturing) approaches the end of the forecast time period, and more economic migrants are anticipated to leave the state.

From 2011 to 2031, Manufacturing's impact on population is predicted to escalate from 176,277 people to 552,629 people. Oklahoma's net economic migrant impact is estimated to increase to 14,687 people per year on average, accounting for 3.5 percent of the average population impact (421,275 people).

Graph 3.2: Economic Impact of Population



	2011	2031	Average
Population Impact	176,277	552,629	421,275
Without Manufacturing	3,854,513	4,410,259	4,186,586
With Manufacturing	4,030,790	4,962,888	4,607,861

Proprietors' Income (with Inventory & Capital Adjustment)

Proprietors' Income It is a BEA (Bureau of Economic Analysis) concept, including income in kind of sole-proprietorships, partnership, and tax-exempt cooperatives, excludes dividends, monetary interest received by nonfinancial business, and rental income received by persons not primarily engaged in the real estate business. Affected By: Wage Rate, Prices, Costs Affect-

Proprietors' Income with Inventory and Capital Consumption Adjustments is the current production income of sole proprietorships, partnership, and tax-exempt cooperatives. Corporate directors' fees are included in proprietors' income, but the imputed net rental income of owner occupants of all dwellings is included in the rental income of persons.

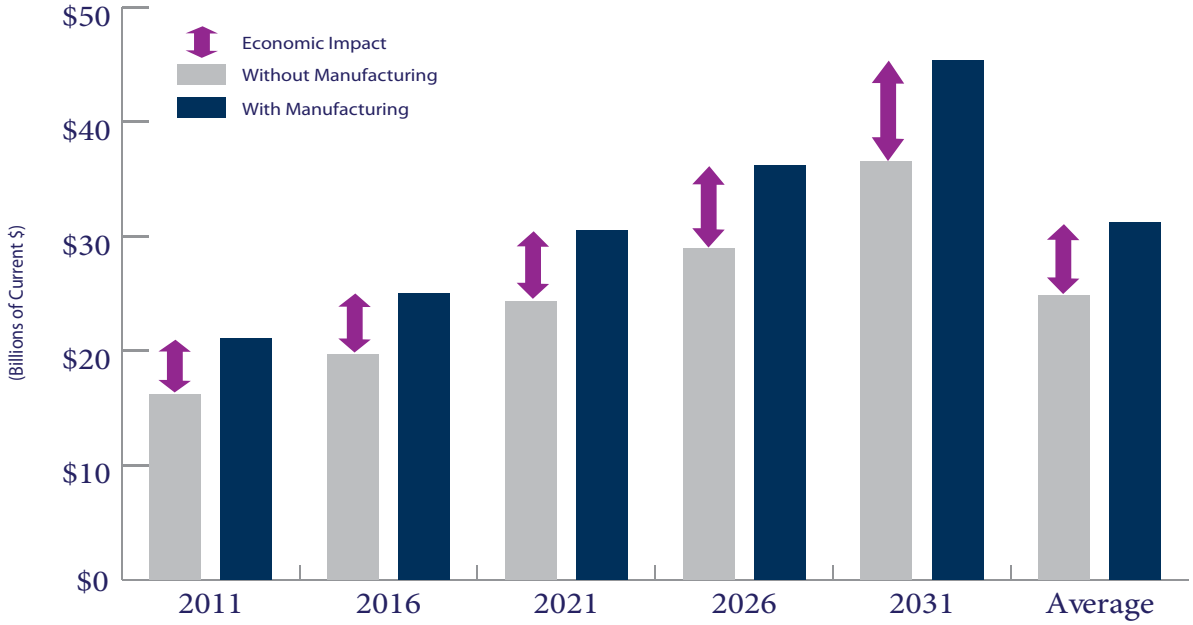
Proprietors' income excludes dividends and monetary interest received by nonfinancial business and rental incomes received by persons not primarily engaged in the real estate business; these incomes include dividends, net interest, and rental income of persons, respectively.

As noted in the graph, if nothing changes in the economy, the predicted proprietors' income would be $16.249 billion in 2011. With the stimulation of Manufacturing's economic activities on the statewide economy, the proprietors' incomes are predicted to spiral upward to $21.068 billion, resulting in a proprietors' income impact of $4.819 billion.

By 2031, 24.3 percent or $8.886 billion worth of proprietors' income impact is projected to be added to the state, which brings the total proprietors' income to equate $45.435 billion.

Over the years, the average annual impact on proprietors' income is expected to increase approximately $6.387 billion annually, growing at an average annual rate of 3.1 percent.

Graph 4.1: Economic Impact of Proprietors' Income



	2011	2016	2021	2026	2031	Average
Economic Impact	$4.819	$5.292	$6.147	$7.278	$8.886	$6.387
Without Manufacturing	$16.249	$19.734	$24.371	$28.944	$36.549	$24.826
With Manufacturing	$21.068	$25.026	$30.518	$36.222	$45.435	$31.213

Income Taxes

Income Taxes It is a BEA (Bureau of Economic Analysis) concept of personal income taxes, which when subtracted from personal income (income received by persons from all sources), resulted in disposable personal income (total after tax income received by persons; it is the income available to persons for spending or saving) Affected By: Personal Income Affecting: Disposable Personal Income

Income Tax is derived from Personal Income. When this amount is subtracted from Personal Income, it will result in Disposable Personal Income. It is important to note that the income tax impact present in this study represent the revenues (through the spillover effects from Manufacturing's employment) received by the state.[17]

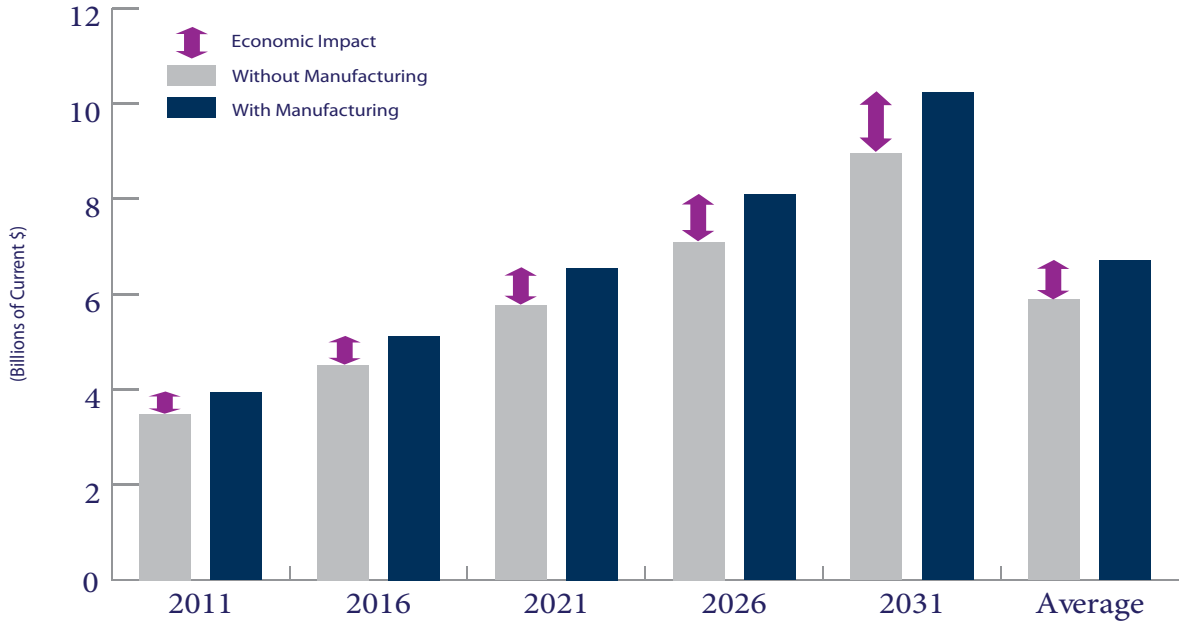
The composition of income tax revenue has to be traced back to Personal Income. Personal Income is calculated as the sum of wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation and capital consumption adjustments, rental income of persons with capital consumption adjustments, personal dividend income, personal interest income, and personal current transfer receipts, less contributions for government social insurance.

The personal income of an area is the income that is received by, or on behalf of, all the individuals who live in the area; therefore, the estimates of personal income are presented by the place of residence of the income recipients.

The economic impact of Manufacturing on income tax revenue is significant over time. If nothing changes economically, income tax revenues would equal $8.946 billion at the baseline level in 2031. This amount would boost to $10.232 billion if Manufacturing's activities were included in the statewide economy, which translates into 14.4 percent of income tax revenue impact or $1.286 billion. The study forecasted that the income tax impact would leap by 184.5 percent within the twenty year time period.

The average income tax impact is estimated to rise by $0.814 billion per year and is projected to grow at an average speed of 5.4 percent annually.

Graph 4.2: Economic Impact of Income Taxes



	2011	2016	2021	2026	2031	Average
Economic Impact	$0.452	$0.608	$0.786	$0.997	$1.286	$0.814
Without Manufacturing	$3.487	$4.516	$5.765	$7.096	$8.946	$5.890
With Manufacturing	$3.939	$5.124	$6.551	$8.093	$10.232	$6.704

Conclusion:

Based on these findings, the economic impact of Manufacturing remains significant and positively affects the statewide economic activities. The following provides a snapshot of the economic impact of Manufacturing upon the state's economy in 2031:

State Output Impact would account for $154.972 billion
Gross State Product Impact would account for $65.402 billion
Real Disposable Personal Income Impact would account for $42.999 billion
Employment Impact would account for 328,540 net new jobs

Northwest Oklahoma

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activity stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the northwest region was comprised of 240 manufacturers, which supported more than 5,811 jobs, both full and part time. Together, these 5,811 jobs in the region accounted for 7.5 percent of total employment in the region, and manufacturing comprised of 3.7 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 26.4 percent above all industries on average annual wage.

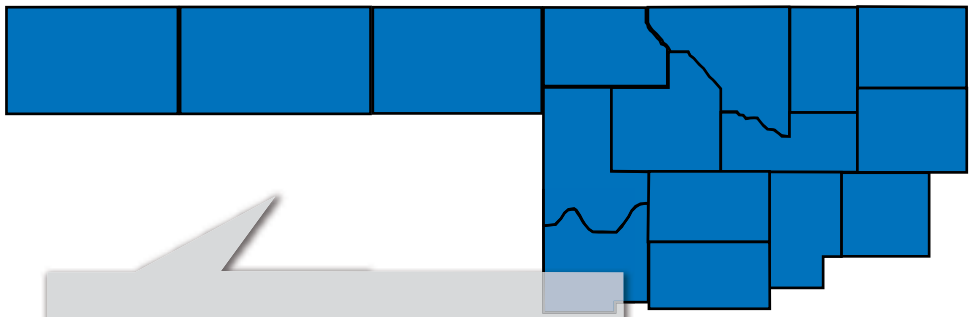
> With an employment multiplier of 1.8, Manufacturing's direct, indirect and induced impact upon Northwest Oklahoma are estimated to add 10,638 net new jobs by 2031.

The region has an employment multiplier of 1.8. This means, with every 100 new jobs created in Manufacturing, an additional 180 jobs will be created.

The top three distinct manufacturing industries in the northwest region include Food manufacturing, Machinery manufacturing, and Fabricated Metal Product manufacturing. Among all, Food manufacturing remained the largest employer in the region, employing more than 2,709 people (47percent) in 2009. By comparison, Machinery manufacturing made up the second largest share of 15.2 percent (885 jobs), while the Fabricated Metal Product manufacturing sustained 626 jobs (10.8 percent) in the region.

Table 5.1 summarizes the economic impact results for the northwest region. (On next page)

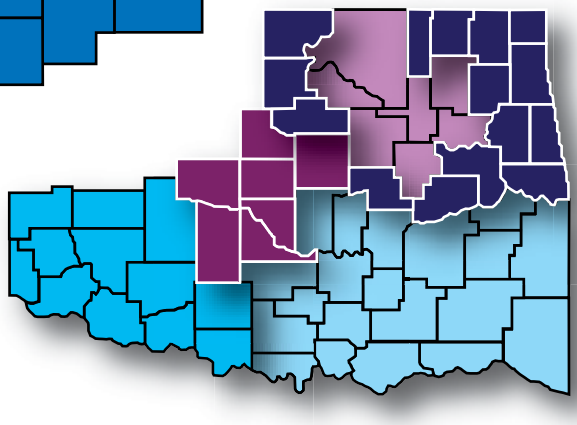
Map 5.1: Manufacturing Overview - Northwest Oklahoma



Northwest Counties

Alfalfa
Beaver
Blaine
Cimarron
Custer
Dewey
Ellis
Garfield
Grant
Harper
Kingfisher
Major
Roger Mills
Texas
Woods
Woodward

Manufacturing - Total Establishment	240
Manufacturing - Total Employment	5,811
Manufacturing - Average Annual Wage	$38,699
All Industries - Total Establishment	6,487
All Industries - Total Employment	77,435
All Industries - Average Annual Wage	$30,628
Manufacturing as a Percent of All Establishment	3.7%
Manufacturing as a Percent of All Employment	7.5%



Source: Oklahoma Employment Security Commission (2009)

Table 5.1: Northwest Oklahoma Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$0.719	$0.880	$1.108	$1.374	$1.727	$1.145
Consumption	$0.298	$0.419	$0.561	$0.718	$0.906	$0.575
Real Disposable Personal Income	$0.394	$0.521	$0.673	$0.857	$1.110	$0.699
Regional Output	$2.090	$2.566	$3.218	$3.979	$4.966	$3.319
Proprietors' Income	$0.058	$0.055	$0.058	$0.067	$0.080	$0.062
Income Taxes	$0.011	$0.016	$0.020	$0.025	$0.032	$0.021

	2011	2031	Average
Capital Stock	$0.150	$2.140	$1.052
Residential Actual Capital Stock	$0.105	$1.638	$0.791
Nonresidential Actual Capital Stock	$0.045	$0.502	$0.261
Employment (People)	10,243	10,689	10,328
Labor Force (People)	5,830	9,978	8,856
Population (People)	6,710	17,167	13,985
Net Economic Migrants (People)	1,722	-	370

In 2011, employment gains in Manufacturing are projected to outpace population growth by 52.7 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 10,243 net new jobs.

Population impact is predicted to grow from 6,710 people in 2011 to 17,167 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 1,722 people in 2011, representing a 25.7 percent gain in total population. Labor force impact, on the other hand, would surge to 9,978 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $0.699 billion per year, hindering an average growth rate of 5.3 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $0.062 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $2.140 billion by 2031. The impact on GRP is estimated to an increase to an average $1.145 billion yearly. Regional consumption, as a component of GRP, would grow by $0.575 billion annually, which would account for 50.2 percent of GRP. By 2031, regional output is predicted to equal $4.966 billion and average annual growth rate of regional output is projected to rise by 4.4 percent annually.

Northeast Oklahoma

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activity stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the northeast region was comprised of 562 manufacturers, which supported more than 18,831 jobs, both full and part time. Together, these 18,831 jobs accounted for 10.4 percent of total employment of all industries, and manufacturing comprised of 5 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 17.7 percent above all industries on average annual wage.

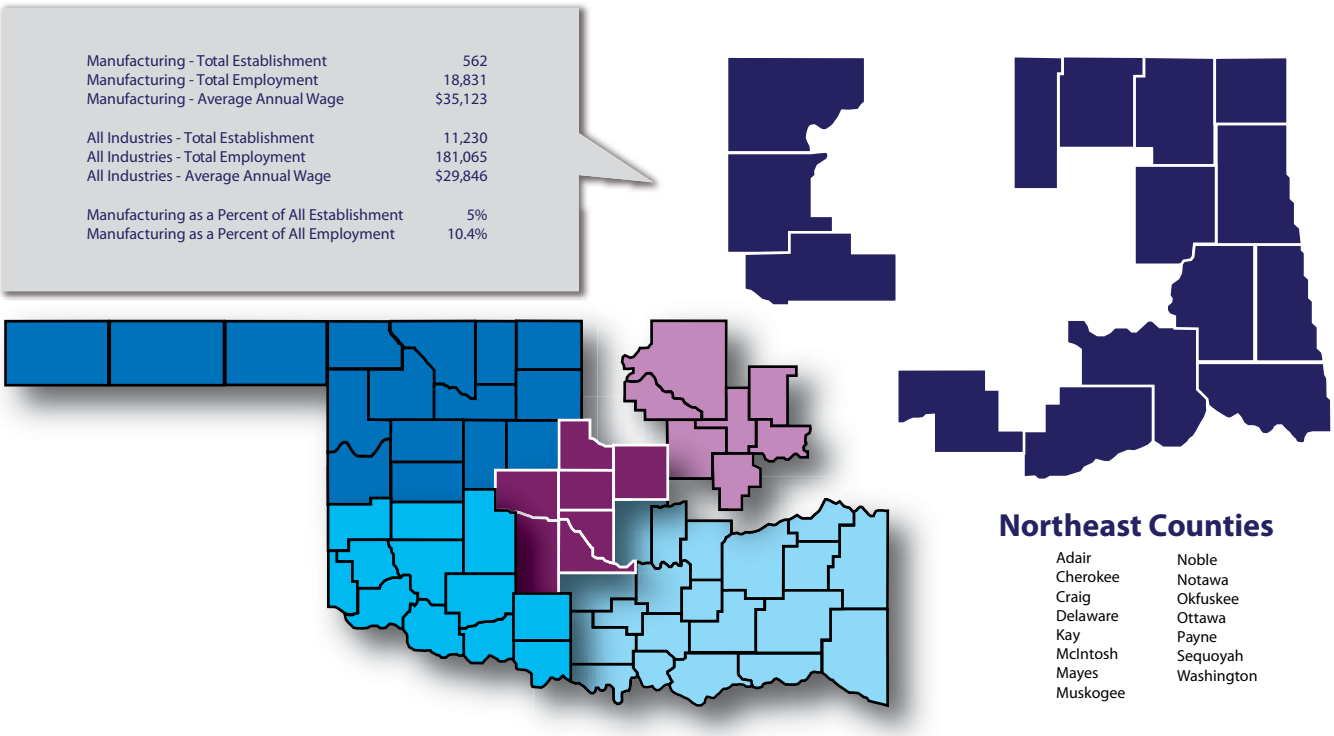
> With an employment multiplier of 2.1, Manufacturing's direct, indirect and induced impact upon Northeast Oklahoma are estimated to add 42,937 net new jobs by 2031.

The region has an employment multiplier of 2.1. This means, with every 100 new jobs created in Manufacturing, an additional 210 jobs will be created.

The top three distinct manufacturing industries in the northeast region include Machinery manufacturing, Food manufacturing, and Fabricated Metal Product manufacturing. Among all, Machinery manufacturing remained the largest employer in the region, employing more than 3,909 people (20.8 percent) in 2009. By comparison, Food manufacturing made up the second largest share of 12.5 percent (2,350 jobs), while the Fabricated Metal Product manufacturing sustained 1,885 jobs (10 percent) in the region.

Table 5.2 summarizes the economic impact results for the northeast region. (on next page)

Map 5.2: Manufacturing Overview - Northeast Oklahoma



Source: Oklahoma Employment Security Commission (2009)

Table 5.2: Northeast Oklahoma Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$2.725	$3.452	$4.444	$5.588	$7.119	$4.596
Consumption	$1.148	$1.640	$2.237	$2.901	$3.735	$2.301
Real Disposable Personal Income	$1.526	$2.069	$2.736	$3.533	$4.605	$2.846
Regional Output	$6.409	$8.073	$10.313	$12.966	$16.488	$10.684
Proprietors' Income	$0.145	$0.133	$0.136	$0.156	$0.187	$0.148
Income Taxes	$0.045	$0.062	$0.082	$0.105	$0.137	$0.085

	2011	2031	Average
Capital Stock	$0.606	$9.036	$4.383
Residential Actual Capital Stock	$0.409	$6.779	$3.206
Nonresidential Actual Capital Stock	$0.197	$2.257	$1.177
Employment (People)	38,767	42,937	40,416
Labor Force (People)	21,057	40,980	34,922
Population (People)	25,666	77,558	59,958
Net Economic Migrants (People)	7,130	209	2,117

In 2011, employment gains in Manufacturing are projected to outpace population growth by 51 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 38,767 net new jobs.

Population impact is predicted to grow from 25,666 people in 2011 to 77,558 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 7,130 people in 2011, representing a 27.8 percent gain in total population. Labor force impact, on the other hand, would surge to 40,980 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $2.846 billion per year, hindering an average growth rate of 5.7 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $0.148 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $9.036 billion by 2031. The impact on GRP is estimated to increase to average $4.596 billion yearly. Regional consumption, as a component of GRP, would grow by $2.301 billion annually, which would account for 50 percent of GRP. By 2031, regional output is predicted to equal $16.488 billion and average annual growth rate of regional output is projected to rise by 4.8 percent annually.

Southwest Oklahoma

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activity stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the southwest region was comprised of 202 manufacturers, which supported more than 7,351 jobs, both full and part time. Together, these 7,351 jobs accounted for 7.7 percent of total employment of all industries, and manufacturing comprised of 3 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 24 percent above all industries on average annual wage.

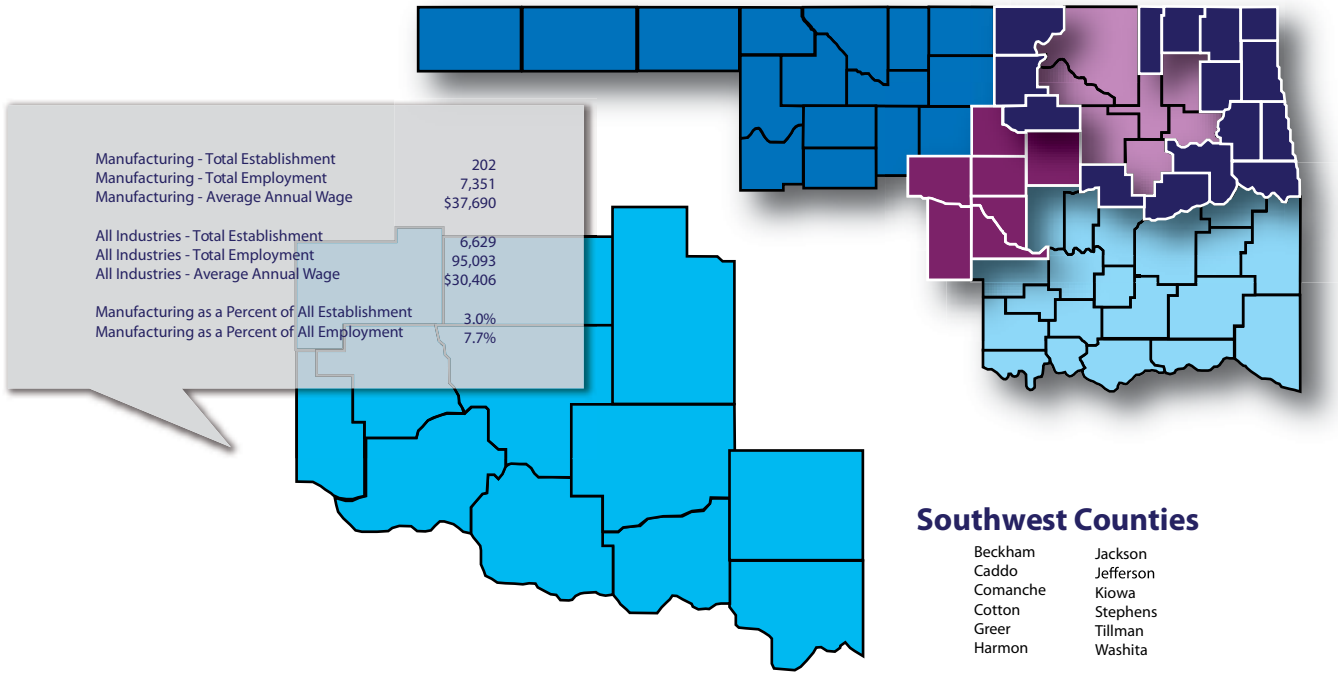
> With an employment multiplier of 2.0, Manufacturing's direct, indirect and induced impact upon Southwest Oklahoma are estimated to add 15,699 net new jobs by 2031.

The region has an employment multiplier of 2. This means, with every 100 new jobs created in Manufacturing, an additional 200 jobs will be created.

The top three distinct manufacturing industries in the southwest region include Plastic and Rubber Product manufacturing, Machinery manufacturing, and Food manufacturing. Among all, Plastic and Rubber manufacturing remained the largest employer in the region, employing more than 2,725 people (37.1 percent) in 2009. By comparison, Machinery manufacturing made up the second largest share of 19.3 percent (1,416 jobs), while the Food manufacturing sustained 1,053 jobs (14.3 percent) in the region.

Table 5.3 summarizes the economic impact results for the southwest region. (on next page)

Map 5.3: Manufacturing Overview - Southwest Oklahoma



Source: Oklahoma Employment Security Commission (2009)

Table 5.3: Southwest Oklahoma Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$1.148	$1.518	$1.989	$2.491	$3.153	$2.036
Consumption	$0.461	$0.668	$0.924	$1.207	$1.549	$0.950
Real Disposable Personal Income	$0.619	$0.847	$1.120	$1.443	$1.872	$1.162
Regional Output	$2.769	$3.697	$4.841	$6.054	$7.623	$4.946
Proprietors' Income	$0.041	$0.027	$0.016	$0.012	$0.010	$0.020
Income Taxes	$0.018	$0.025	$0.033	$0.042	$0.054	$0.034

	2011	2031	Average
Capital Stock	$0.186	$2.825	$1.360
Residential Actual Capital Stock	$0.128	$2.142	$1.014
Nonresidential Actual Capital Stock	$0.058	$0.683	$0.346
Employment (People)	13,464	15,699	14,583
Labor Force (People)	9,779	18,736	16,040
Population (People)	12,351	37,882	29,130
Net Economic Migrants (People)	3,369	-	936

In 2011, employment gains in Manufacturing are projected to outpace population growth by 9 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 13,464 net new jobs.

Population impact is predicted to grow from 12,351 people in 2011 to 37,882 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 3,369 people in 2011, representing a 27.3 percent gain in total population. Labor force impact, on the other hand, would surge to 18,736 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $1.162 billion per year, hindering an average growth rate of 5.7 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $0.020 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $2.825 billion by 2031. The impact on GRP is estimated to increase to an average $2.036 billion yearly. Regional consumption, as a component of GRP, would grow by $0.950 billion annually, which would account for 46.6 percent of GRP. By 2031, regional output is predicted to equal $7.623 billion and average annual growth rate of regional output is projected to rise by 5.2 percent annually.

Southeast Oklahoma

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activities stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the southeast region was comprised of 496 manufacturers, which supported more than 18,473 jobs, both full and part time. Together, these 18,473 jobs accounted for 11 percent of total employment of all industries, and manufacturing comprised of 4.4 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 15.7 percent above all industries on average annual wage.

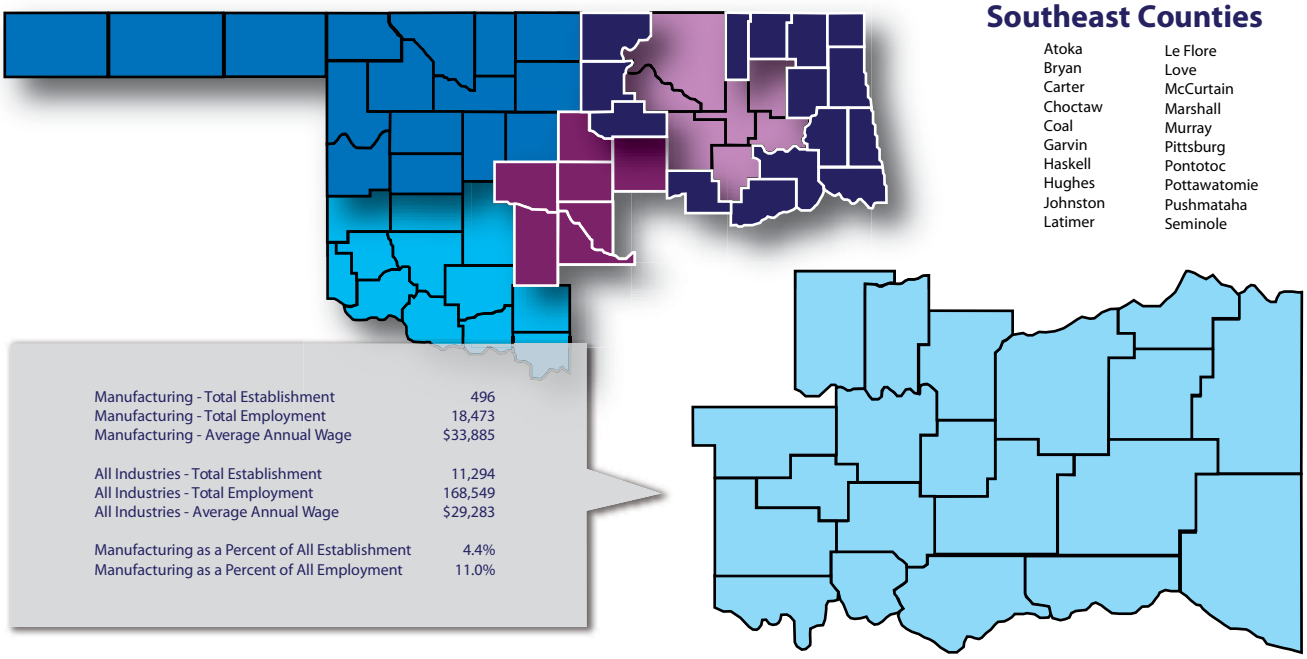
> With an employment multiplier of 2.1, Manufacturing's direct, indirect and induced impact upon Southeast Oklahoma are estimated to add 41,775 net new jobs by 2031.

The region has an employment multiplier of 2.1. This means, with every 100 new jobs created in Manufacturing, an additional 210 jobs will be created.

The top three distinct manufacturing industries in southeast region include Food manufacturing, Plastic and Rubber manufacturing, and Machinery manufacturing. Among all, Food manufacturing took over Plastic and Rubber manufacturing and became the largest employer in the region, employing more than 4,002 people (21.6 percent) in 2009. By comparison, Plastic and Rubber manufacturing made up the second largest share of 20.2 percent (3,729 jobs), while the fabricated metal product manufacturing sustained 2,098 jobs (11.4 percent) in the region.

Table 5.4 summarizes the economic impact results for the southeast region.

Map 2.4: Manufacturing Overview - Southeast Oklahoma



Source: Oklahoma Employment Security Commission (2009)

Table 5.4: Southeast Oklahoma Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$2.651	$3.337	$4.266	$5.320	$6.717	$4.397
Consumption	$1.127	$1.604	$2.193	$2.848	$3.654	$2.256
Real Disposable Personal Income	$1.499	$2.036	$2.699	$3.491	$4.544	$2.807
Regional Output	$7.591	$9.710	$12.420	$15.464	$19.423	$12.764
Proprietors' Income	$0.168	$0.150	$0.151	$0.169	$0.197	$0.163
Income Taxes	$0.044	$0.060	$0.080	$0.102	$0.133	$0.083

	2011	2031	Average
Capital Stock	$0.626	$9.273	$4.492
Residential Actual Capital Stock	$0.407	$6.774	$3.201
Nonresidential Actual Capital Stock	$0.219	$2.499	$1.290
Employment (People)	37,585	41,775	39,261
Labor Force (People)	22,361	43,098	36,749
Population (People)	28,265	84,447	65,530
Net Economic Migrants (People)	7,733	61	2,192

In 2011, employment gains in Manufacturing are projected to outpace population growth by 133 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 37,585 net new jobs.

Population impact is predicted to grow from 28,265 people in 2011 to 84,447 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 7,733 people in 2011, representing a 27.4 percent gain in total population. Labor force impact, on the other hand, would surge to 43,098 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $2.807 billion per year, hindering an average growth rate of 5.7 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $0.163 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $9.273 billion by 2031. The impact on GRP is estimated to increase to an average $4.397 billion yearly. Regional consumption, as a component of GRP would grow by $2.256 billion annually, which would account for 51.3 percent of GRP. By 2031, regional output is predicted to equal $19.423 billion and average annual growth rate of regional output is projected to rise by 4.8 percent annually.

OKC MSA

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activities stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the OKC MSA was comprised of 1,333 manufacturers, which supported more than 32,750 jobs, both full and part time. Together, these 32,750 jobs accounted for 6.0 percent of total employment of all industries, and manufacturing comprised of 3.9 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 55.7 percent above all industries on average annual wage.

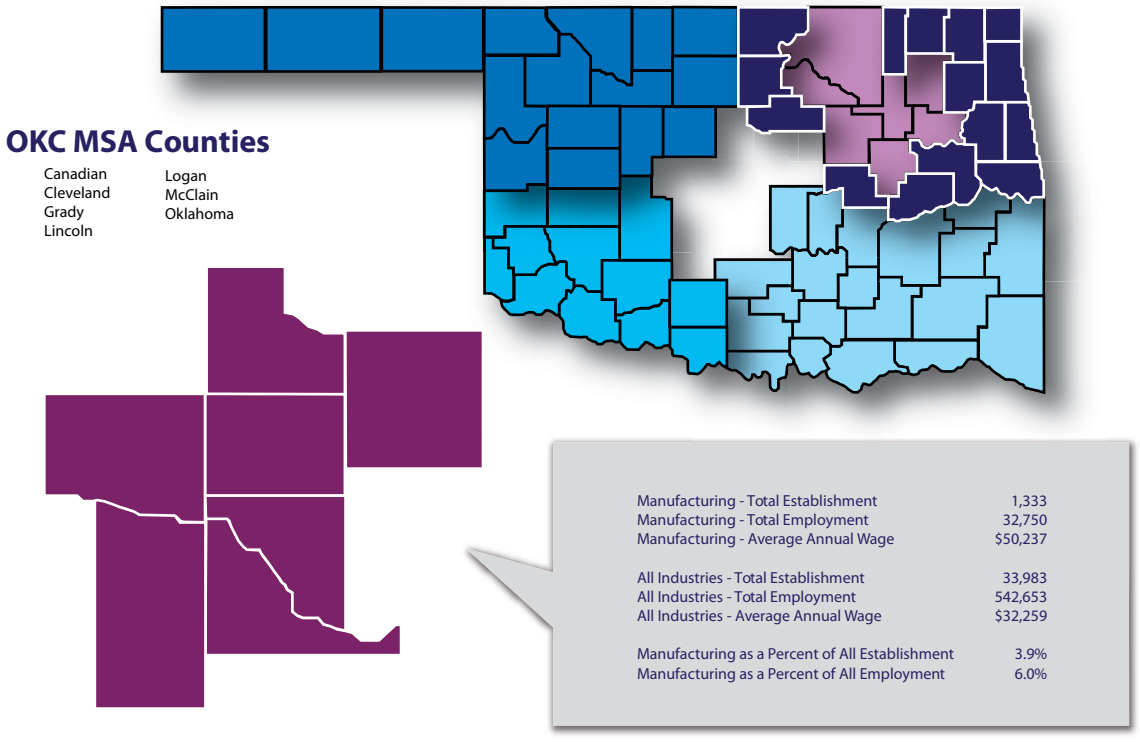
> With an employment multiplier of 2.7, Manufacturing's direct, indirect and induced impact upon OKC MSA are estimated to add 93,513 net new jobs by 2031.

The region has an employment multiplier of 2.7. This means, with every 100 new jobs created in Manufacturing, an additional 270 jobs will be created.

The top three distinct manufacturing industries in OKC MSA include Machinery manufacturing, Fabricated Metal Product manufacturing, and Transportation Equipment manufacturing. Among all, Machinery manufacturing remained as the largest employer in the region, employing more than 7,071 people (21.7 percent) in 2009. By comparison, Fabricated Metal Product manufacturing made up the second largest share of 17.1 percent (5,588 jobs), while the fabricated metal product manufacturing sustained 3,430 jobs (10.5 percent) in the region.

Table 5.5 summarizes the economic impact results for the OKC MSA region. (on next page)

Map 2.5: Manufacturing Overview - OKC MSA



Source: Oklahoma Employment Security Commission (2009)

Table 5.5: OKC MSA Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$7.087	$8.929	$11.552	$14.726	$19.076	$12.059
Consumption	$3.343	$4.475	$5.917	$7.576	$9.722	$6.117
Real Disposable Personal Income	$4.660	$5.982	$7.706	$9.832	$12.732	$8.042
Regional Output	$15.351	$19.359	$24.912	$31.706	$40.837	$25.990
Proprietors' Income	$1.795	$2.009	$2.369	$2.831	$3.458	$2.456
Income Taxes	$0.137	$0.183	$0.235	$0.298	$0.384	$0.244

	2011	2031	Average
Capital Stock	$1.682	$23.397	$11.527
Residential Actual Capital Stock	$1.184	$17.615	$8.522
Nonresidential Actual Capital Stock	$0.499	$5.782	$2.995
Employment (People)	84,461	93,513	87,119
Labor Force (People)	33,580	71,225	59,044
Population (People)	41,615	140,710	104,820
Net Economic Migrants (People)	11,960	719	3,909

In 2011, employment gains in Manufacturing are projected to outpace population growth by 103 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 84,461 net new jobs.

Population impact is predicted to grow from 41,615 people in 2011 to 140,710 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 11,960 people in 2011, representing a 28.7 percent gain in total population. Labor force impact, on the other hand, would surge to 71,225 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $8.042 billion per year, hindering an average growth rate of 5.2 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $2.456 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $23.397 billion by 2031. The impact on GRP is estimated to increase to an average $12.059 billion yearly. Regional consumption, as a component of GRP, would grow by $6.117 billion annually, which would account for 50.7 percent of regional GRP. By 2031, regional output is predicted to equal $40.837 billion and average annual growth rate of regional output is projected to rise by 5 percent annually.

Tulsa MSA

To analyze the economic impact of Manufacturing at the regional level, the state of Oklahoma is divided into 6 sub-state regions. The magnitude of economic impact for each region differs depending on the volume of economic activity stimulated by Manufacturing, and stems from the nature of the economic structure, activities, and labor market condition of the region.

In 2009, the Tulsa MSA was comprised of 1,587 manufacturers, which supported more than 46,785 jobs, both full and part time. Together, these 46,785 jobs accounted for 11.7 percent of total employment of all industries, and manufacturing comprised of 6.3 percent of the total industry establishment.

Manufacturing pays some of the highest wages compared to all industries in the region. As noted in the map, Manufacturing jobs in this region pay more than 44.3 percent above all industries on average annual wage.

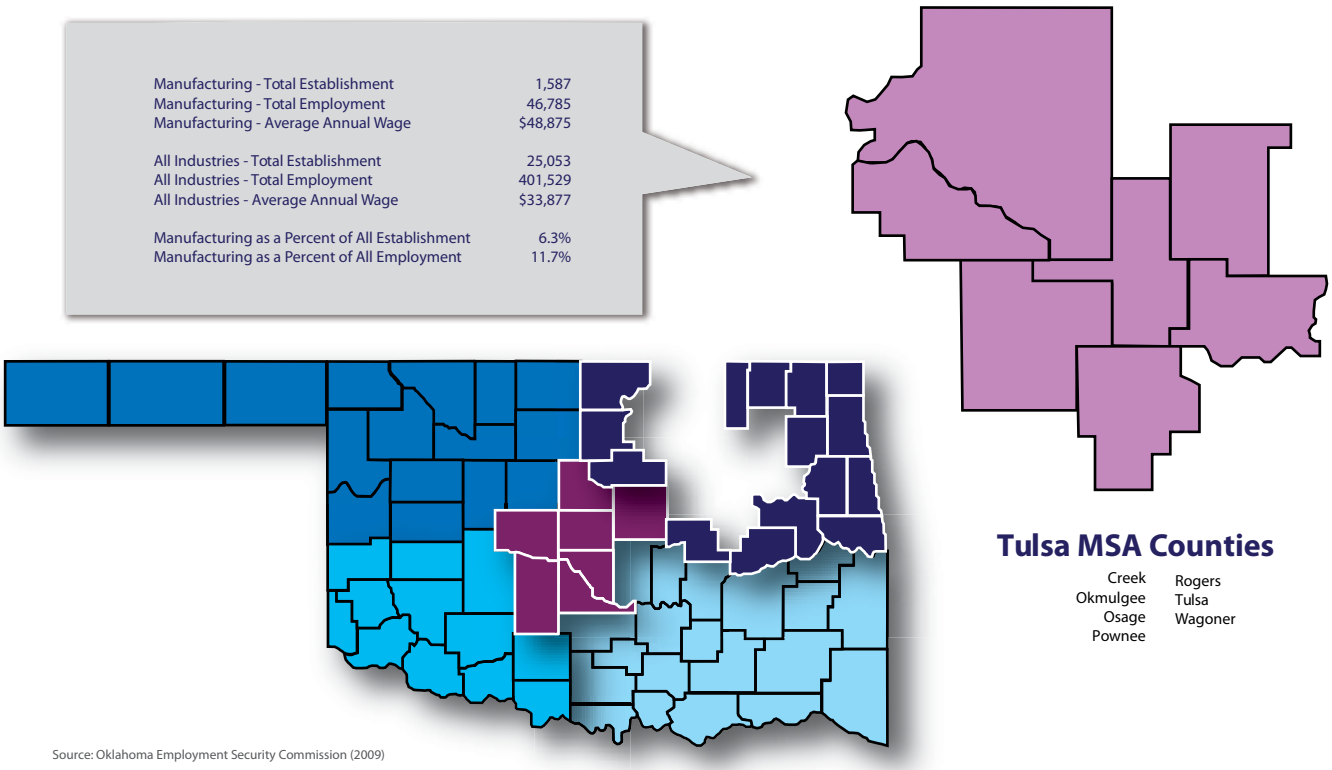
> With an employment multiplier of 2.5, Manufacturing's direct, indirect and induced impact upon Tulsa MSA are estimated to add 123,927 net new jobs by 2031.

The region has an employment multiplier of 2.5. This means, with every 100 new jobs created in Manufacturing, an additional 250 jobs will be created.

The top three distinct manufacturing industries in Tulsa MSA include Fabricated Metal Product manufacturing, Machinery manufacturing, and Transportation Equipment manufacturing. Among all, Fabricated Metal Product manufacturing remained as the largest employer in the region, employing more than 11,006 people (23.5 percent) in 2009. By comparison, Machinery manufacturing made up the second largest share of 23.1 percent (10,808 jobs), while the Transportation Equipment manufacturing sustained 5,278 jobs (11.3 percent) in the region.

Table 5.6 summarizes the economic impact results for the Tulsa MSA. (on next page)

Map 2.6: Manufacturing Overview - Tulsa MSA



Source: Oklahoma Employment Security Commission (2009)

Table 5.6: Tulsa MSA Economic Impact (in billions of current $)

Variable	2011	2016	2021	2026	2031	Average
Gross Regional Product	$10.536	$13.152	$16.868	$21.332	$27.610	$17.593
Consumption	$4.838	$6.489	$8.538	$10.865	$13.904	$8.806
Real Disposable Personal Income	$6.681	$8.553	$10.983	$13.935	$18.042	$11.443
Regional Output	$24.841	$31.405	$40.331	$51.028	$65.673	$41.973
Proprietors' Income	$2.613	$2.917	$3.418	$4.044	$4.953	$3.538
Income Taxes	$0.198	$0.262	$0.336	$0.424	$0.547	$0.349

	2011	2031	Average
Capital Stock	$2.572	$34.166	$17.104
Residential Actual Capital Stock	$1.708	$25.181	$12.237
Nonresidential Actual Capital Stock	$0.864	$8.985	$4.867
Employment (People)	114,770	123,927	116,710
Labor Force (People)	49,347	98,515	83,086
Population (People)	61,670	194,865	147,851
Net Economic Migrants (People)	17,130	715	5,162

In 2011, employment gains in Manufacturing are projected to outpace population growth by 86.1 percent, suggesting the sector is continuing to expand its role in stimulating regional economic activities. Manufacturing's impact on employment is estimated to create an additional 114,770 net new jobs.

Population impact is predicted to grow from 61,670 people in 2011 to 194,865 people in 2031. The projected population growth is largely affected by the influx of economic migrants entering the region. Economic migrants entering the region are predicted to total 17,130 people in 2011, representing a 27.8 percent gain in total population. Labor force impact, on the other hand, would surge to 98,515 people by 2031.

Real disposable personal income impact is forecasted to realize an average of $11.443 billion per year, hindering an average growth rate of 5.0 percent yearly. On the flip side, manufacturing's impact upon regional proprietors' income would average $3.538 billion annually.

Manufacturing's impact on total actual capital stock would ramp up to $34.166 billion by 2031. The impact on GRP is estimated to increase to an average $17.593 billion yearly. Regional consumption, as a component of GRP, would grow by $8.806 billion annually, which would account for 50 percent of regional GRP. By 2031, regional output is predicted to equal $65.673 billion and average annual growth rate of regional output is projected to rise by 5.0 percent annually.

References:

1. Advance Gross Domestic Product by Industry (2010), Bureau of Economic Analysis, (http://www.bea.gov/newsreleases/industry/gdpindustry/gdpindnewsrelease.htm)

2. International Comparisons of Manufacturing Productivity and Unit Labor Cost Trends in 2009 (December 21, 2010), Bureau of Labor Statistics, U.S. Department of Labor, (http://www.bls.gov/news.release/prod4.nr0.htm)

3. 2010 Gross Domestic Product by State, Bureau of Economic Analysis

4. Competing and Winning in a Global Economy, US Department of Commerce, (http://www.manufacturing.gov/report/competing.pdf)

5. Employment Database (2007 - 2009), Oklahoma Employment Security Commission

6. Richard McPherson and Lynn Gray (May 2011) Oklahoma Economic Indicators, Oklahoma Employment Security Commission

7. Oklahoma Manufacturing Facts, National Association of Manufacturers, (http://www.nam.org/~/media/A11D3C9D16F14B16BE10DE3117E15310.ashx)

8. 2011 ACE Book, Oklahoma 21st Century-Research Foundation Affiliate of The State Chamber, (http://www.ok21stcentury.com/images/uploads/2011ACEBook.pdf)

9. Kail M Padgitt (October 2010, Number 60), 2011 State Business Tax Climate, Tax Foundation

10. 2010 Oklahoma Export Report, Oklahoma Department of Commerce, (http://www.okcommerce.gov/Libraries/Documents/2010-Oklahoma-Exports-Overview-1_3263.pdf)

11. State Exports for Oklahoma, U.S. Census Bureau, (http://www.census.gov/foreign-trade/statistics/state/data/ok.html)

12. Daniel Griswold (June, 2011), 'Trade Agreements Promote U.S. Manufacturing Exports', (http://www.cato-at-liberty.org/trade-agreements-promote-u-s-manufacturing-exports/)

13. 2009 Oklahoma Export Statistics Report, The State Chamber of Oklahoma, (http://www.okstatechamber.com/additional/pdf/09OKExportReport.pdf)

14. George Treyz, Regional Economic Modeling, Kluwer Academic Publishers, 1993

15. Office of Management & Budget

16. Resource System Group, Inc.

17. The Oklahoma Tax Commission (http://www.oktax.state.ok.us) reports $3,250,058,797 of income tax was collected in 2009. The Bureau of Economic Analysis (http://www.bea.gov) reports personal income in Oklahoma equaled $132,132,355,000 in 2009. The proportion of income tax collected to personal income equals 2.46% The calculation for Oklahoma tax revenue applies to the same proportion (income tax collected/ personal income = 2.46%) to the personal income figure reported by the REMI model.

Center for Economic & Business Development
100 Campus Drive
Weatherford, OK 73096
Phone (580) 774-7095
Fax (580) 774-7096
cebd@swosu.edu
www.swosu.edu/cebd

© 2011 Southwestern Oklahoma State University's Center for Economic & Business Development