



**SCHOOL OF BUSINESS AND ECONOMICS
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**CONTRIBUTION OF MOTOR VEHICLE PARTS MANUFACTURING TO THE
KNOXVILLE METROPOLITAN ECONOMY**

Introduction

The purpose of this study is to estimate the contribution and economic impact of the motor vehicle parts manufacturing on the Knoxville Metropolitan Statistical Area (MSA). East Tennessee, located in the middle of the Southern Automotive Corridor, is the fastest growing region in North America. Using data from the East Tennessee Economic Development Agency (ETEDA), six of the seven new original equipment manufacturer (OEM) car and truck light assembly plants announced in the U.S. in the past 10 years are located in this corridor.¹ As a part of East Tennessee, the Knoxville MSA represents a portion of this activity through production of automotive parts. Currently, motor vehicle parts manufacturing represents about 20 percent of all manufacturing that occurs in the Knoxville MSA.² This means that this sector of manufacturing has a significant impact on the overall economic outcome of the Knoxville MSA. Because of the significant influence of this industry on the local economy, it is important to understand the trends and impacts of the industry for economic development and policy decisions. The Bureau of Labor Statistics currently defines the Knoxville MSA as Anderson, Blount, Campbell, Grainger, Knox, Loudon, Morgan, Roane, and Union Counties.

The U.S. automotive industry is going through a transformation to become more competitive globally, creating leaner more efficient operations. The Knoxville area is considered an excellent location for the next phase of growth in the automotive sector. While visiting many of the manufacturing facilities, it was determined that many of these producers are undergoing or have undergone recent expansions. In addition, the Knoxville area enjoys easy access to manufacturers throughout the South, including a one and a half hour drive to the \$1 billion Volkswagen OEM. Both suppliers and OEMs have found this region offers many benefits to the automotive industry, provided from the ETEDA, including:

- A prime location at the juncture of Interstates I-75, I-40, and I-81.
- More than 20 assembly plants within 200 miles

- More than 50 manufacturers producing assemblies and subassemblies
- A skilled and experienced workforce
- Access to automotive and advance materials research
- An overall favorable business climate.

A positive business climate, workforce, accessibility, and direct access to advanced research programs and facilities create a positive atmosphere in the Knoxville area for business. For example, research facilities and technology readily available to this industry, from the ETEDA, are listed below:

- Knoxville-Oak Ridge Technology Corridor
- Access to research at the Oak Ridge National Laboratory (ORNL)
- Center for Transportation Research at the University of Tennessee Knoxville (UT)
- National Transportation Research Center (researchers from ORNL and UT)
- Automotive Research Alliance

A basic industry is one in which the employment contributes to producing output that is sold (exported) outside of the region to non-residents. Manufacturing sectors tend to be classified as basic industries because most of the output in these industries is exported. The income derived from basic industries is then brought into the region and can be used to increase the overall economic well-being of the area. For the Knoxville MSA, the motor vehicle parts manufacturing industry would be considered a basic industry. There are over 20 automotive suppliers in the immediate Knoxville area serving the basic industry.

A non-basic industry is one in which the industry provides services, inputs, or output purchased by residents in the region. Non-basic industries are usually those that support the activities of basic industries or provide goods and services to residents. For example, restaurants and retail services tend to be non-basic as they are created from the income derived by the basic industries. By studying the economic impact of a basic industry, we can identify and relate the importance of the industry's activities for the economic growth and output of the region.

Location Quotients and Trends

A Location Quotient (LQ) is a statistic that shows the ratio of an industry's employment in a region compared to the overall level of employment in the region versus an industry's employment in the entire economy versus the overall level of employment in the entire economy. The LQ provides an analysis of how important an industry is to a local economy relative to the national economy. If an industry has a LQ equal to 1, then it would indicate the industry has the same concentration in the region as the entire economy. When an industry has a LQ greater than one, then it indicates the industry has a greater concentration in a region than the entire economy. The greater the LQ, the more the industry is concentrated in a region compared to the entire economy, which indicates that more of the industry's output will be exported. Thus, a larger LQ will indicate an industry is more of a basic industry.

The LQ for the Knoxville MSA motor vehicle parts manufacturing is computed by:

$$LQ = (M_k/T_k) / (M_{us}/T_{us}), \text{ where}$$

M_k = motor vehicle parts manufacturing in the Knoxville MSA

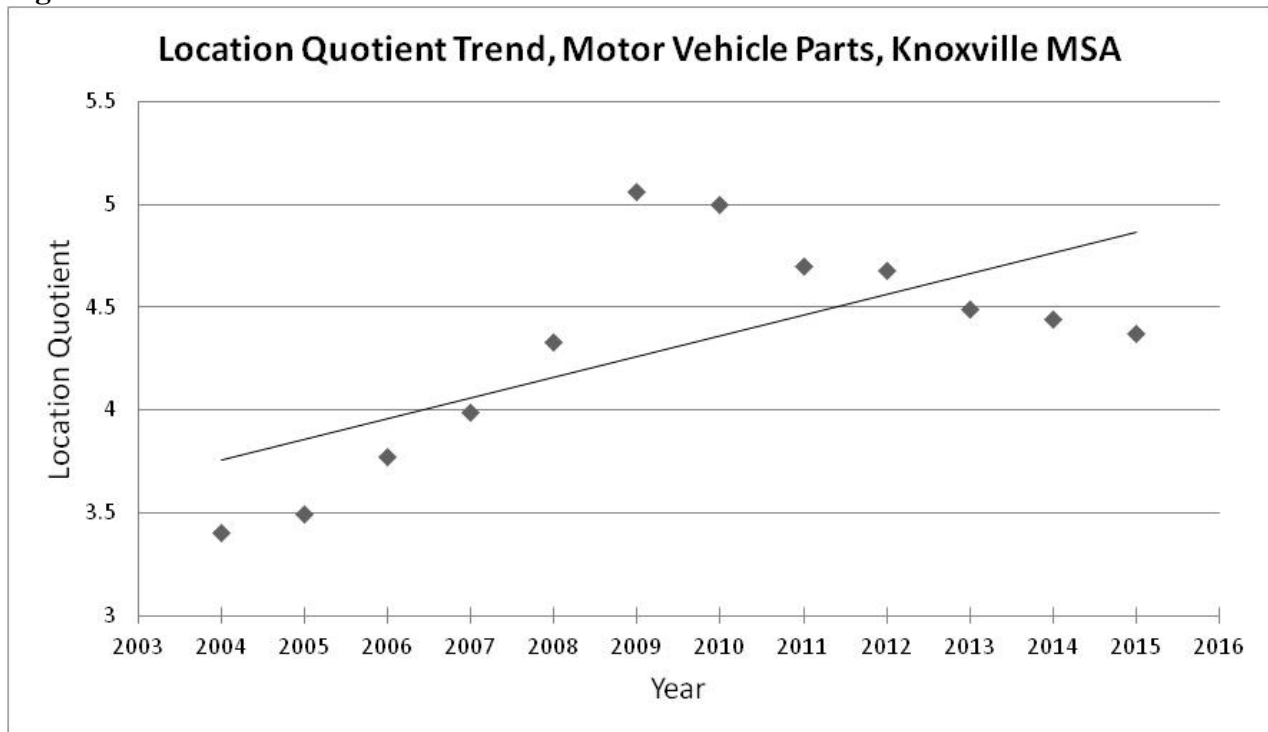
T_k = total employment in the Knoxville MSA

M_{us} = motor vehicle parts manufacturing in the United States

T_{us} = total employment in the United States.

The Bureau of Labor Statistics (BLS) provides a LQ calculator that can be used to find the LQ for the motor vehicle parts manufacturing industry for the Knoxville MSA. The calculator was used to find the LQ's for 2004 – 2015, which are shown in Figure 1. Table 1 and Figure 2 show the employment data for the motor vehicle parts manufacturing industry from 2004 – 2015. The BLS calculator can be accessed at http://data.bls.gov/location_quotient/ControllerServlet.

Figure 1



The latest LQ for the motor vehicle parts manufacturing industry for the Knoxville MSA was 4.37 in 2015. The high LQ confirms that the industry is a basic industry and almost all of the income in the industry would be derived from outside the region.³ In addition, as Figure 1 shows, the overall trend has been an increase in the LQ over time. The high LQ indicates that this industry is more concentrated and important for the Knoxville MSA economy versus the US economy while the upward trend in the LQ indicates the industry is becoming more significant for the local economy.

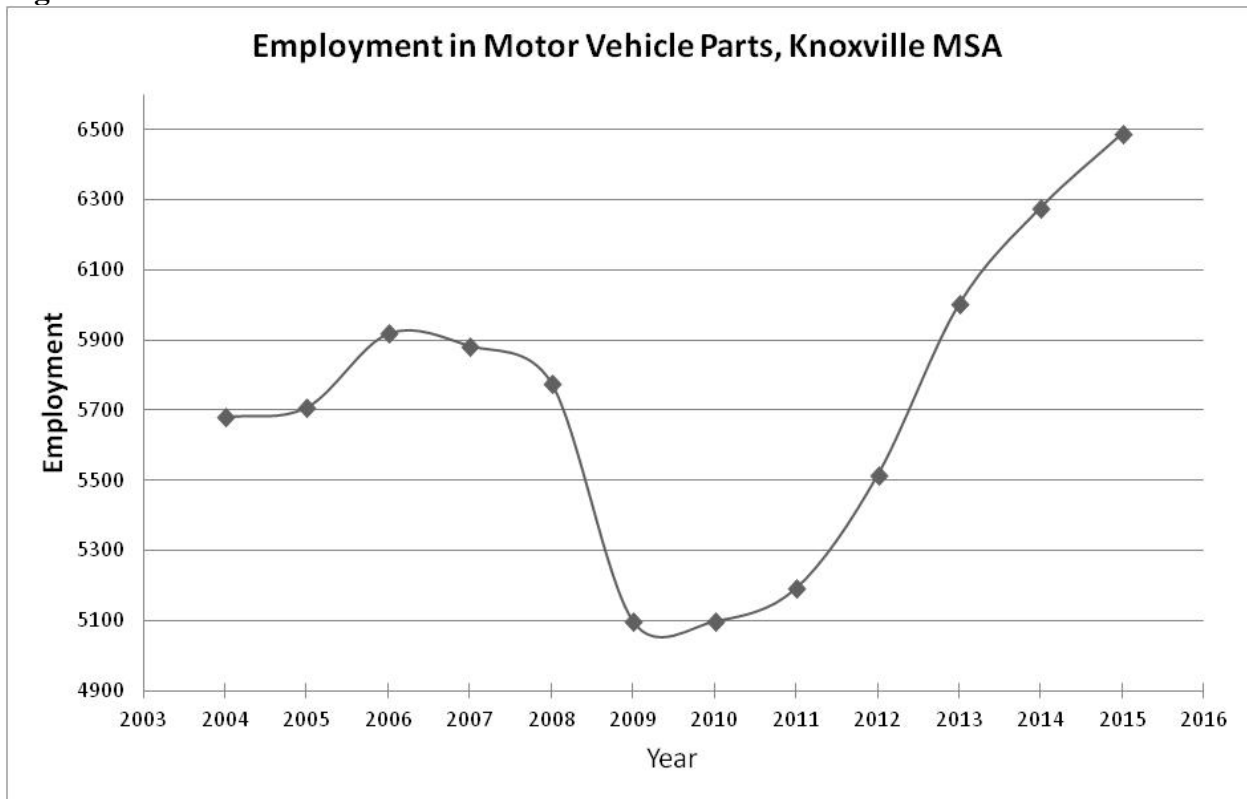
Except for the recession period of 2007-2009, employment has been increasing in this sector. While the LQ has increased since 2004, it reached a high point in 2009. Even though employment had

declined in 2009, the LQ increased because the employment of the industry in the Knoxville MSA did not decline as much as employment declined for the entire US economy. All of this data show the increased importance of the motor vehicle parts industry on the Knoxville MSA. The increased importance of this industry is more of a reason for the need of this type of study.

Table 1

Year	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
Employment	6487	6276	6000	5512	5190	5096	5097	5776	5882	5917	5707	5679

Figure 2



Economic Impact Analysis

For the Knoxville MSA, we have employment data from the BLS for 2015 for the motor vehicle parts industry. The Bureau of Economic Analysis (BEA) provides data on regional real GDP of the industry for the Knoxville MSA. The industry regional real GDP provides a measure of the value of output or income generated for the local economy from the industry. The amount of employment and regional real GDP can be used as starting values to find the contribution to the economy's total employment and income from the auto parts manufacturing industry.

For 2015, the level of employment in the motor vehicle parts manufacturing industry was 6,487 workers. The most recent data on regional real GDP provided by the BEA for the Knoxville MSA in

the motor vehicle parts manufacturing industry is from 2014. In 2014, regional real GDP in the Knoxville MSA for this industry was \$975.88 million.⁴

The BEA produces employment and output multipliers for different regions and industries in the United States using a Regional Input-Output Modeling System (RIMS II). RIMS II multipliers used for this study were produced by the Regional Product Division of the Bureau of Economic Analysis on 1/23/2017. Analysis developed with these multipliers should be attributed to the study’s authors, rather than the BEA. The RIMS II multipliers can be used to show how changes in final demand will impact changes in a region’s economic activity; however, the multipliers can also be used to estimate the total contribution an industry provides to a region’s overall economic activity. In general, economic multipliers estimate how much an initial change in economic activity will cause in total increased economic activity by including additional rounds of spending that are triggered by the initial change. The multipliers represent the total of the initial change and all of the rounds of spending.

Because this study is examining the total contribution of the motor vehicle parts manufacturing industry on the Knoxville MSA economy, the Type II multipliers from RIMS II will be utilized. The Type II multipliers include the direct impacts (those caused by the direct spending in the industry), indirect impacts (those caused by the production needs of the industry), and induced impacts (those caused by the spending of people receiving benefits from the industry) that occur in the region. This will allow for all activity an industry contributes to a region’s economy to be included.

The employment and regional Real GDP, along with the RIMS II multipliers, will provide estimates of the total economic impact the motor vehicle parts manufacturing industry contributes to the Knoxville MSA economy. Table 2 uses the final-demand multiplier for output and regional Real GDP to estimate how much of the region’s gross output is supported by the industry in 2014.

Table 2

Total Contribution by the Motor Vehicle Parts Manufacturing Industry to the Knoxville MSA Gross Output in 2014	
Regional Real GDP for the Motor Vehicle Parts Manufacturing Industry (millions of dollars)	\$975.88
Final Demand Output Multiplier	1.8954
Total Contribution to Gross Output (millions of dollars)	\$1,849.68

For 2015, because regional Real GDP data is not available, a direct effect employment multiplier will be used. Table 3 uses the direct effect employment multiplier to estimate the number of jobs in the region that have been created from each job in the industry.

Table 3

Number of Jobs Directly Supported by the Motor Vehicle Parts Manufacturing Industry in the Knoxville MSA in 2015	
Employment for the Motor Vehicle Parts Manufacturing Industry (number of jobs)	6,487
Direct Effect Employment Multiplier	2.7127
Number of Jobs Directly Supported (number of jobs)	17,597

Marginal Economic Impact of Motor Vehicle Parts Manufacturing

The marginal economic impact of an industry, such as the motor vehicle parts manufacturing, is defined as the “change in total earnings paid to households employed in all industries for each job created or lost in the motor vehicle parts manufacturing industry.” The marginal economic impact is not the same as an industry’s total contribution to the local economy. Some service industries provide thousands of jobs in the local economy, but have small marginal economic impacts, whereas many manufacturing industries with far fewer employees have large marginal impacts. The marginal economic impact is useful in measuring how expansion or contraction of an industry affects household earnings.

The marginal economic impact for an industry is derived from BEA RIMS II multipliers. The methodology for computing marginal economic impacts from BEA multipliers is presented in KIRES Report No, 10, “*A Methodology to Rank Industries According to their Marginal Economic Impact: Case Studies for the First Congressional District of Tennessee and The Knoxville Metro Area*,” January 2014. The report is available at <http://kires.king.edu>.

The marginal economic impact for the motor vehicle parts manufacturing industry in the Knoxville metro area is estimated at \$135,100 (2015 dollars, rounded to the nearest hundred). This means that for each additional job created in this industry, total earnings paid to households employed in all industries in the metro area increase by \$135,100. The marginal economic impact for each job lost in the industry is a negative \$135,100.

The direct effect jobs multiplier for the motor vehicle parts manufacturing industry is 2.7127, indicating that each job in this industry supports an additional 1.7127 jobs in all other sectors of the metro economy. The marginal economic impact of \$135,100 is, therefore, the sum of household earnings from all 2.7127 jobs.

As shown in Table 1, employment in the motor vehicle parts industry increased from 6,276 in 2014 to 6,487 in 2015, a gain of 211 jobs. The marginal economic impact of \$135,100 implies that total earnings paid to households employed in all sectors of the Knoxville Metro economy rose by \$28.5 million (\$135,100 multiplied by 211).

Conclusion

The motor vehicle parts manufacturing industry plays a vital role in determining the level of economic activity in the Knoxville MSA. Already at 20 percent of the manufacturing of the economy, this industry supports many jobs in the area and provides a significant amount of value to the region’s total output. This study found that the motor vehicle parts manufacturing industry supports 17,597 jobs in the region and contributes \$1.85 billion to the Knoxville MSA regional Real GDP. And, as noted above, expansion or contraction of the industry has a significant impact on household earnings.

As this industry is continuing to expand over time, it is important that other business leaders and government officials understand the importance of this industry to the regional economy. A great

deal of care should be taken when considering changes to policy that may increase or decrease activity in the motor vehicle parts manufacturing industry. In addition, when changes in the national economy occur, knowing how those changes impact the industry is essential for understanding how regional employment and output will be affected.

Footnotes

1-Data from East Tennessee Economic Development Agency can be found at:

http://www.eteda.org/business_sectors/advanced

2 – Using data from the BEA, the Real GDP for the Knoxville MSA in the motor parts manufacturing industry as a percentage the Real GDP for the Knoxville MSA of overall manufacturing in 2014 was 20 percent.

3 – In contrast, retail trade, in 2015, had a LQ of 1.11. Therefore, retail trade would be a non-basic industry with a concentration about the same as the overall US economy.

4 – The data provided by the BEA for regional Real GDP is for the Motor vehicles, bodies and trailers, and parts manufacturing industries. Because the motor vehicle parts manufacturing is a portion of this total, employment data was used to estimate the portion of regional Real GDP attributed to the motor vehicle parts manufacturing industry in 2014.

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