

**CONTRIBUTION OF THE AUTOMOTIVE INDUSTRY  
TO THE ECONOMIES OF ALL FIFTY STATES  
AND THE UNITED STATES**

**BY**



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## **EXECUTIVE SUMMARY**

- **8 million private sector jobs impacted by the U.S. auto manufacturers, suppliers and dealers**
- **\$500 billion in annual compensation**
- **Vehicle manufacturer job creation multiplier of 10**
- **Entire industry multiplier of 4**

The year 2008 was like no other in the U.S. automotive industry. Vehicle sales early in the year appeared to be on track with expected volumes but quickly deteriorated as a recession took hold and the bottom fell out of the financial sector — choking off credit to automakers, suppliers and consumers. By the end of 2008, two of the Detroit-based companies' long term sustainability was threatened, and virtually the entire U.S.-based auto producing industry was operating facilities at less than 50 percent capacity utilization. This ramp-down in production affected not only the OEMs, but the supplier sector quickly felt the pain as many suppliers halted production and (along with the OEMs) laid off employees — some never to come back.

This situation of extremely low year-end employment made it very difficult to analyze the true employment and economic impact of the auto industry—the purpose of this report. Performing an economic and employment impact analysis of the auto industry requires the input of year-end direct employment data for the original equipment vehicle manufacturers (OEM), supplier and dealer sectors. This left the study authors in a predicament: what employment numbers to use—the year end, depth-of-a-recession employment numbers which are not sustainable, the high point of earlier in the summer of 2008, or something else? CAR researchers chose to use an average employment (between the low and high ends) on the theory that the auto industry would not remain in recession and the employment numbers at the bottom of a recession would not be the real indicators of true employment. However, with the uncertainty about when the industry would return to “normal” employment, the authors did not want to appear overly optimistic, instead inputting numbers that roughly correlate with a 12 million unit sales year—the expectation for 2010. As a result, this study represents the expected employment and economic impact of the industry on the national and 50-states' economies within the next year or so.

For the study, the authors assumed:

- Vehicle manufacturers (OEM) directly employed 313,000 people  
Includes manufacturing, research and development, headquarters, and all other operational activities

- 686,000 people were employed in the automotive parts sector. Includes a percentage employment from rubber, plastics, batteries, and other non-automotive sectors
- 737,000 people were employed in the dealer network selling and servicing new vehicles
- 1,736,000 people were employed in the entire industry

The study shows that these 1.7 million direct jobs contribute to an estimated:

- 8 million total private sector jobs
- more than \$500 billion in annual compensation and
- more than \$70 billion in personal tax revenues.

Therefore, the employment multiplier for OEM activities is 10, while the employment multiplier for the entire industry is 4.

The employment multipliers derived from manufacturing vehicles, and from manufacturing and selling vehicles are both higher than multipliers seen in previous studies. The authors believe the recession is assisting in determining the true impact of the industry by not only calculating marginal jobs affected by the industry, but also by estimating that entire companies would close, taking many of the support jobs with them. It may be that the 10 multiplier is indeed a truer indicator of the auto industry's impact than previous studies had revealed.

Breakout of the employment and economic impacts by OEM, supplier, and dealer sector are as follows:

- Direct, intermediate, and spin-off employment from OEM activities estimated at 3.1 million
- Total compensation of over \$200 billion
- Estimated personal tax payments of nearly \$30 billion
  
- Total employment generated by parts manufacturing is estimated to be 3.3 million
- Total compensation of over \$200 billion
- Estimated personal tax payments of \$30 billion
  
- Total employment generated by the dealership network is estimated to be 1.5 million
- Total compensation of \$90 billion
- Estimated personal tax payments of roughly \$10 billion



Further details of these impacts, and those regarding state-level employment and economic impacts, can be found in the body of the study.

## ***INTRODUCTION***

The United States automotive industry is a critical component of economic growth with extensive interconnections across the industrial and cultural fabric of the U.S. This report outlines many known elements and highlights tremendously important associations beyond the market space of manufacturing. It touches on the following elements as they relate to the automotive industry: national and regional employment; research, development and innovation; state and local government revenues; foreign direct investment; education; health care; U.S. trade; and quality of life.

The paper is organized into two sections: Section I provides qualitative context and current market metrics for the automotive industry, both of which are needed to truly appreciate the contributions of the industry to the broader economy and gauge where the sector may be heading; Section II features an in-depth quantitative analysis of employment and personal income associated with the automotive sector. Section II is subdivided into four primary sections to capture the distinct contributions of suppliers, assemblers, and dealers to the national economy with a final summary section that describes the state-level employment associated with the automotive industry.

The auto industry is one of the most important industries in the United States. It historically has contributed 3 – 3.5 percent to the overall Gross Domestic Product (GDP). The industry directly employs over 1.7 million people engaged in designing, engineering, manufacturing, and supplying parts and components to assemble, sell and service new motor vehicles. In addition, the industry is a huge consumer of goods and services from many other sectors, including raw materials, construction, machinery, legal, computers and semi-conductors, financial, advertising, and healthcare. The auto industry spends \$16 to \$18 billion every year on research and product development – 99 percent of which is funded by the industry itself. Due to the industry's consumption of products from many other manufacturing sectors, it is a major driver of the 11.5% manufacturing contribution to GDP. Without the auto sector, it is difficult to imagine manufacturing surviving in this country.

Recently, the auto industry has fallen on tough times. However, the U.S. market is still one of the largest motor vehicle markets in the world; consequently, many automakers sell and manufacture in the U.S. In fact, many automakers make the lion's share of their profits in North America. There has been a period of restructuring by the three U.S.-based companies in order to right-size their operations and be able to respond to this fierce competition in the U.S. market. In the latest restructuring, a bursting of the housing bubble and a collapse of the financial sector

led to the current period of extremely tight credit, making it nearly impossible for companies and consumers to make investments. During this period, many supplier companies, dealerships and a couple of manufacturers found themselves fighting for survival and turning to the lender of last resort—the federal government. This led to an amazing time of public introspection concerning the value to the country of a U.S.-based auto industry.

In this paper, the authors touch on many of the factors that support the auto industry's importance and standing in the national economy, along with an estimate of the industry's employment and economic contribution to the national economy and to each of the 50 states and the District of Columbia.

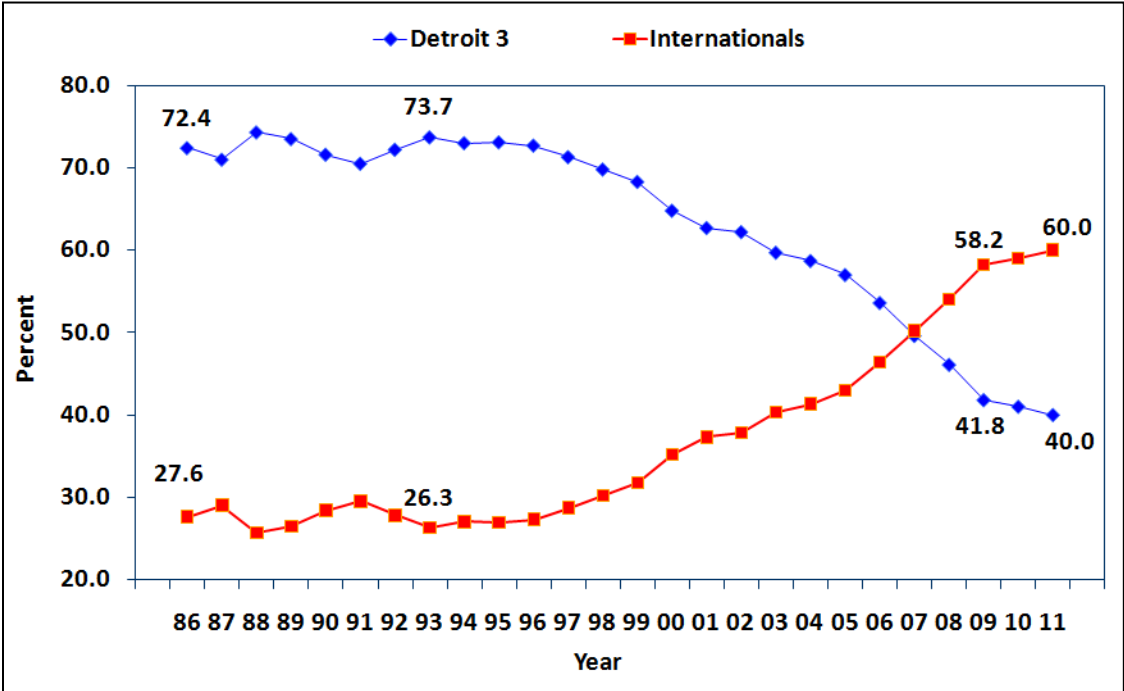
As previously mentioned, over 1.7 million people are employed by the auto industry. In addition, the industry is a huge consumer of goods and services from many other sectors and contributes to a net employment impact in the U.S. economy of nearly 8 million jobs. Approximately 4.5 percent of all U.S. jobs are supported by the strong presence of the auto industry in the U.S. economy. People in these jobs collectively earn over \$500 billion annually in compensation and generate more than \$70 billion in tax revenues.

**SECTION I – Automotive Industry Overview**

National economies are defined by their ability to develop differentiated goods and services. For roughly 100 years, the United States automotive industry has helped shape the identity of the U.S. economy and has generated millions of jobs. Given the immense economic uncertainties that accompany the current recession, it is important to understand the industry’s characteristics and contributions to the broader economy. Section I of this report begins with summary information on the overall size and composition of the industry.

The composition of the auto industry has been transformed over the past two decades as domestic automotive assembly firms (Chrysler, Ford and General Motors) have slowly lost market share to international firms (e.g., Toyota, Honda and Hyundai) operating in the U.S. As shown in Figure 1.1, in 2007, for the first time in history, market share parity occurred; by the end of 2009, the Detroit 3’s market share is expected to be just below 42 percent. A leveling-off effect is forecasted for 2010 and 2011. The stark erosion of domestic OEM market share in just twenty years reveals how competitive the U.S. automotive landscape has become for manufacturers worldwide.

**Figure 1.1: U.S. Motor Vehicle Market Share, 1986-2011**



Source: CAR Research

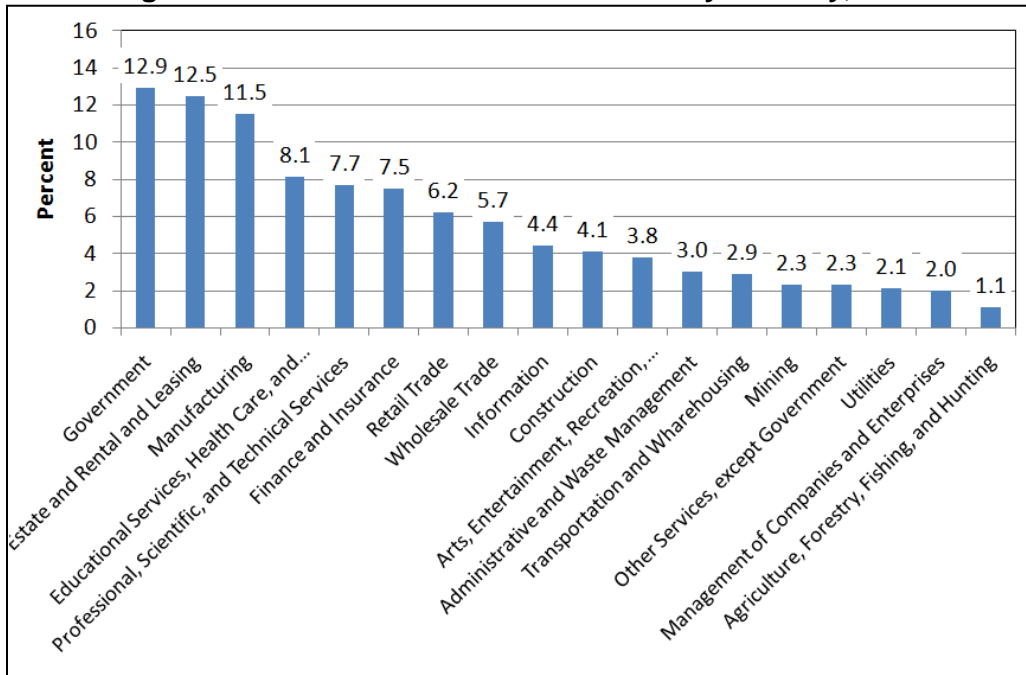
The automotive industry is dynamic; over the past two decades, the U.S. industry has been transformed by more than \$25 billion in new direct investments from Asia and Europe<sup>1</sup>. Much of the foreign direct investment has gone to areas in the country that were not traditional locations for automotive employment—in effect, stretching the footprint of the U.S. auto industry. This transformation has been very important to suppliers throughout the U.S.; the density distribution of jobs related to suppliers (as reported in Section II) shows both growth areas in the southern U.S. in addition to the dense network of manufacturing found in the Great Lakes states.

The economic performance of the automotive sector, and the broader manufacturing sector, is extremely important for the continued development and growth of the national and regional economies, as it comprises a large share of total U.S. output (see Figures 1.2 and 1.3). At the end of 2008, U.S. automotive output was 2.2% of GDP, and overall manufacturing contributed 11.5% to GDP. The sizeable contribution to economic output by the manufacturing industry is attributable to several factors, including international trade opportunities that allow for the export of highly specialized manufactured products. Many of these products are high value-added goods that are made through the use of skilled laborers and advanced equipment. The complexity of making these products contributes to the large job-creating multiplier effect of manufacturing within the U.S.

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<sup>1</sup> Center for Automotive Research, Book of Deals

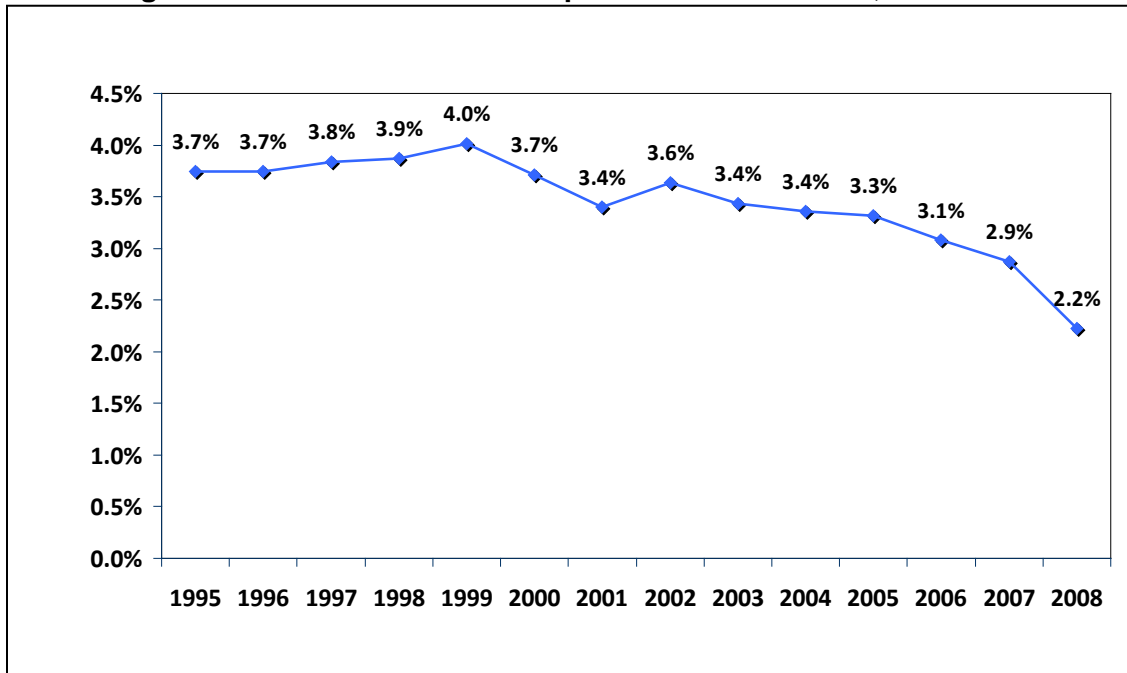
**Figure 1.2: Percent Contribution to GDP by Industry, 2008**



Source: Bureau of Economic Analysis

Innovation and productivity by manufacturers allows for the development and delivery of customized, durable, high quality goods to households. Maintaining and enhancing these positive aspects of U.S.-manufactured goods requires a commitment to the research and development process. Despite recent declines in the once booming manufacturing sector, the important catalytic effect from these industries should be acknowledged.

**Figure 1.3: U.S. Automotive Output as Percent of GDP, 1995-2008**



Source BEA

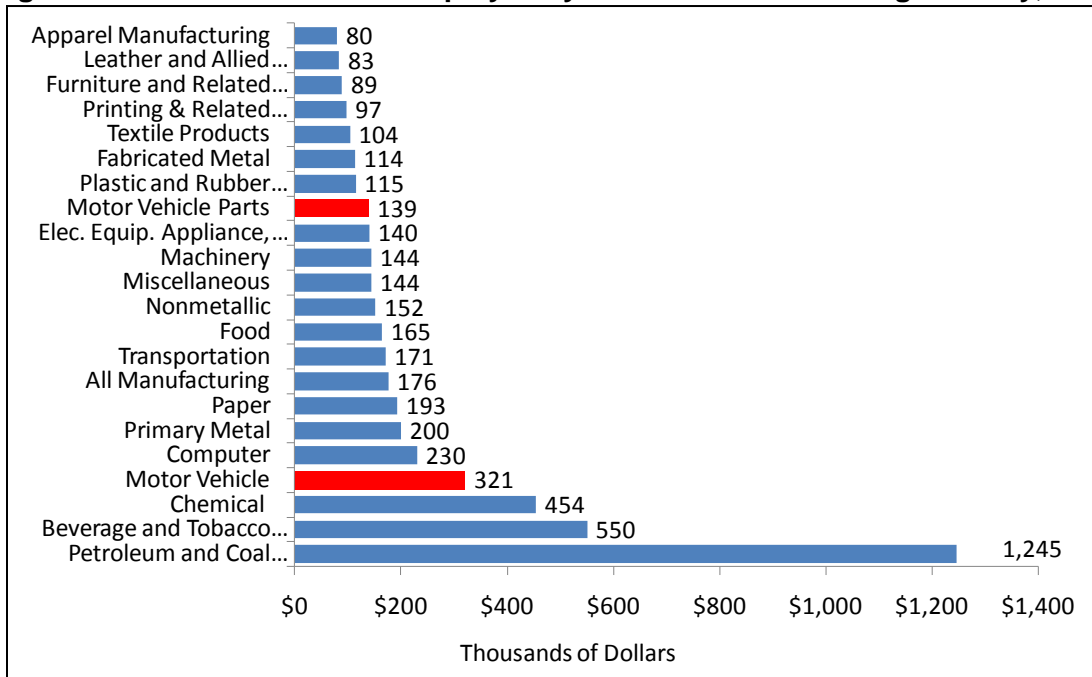
All estimates Nominal

When people think of the automobile industry, they generally picture a very large assembly plant staffed with thousands of people and equipped with conveyor belts and robots as far as the eye can see. What these observers probably do not see are the many supplier companies that design and manufacture the parts needed for the final assembly to occur. In the past, parts-making operations were an integral function of the large motor vehicle assembly companies, but as the industrial structure of the automotive industry evolved and the number of parts required to fully assemble a vehicle grew, so too did the technical depth and geographic location of parts manufacturers. A primary objective of this report is to illustrate just how important the diversity and quality embodied in the parts sector is to the automotive sector value-chain.

The automotive industry is a very important industry in the U.S. economy; no other single industry links as closely to the U.S. manufacturing sector or directly generates as much retail business and overall employment. Manufacturing has been the backbone of the American economy, and the automotive industry is its heart. A look at the entire production and supply chain provides a rich narrative of how a strong automotive industry historically supports the growth and stability of many other industries, such as basic materials suppliers of steel, plastic, rubber and glass, which are used for making bodies, interiors and trim, tires, gaskets and windows.

Figure 1.4 provides a comparison of the value added per employee (measured in thousands of dollars per year) across several manufacturing industries. The value added per employee can be thought of as the difference between the cost of materials and the sale price of the good. Effective deployment of land, labor, and capital create value; in 2006, each employee in the motor vehicle assembly industry created \$321,000 of value in the final products shipped; fourth highest amongst manufacturing industries.

**Figure 1.4: Value-Added Per Employee by Detailed Manufacturing Industry, 2006**

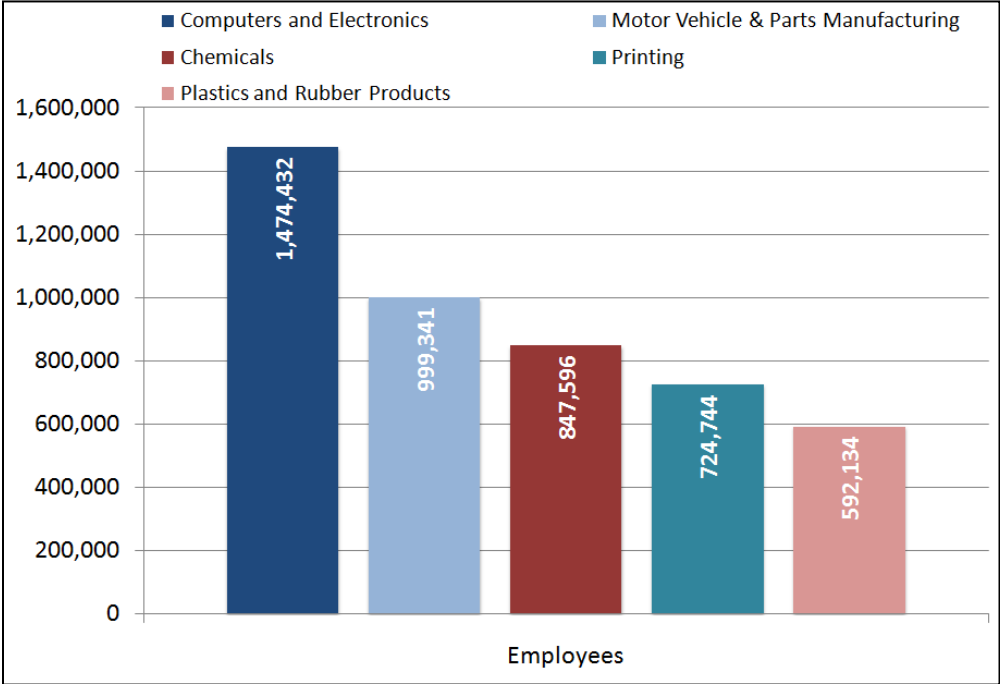


Source: 2006 Annual Survey of Manufacturers; US Census Bureau



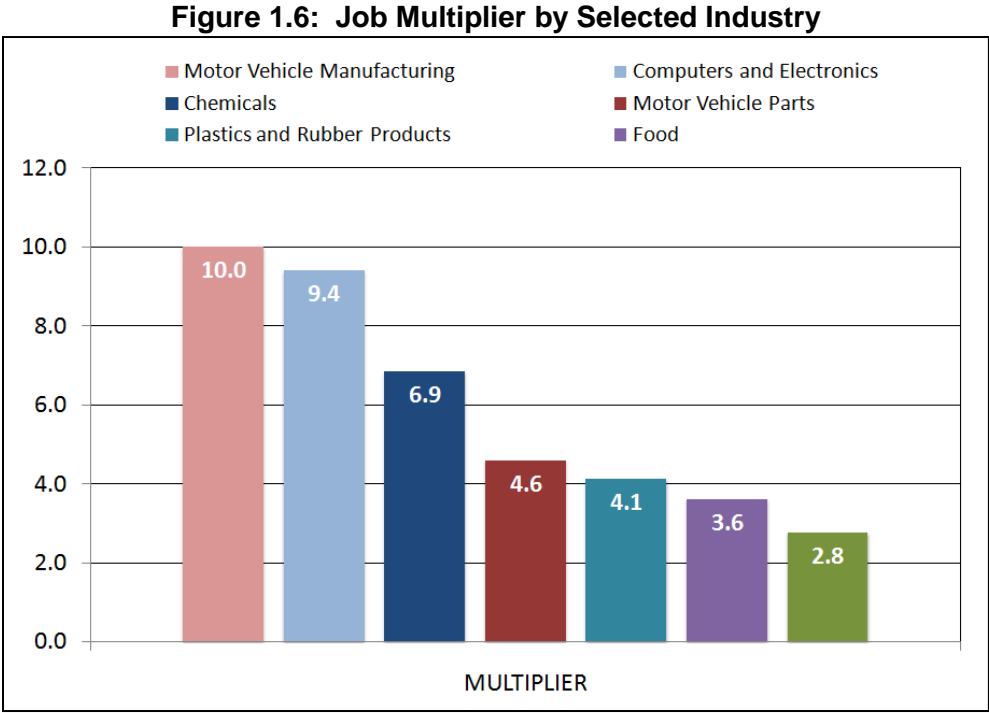
An economy is reinforced by the size and job creating capability of its manufacturing base. Within the broad manufacturing landscape of the U.S., few industries are as large or provide so many indirect and ancillary opportunities for job creation as the motor vehicle industry. Figure 1.5 highlights the sheer size of the motor vehicle assembly and parts manufacturing industry which is the second largest employer within the subset of manufacturing.

**Figure 1.5: Employees by Selected Industry**



Some industries inherently create more jobs than other industries. A high jobs creation multiplier tends to be associated with industries that require large amounts of inputs from other industries, source inputs from industries that have a high regional purchase coefficient, or pay above average wages.

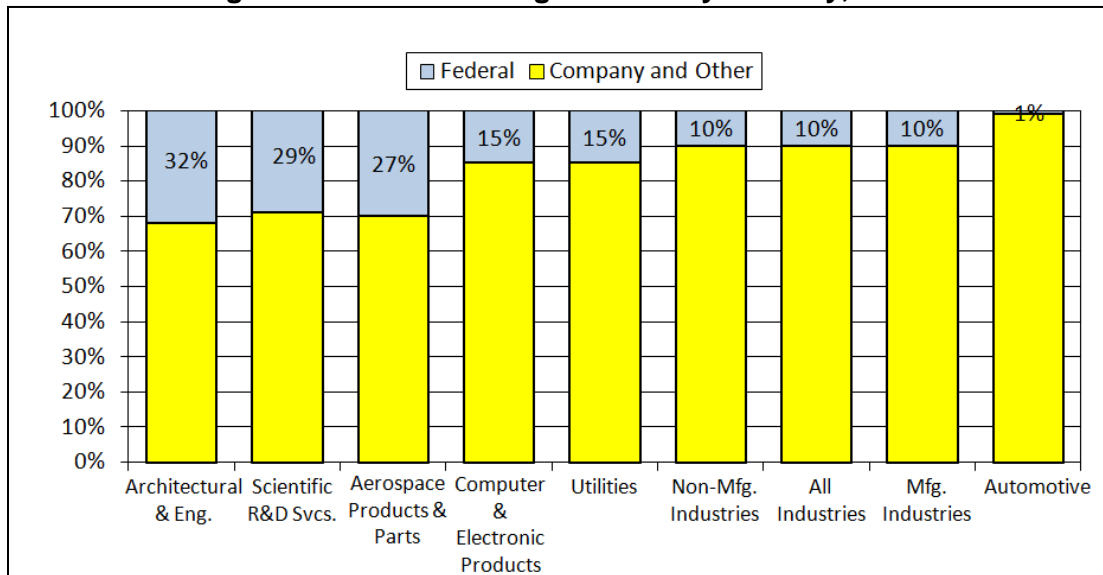
Figure 1.6 details the employment multiplier for a select set of industries. The motor vehicle assembly industry, with its multiplier of 10, is an industry that meets all of the above criteria.



## Research, Development & Innovation

The automotive industry invests heavily in research and development. Unlike other industries, automotive research and development efforts are largely funded by the industry, rather than through public sources. Only 1 percent of R&D in the automotive industry was funded through the Federal government, leaving the industry to bear essentially the full cost of creating new technologies, engine and equipment designs, testing, and implementation (see Figure 1.7). More recent developments in Federal funding — of automotive R&D specifically and the industry in general — as a result of the economic downturn and a federal emphasis on increased fuel efficiency will be detailed at the end of Section I.

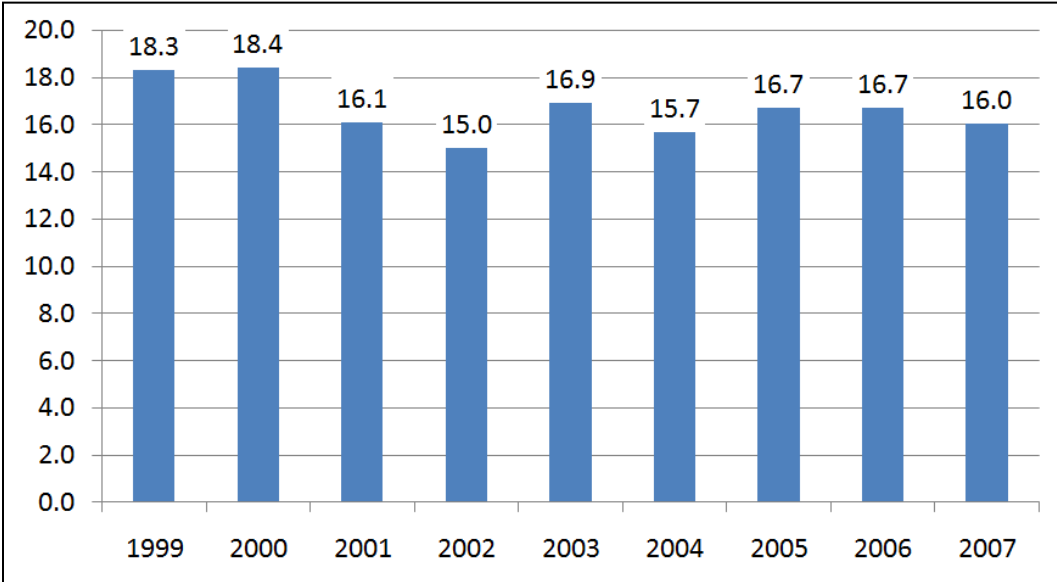
**Figure 1.7: R&D Funding Sources by Industry, 2007**



Source: National Science Foundation

In 2007, the U.S. automotive sector, responding to: 1) the need to improve safety in vehicles, 2) consumer demands for new model types with enhanced cosmetic and drive performance characteristics, and 3) regulation of emissions, invested \$16 billion into R&D. It should be pointed out that several other industries, all of which comprise a smaller share of GDP and national employment than automotive, often receive a substantial amount of R&D funding from the Federal government. The need to constantly innovate and remain competitive drives both domestic and international automotive manufacturers to focus on R&D.

**Figure 1.8: U.S. Automotive Spending, 1999-2007**



Source: *Research and Development in Industry: 2007*, National Science Foundation

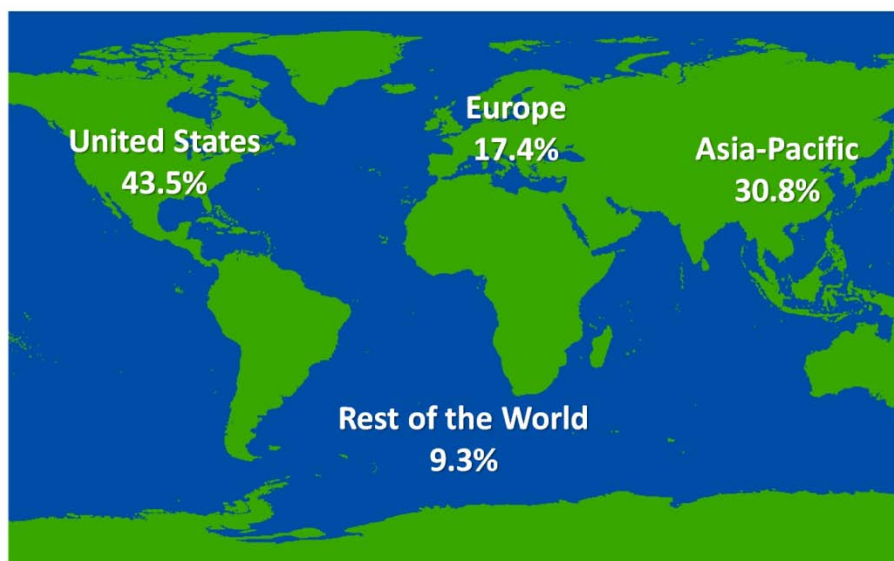
Given the complexity of motor vehicles, the automotive sector requires a highly educated labor force. Highly skilled labor is required both in engineering design studios as well as on the assembly line. Complex computer-assisted robotic equipment is the norm for many automotive assembly and parts manufacturing operations and the interaction between machinery and a well educated labor force results in highly productive employees creating cutting-edge products used by nearly all households and businesses.

Diversity in skill sets, education, and equipment also affords parts suppliers the opportunity to diversify and develop products for a variety of industries outside of automotive. If it were not for the R&D investments within the automotive sector, the dynamic cross-fertilization of the R&D process would not be available to other industries.

## U.S. Medium and Heavy Duty Trucks Sector

While not included in the economic modeling of the impact analysis, the manufacture of medium and heavy duty trucks and parts is a key component of the motor vehicle industry, and here we provide an overview of the activity of this sub-sector of the industry. Medium duty trucks include Classes 3 to 6 (10,000 to 26,000 lbs.) and heavy duty trucks include Classes 6 to 8 (26,001 to over 33,000 lbs). Currently there are over 10.6 million medium and heavy trucks registered in the United States.<sup>2</sup> Together, the medium duty and heavy duty truck markets in the United States sell 433,263 units annually<sup>3</sup> and have a value of \$125.5 billion.<sup>4</sup> Of the total U.S. sales, over 420,000 are domestically produced vehicles and nearly 13,000 are imported vehicles. The United States is the largest medium and heavy duty truck market in the world, accounting for 43.5% of the world market, followed by the Asia-Pacific region with 30.8% of the market and Europe with 17.4% of the market.<sup>5</sup> Figure 1.9 illustrates the distribution of the global medium and heavy truck market.

**Figure 1.9: World Medium and Heavy Duty Truck Market**



The medium and heavy duty vehicles comprise slightly less than 6.5% of all motor vehicle sales, with medium duty trucks accounting for over 250,000 sales and heavy duty trucks accounting for over 180,000 sales annually.<sup>6</sup> The medium duty vehicle market in the United States consists

<sup>2</sup> Ward's Motor Vehicle Facts & Figures 2009. "Truck Registrations by State and Type."

<sup>3</sup> Ward's Motor Vehicle Facts & Figures 2009. "U.S. Retail Sales of Trucks by Manufacturer, Gross Vehicle Weight Rating, and Source."

<sup>4</sup> Datamonitor. "Medium & Heavy Trucks in the United States." Industry Profile. December 2008.

<sup>5</sup> Ibid.

<sup>6</sup> Ward's Motor Vehicle Facts & Figures 2009. "U.S. Retail Sales of Trucks by Manufacturer, Gross Vehicle Weight Rating, and Source."

primarily of class 3 vehicles (over 53% of units sold) while the heavy duty vehicle market consists primarily of on-road interstate trucks in the Class 8 category (over 73% of units sold).<sup>7</sup> Table 1.1 contains sales data pertaining to the United States truck market.

**Table 1.1: United States Retail Sales of Trucks, 2008<sup>8</sup>**

Truck Class	Category	Sales	Percent of Total	Category Total	Percent in Category
Class 1	Light	4,358,336	65.25%	6,246,533	69.77%
Class 2	Light	1,888,197	28.27%		30.23%
Class 3	Medium	134,839	2.02%	250,910	53.74%
Class 4	Medium	36,374	0.54%		14.50%
Class 5	Medium	40,300	0.60%		16.06%
Class 6	Medium	39,397	0.59%		15.70%
Class 7	Heavy	48,880	0.73%	182,353	26.81%
Class 8	Heavy	133,473	2.00%		73.19%
Total	-	6,679,796	100.00%	-	-

The annual production and sales of this class of vehicle are highly cyclical. The heavy duty vehicle sector, similar to that of light duty vehicles, is affected by the economic forces of the general economy, but its cycles are also affected by governmental regulation. Most recently, Class 8 sales have been on a downward trend since 2006, when their sales peaked at over 280,000 units. The peak was led by a need to replace the fleet of Class 8 rigs as they aged and by operators who wanted to purchase vehicles before new EPA pollution regulations on diesel engines took effect in that year. Since 2006, annual sales fell to just over 150,000 in 2007 and continued to decrease to around 133,000 units in 2008, similar to sales numbers from 2001 to 2003.<sup>9</sup>

U.S. production of heavy duty trucks ranges from 200,000 to 300,000 units annually with assembly facilities employing just over 26,000 in 2009, dropping from approximately 28,700 individuals in 2008, and 36,800 individuals in 2006.<sup>10</sup> In addition to manufacturing heavy duty trucks, over 20,000 individuals were employed manufacturing trailers in 2009 (down from 30,300 in 2008 and 39,700 in 2006).<sup>11</sup> This, of course, does not include the considerable

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Ward's Motor Vehicle Facts & Figures 2009. "U.S. Retail Sales of Trucks by Manufacturer, Gross Vehicle Weight Rating, and Source."

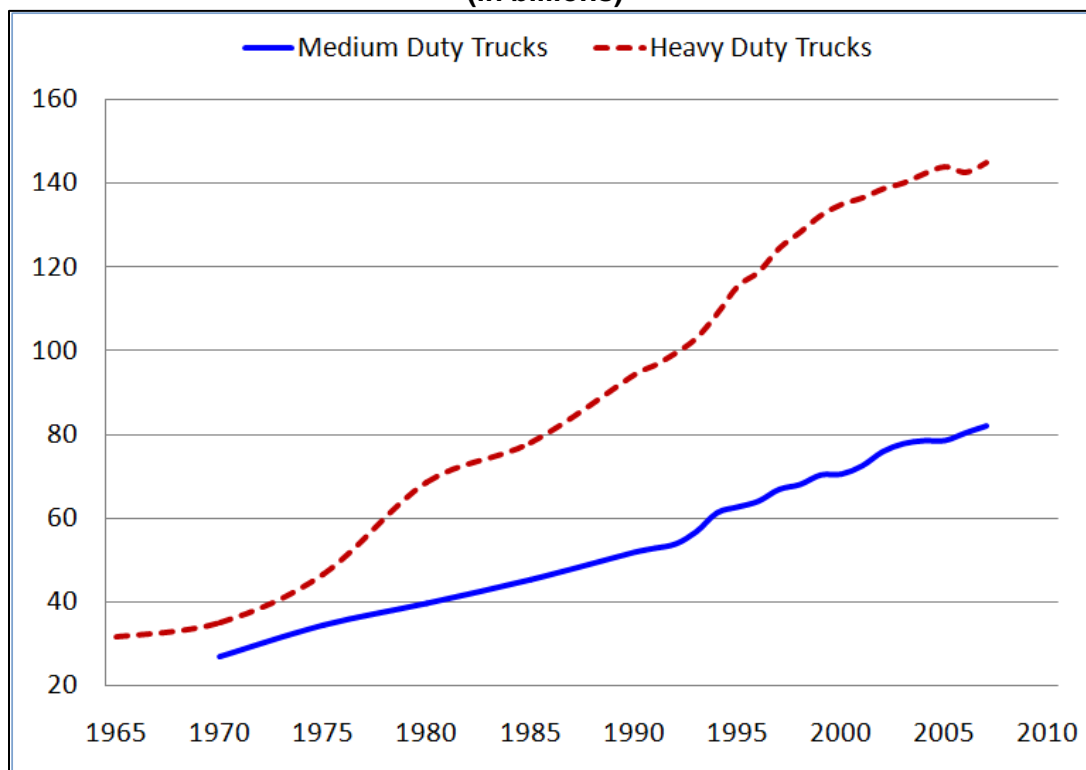
<sup>10</sup> Bureau of Labor Statistic, Employment Statistics Survey www.bls.gov Series 33612

<sup>11</sup> Ibid.

number of individuals who work as suppliers to the heavy duty truck OEMs. These suppliers, in many cases, supply both heavy duty and light duty motor vehicle manufacturers.

These vehicles are instrumental in keeping America's economy going by transporting goods and products in a timely and cost-effective manner. As of 2007, over 68% of America's freight—by gross tonnage — is hauled by truck. When considering the value of shipments, this figure climbs to around 70%.<sup>12</sup> Between 1965 and the present, use of heavy duty trucks on the highway has increased by a factor of nearly five — from almost 32 billion vehicle miles traveled (VMT) in 1965 to over 145 billion VMT in 2007.<sup>13</sup> Meanwhile, medium duty trucks have increased their use by a factor of nearly four — from just over 27 billion VMT in 1970 to almost 82 billion VMT in 2007. Figure 1.10 displays the increases in total VMT for these two vehicle classes.

**Figure 1.10: Annual Vehicle Miles Traveled for Medium and Heavy Duty Trucks (in billions)<sup>14</sup>**



<sup>12</sup> Research and Innovative Technology Administration, Bureau of Transportation Statistics. Commodity Flow Survey. "Shipment Characteristics by Mode of Transportation for the United States: 2007." [www.bts.gov](http://www.bts.gov)

<sup>13</sup> Research and Innovative Technology Administration, Bureau of Transportation Statistics. "National Transportation Statistics 2008." [www.bts.gov](http://www.bts.gov)

<sup>14</sup> Research and Innovative Technology Administration, Bureau of Transportation Statistics. "National Transportation Statistics 2008." [www.bts.gov](http://www.bts.gov)

## **U.S. Automotive Aftermarket Sector**

While not explicitly detailed in the economic impact analysis (Section II), the aftermarket sector is inherently included in the supplier totals. Here we highlight their economic contribution to the entire industry. The aftermarket segment consists of suppliers who provide products for the repair and maintenance of light and heavy vehicles. For some automotive products, the aftermarket is far greater than the new vehicle market. For example, a new car gets only one battery installed by the vehicle assembler, but during the life of that car, 5 or 6 replacement batteries may be purchased. For frequently replaced service products like oil filters, the ratio is as high as 35 to 1. These aftermarket products are sold through auto parts stores and used by service technicians in garages and specialty service providers to maintain the vehicles in use on America's roadways. As a result, the automotive aftermarket manufacturers support millions of service and distribution jobs that are not included in this study.

The aftermarket manufacturing supply sector provides parts and equipment for the maintenance, repair, and enhancement of the more than 250 million light duty vehicles currently on the road in the United States. There are 536,400 retail outlets<sup>15</sup> that comprise the automotive aftermarket in the United States with forecasted revenue of \$215.5 billion for 2008.<sup>16</sup> The medium and heavy duty aftermarket revenue forecast amounted to \$75.2 billion, bringing the total forecasted U.S. aftermarket value to \$290.7 for 2008.<sup>17</sup> The largest revenue generators for the automotive aftermarket are mechanical parts (26.3%) and crash repair (22.5%).<sup>18</sup>

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<sup>15</sup> Datamonitor. "Automotive Aftermarket in the United States." Industry Profile. November 2008.

<sup>16</sup> AAIA 2009 Factbook. "Size of the U.S. Motor Vehicle Aftermarket." [www.smpcorp.com](http://www.smpcorp.com)

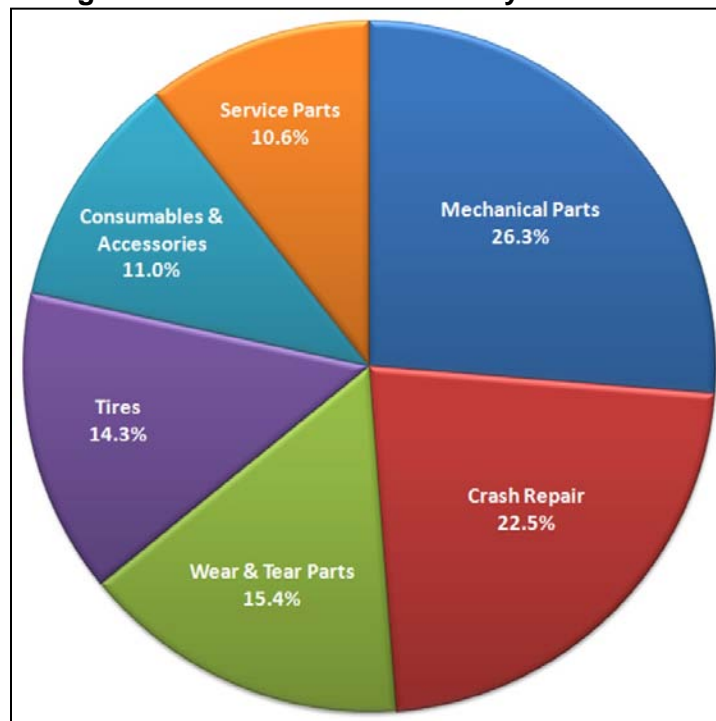
<sup>17</sup> Ibid.

<sup>18</sup> Datamonitor. "Automotive Aftermarket in the United States." Industry Profile. November 2008.



Figure 1.11 breaks down the light vehicle aftermarket (by revenues) into mechanical parts, crash repair, wear and tear parts, tires, consumables and accessories, and service parts. Mechanical parts includes powertrain parts; crash repair includes any charge for body parts, lighting, glass, paint, and solvents; wear and tear parts includes batteries, emission systems, brakes, and ride control; and consumables and accessories includes cleaners, waxes, polishes, windscreen washes, antifreeze, entertainment systems, alarms and security, alloy wheels, storage, and decorative additions.

**Figure 1.11: Aftermarket Share by Revenues<sup>19</sup>**



In 2007, among 163,627 automotive repair and maintenance companies, there were nearly 900,000 employees compensated by over \$25.1 billion.<sup>20</sup> Also in 2007, among 58,144 automotive parts, accessories, and tire stores, there were nearly 500,000 employees compensated by over \$12.5 billion.<sup>21</sup>

<sup>19</sup> Ibid.

<sup>20</sup> U.S. Department of Commerce, Bureau of the Census. "2007 Economic Census." NAICS 8111

<sup>21</sup> U.S. Department of Commerce, Bureau of the Census. "2007 Economic Census." NAICS 4413

## **The Industry Struggles in an Economic Downturn**

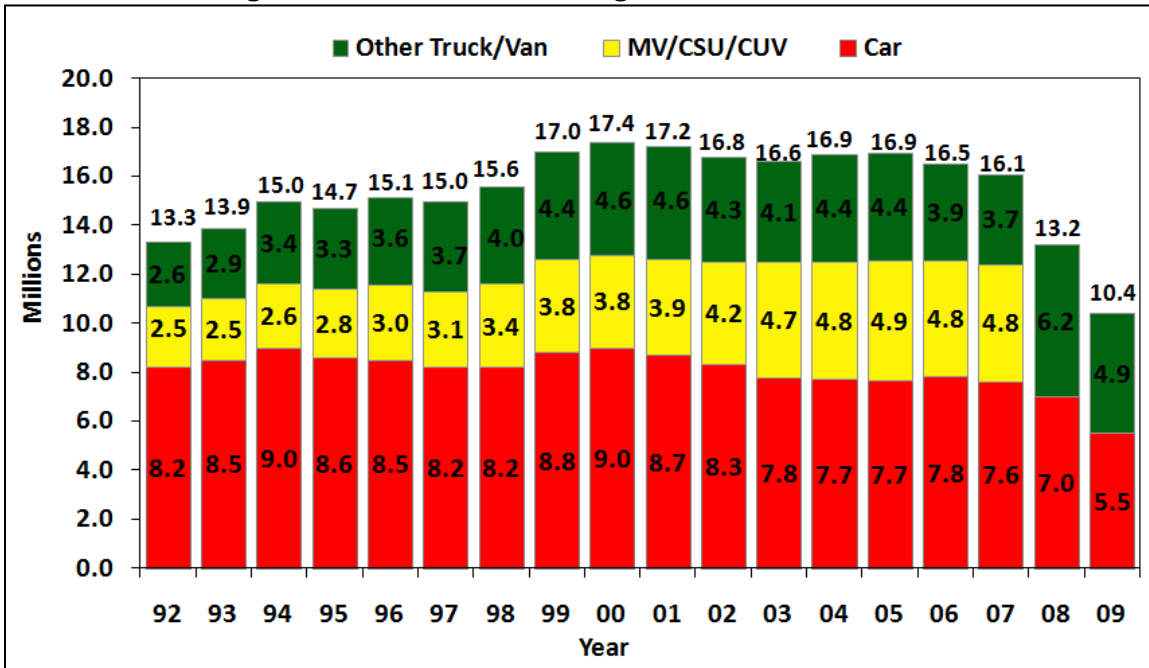
The financial turmoil of late 2008, peaking with the collapse of Lehman Brothers, hurt the U.S. automotive industry in several ways. At the time this paper is published, it is likely that most readers are seasoned veterans at describing bubble markets and can easily define a derivative instrument. Nonetheless, it is important to step back and understand how an event like a price bubble in the housing sector has an effect on motor vehicle production and sales — for diagnostic purposes as well as to express the degree and magnitude of interconnectedness across various industry sectors.

Several contributing factors are responsible for the current anemic economic situation, yet the primary culprit tends to be the American housing market and the risky operations that lead to its growth. The growth of new home sales, boosted by a surge of sub-prime lending practices and loose regulations, started to decline in some parts of the country by 2006, with widespread acknowledgement that the previous record growth was unsustainable. In 2007, several leading economists (including former Federal Reserve Chairman Alan Greenspan) acknowledged that the end of the housing boom would create economic problems down the road. Yet, the current issues in the automotive industry that rose from the ashes of the housing bubble are uniquely two-fold and highly interrelated: a credit crunch and a surplus of vehicles purchased in the early part of the decade.

Throughout the early part of this decade, annual motor vehicle sales consistently surpassed 16 million units with a peak of 17.4 million in 2000 (see Figure 1.12). This sales volume enabled suppliers, dealers, and assemblers to expand capacity into new geographic territory in the U.S. and invest in new technologies at production facilities. This unprecedented sales activity was largely supported by: easy access to low interest credit (often through draws on home equity); an ex-urban housing development movement necessitating increased vehicle ownership; a booming stock market; post- 9/11 manufacturer incentives; and an enhanced sense of personal wealth.

It should also be noted that the expansion in production capacity by international and domestic original equipment manufacturers (OEMs) in the 1990s and early 2000s created the need to maintain high sales figures. The fixed costs of developing new infrastructure are significant, and company management understood that long term viability required robust annual sales. Thus, vehicle incentives were introduced and continued to move product at a brisk pace for many years.

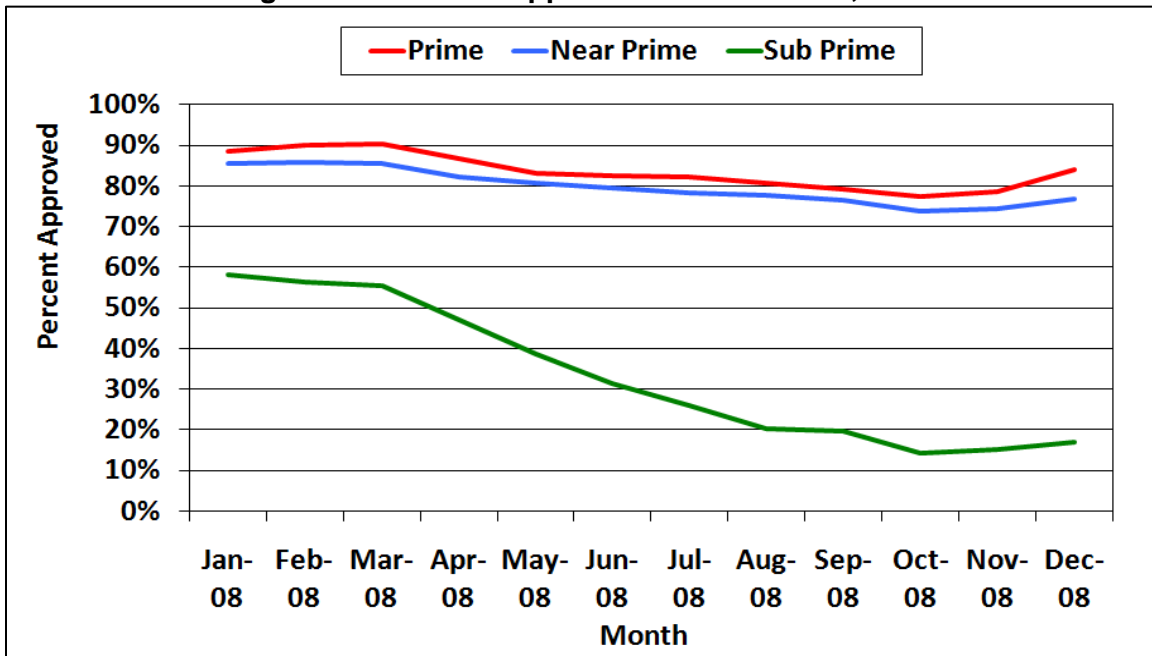
Figure 1.12: U.S. Sales of Light Vehicles, 1992-2009



Source: Ward's Automotive Reports

Once the housing bubble burst, so did other bubbles associated with debt financing, including the sale of motor vehicles. To protect against additional liabilities on their balance sheets, the major consumer lending arms of large banks increased credit requirements and reduced lines of credit to all but the most qualified applicants (see Figure 1.13). The increasing unemployment rate compounded the problem of lost sales, because of the reduction in available credit. As companies pared their payrolls and job security became more and more uncertain, people stopped buying cars.

**Figure 1.13: Credit Approval for Auto Loans, 2008**



Source: CNW Market Research

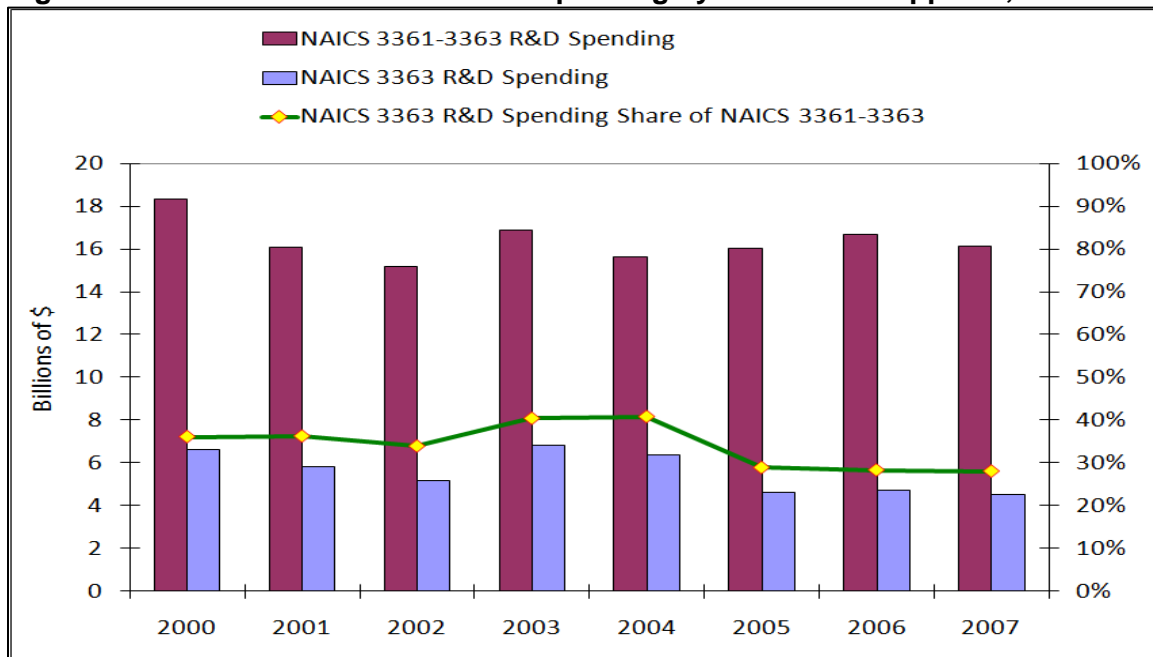
The severity and permanence of the decline in vehicle sales weighed heavily on the interconnected automotive chain of parts suppliers, assemblers, and dealerships. A surplus of assembled vehicles and parts rapidly accumulated, leaving dealers with the problem of finding buyers to clear these increasingly high levels of inventory. As consumer demands withered, the once smooth network of accounts payable and receivable between the assemblers, suppliers and dealers suddenly buckled, creating tremendous strain on the viability of all parties involved. It is believed vehicle sales may plateau near the fifteen million mark in the foreseeable future; return to the previous highs will only happen with an increase in the number of households.

## Suppliers

In this report, the automotive supplier industry is defined as a large group of independent, non-OEM, parts producers that sell their finished goods to both domestic and international OEMs, as well as after-market parts replacement retailers. For the purpose of this study, the automotive supplier group includes employees beyond NAICS 3363 (the industry classification code for motor vehicle parts) to account for products developed by other manufacturing industries that are used in the production of vehicles.

The total direct employment count for 2008 is 685,892 workers; this figure includes employees associated with manufacturing tires, hoses, hardware, lighting, batteries, and plastics for motor vehicles. A breakout of the parts sector is available in the appendix and serves as a detailed reference to illustrate the depth of the motor vehicle parts sector. It also indicates that, without the inclusion of products like rubber hoses and tires, NAICS 3363 would not be sufficient to fully describe all products used to manufacture a finished vehicle.

**Figure 1.14: Automotive-related R&D Spending by OEMs and Suppliers, 2000-2007**



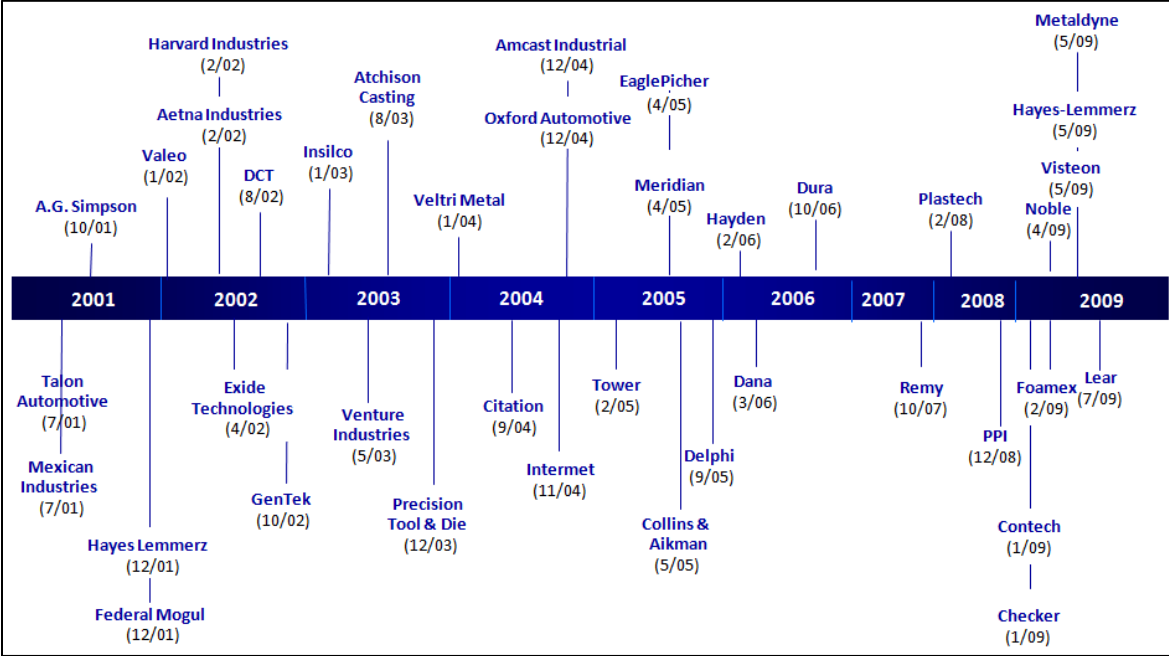
Source: National Science Foundation

In recent years, the suppliers' responsibility to add technology and value to the automobile has grown. Parts R&D, production, and sub-assembly have been shifted onto suppliers, as OEMs — facing declining profits and other business operation issues — have spun off many of their in-house parts operations. This transition is significant for two reasons: 1) 25-40% of R&D

spending in the automotive industry is now undertaken by the suppliers, and 2) the cost of R&D was transferred into an industry sector with a large proportion of small- to medium-sized businesses. The combination of the added pressure to invest in research without an immediately recognizable revenue stream and the size make-up of suppliers has had substantial impact on the viability of the supplier sector. It should be noted that not all automotive R&D has been transferred to the supplier sector; OEMs still largely fund vehicle engine and transmission design, as well as parts integration R&D for the development of future model lines.

Innovation is a key to productivity, yet breakthroughs do not always occur in a timely manner. The responsibility to design new products has put great financial strain on suppliers. In addition, the collapse of the financial sector, the evaporation of credit and the subsequent downward impact on vehicle production volumes have put a tremendous strain on suppliers, and as a result of these dynamics, many suppliers have been driven to either consolidate or close down operations. Figure 1.15 indicates major bankruptcies since 2001.

**Figure 1.15: Major Supplier Bankruptcies, 2001-2009**



Source: IRN, Wall Street Journal, BankruptcyData.com

Competition from new OEM and supplier facilities owned by Japanese and European companies operating within the U.S. led to large productivity jumps. According to CAR research, between 1990 and 2008, motor vehicle parts labor productivity increased 20 percent

more than OEM labor productivity during the same period. Overall, each sector realized at least a doubling of labor productivity, as measured by output per employee.

Large and expensive investments at both the older domestic facilities and newer supplier “branch plants” in non-traditional geographic locations paralleled the development of new foreign-funded facilities. Certainly, some of these investments were necessary and long overdue; without the rapid improvement in facilities, spurred on by the competition of foreign investments, the U.S. motor vehicle sector would be far less efficient. Even after accounting for closures, consolidations and bankruptcies, the end result is a much more skilled and productive parts sector that has embraced the challenge to innovate.

The diversity of products and occupations in the supplier sector represents robust inter-industry connections. These connections allow the automotive sector to produce high quality vehicles that improve the driving experience. In recent years, U.S. suppliers have faced tremendous adversity in remaining cost competitive with foreign parts suppliers due to higher labor costs and increases in the cost of metal commodities used to manufacture parts. Acknowledging that some of the parts operations are moving to low-wage regions across the globe, there still is a very interesting story to be told regarding interstate expansion across the U.S. Section II will provide details on the current geographic composition of the U.S. automotive parts sector and related employment.

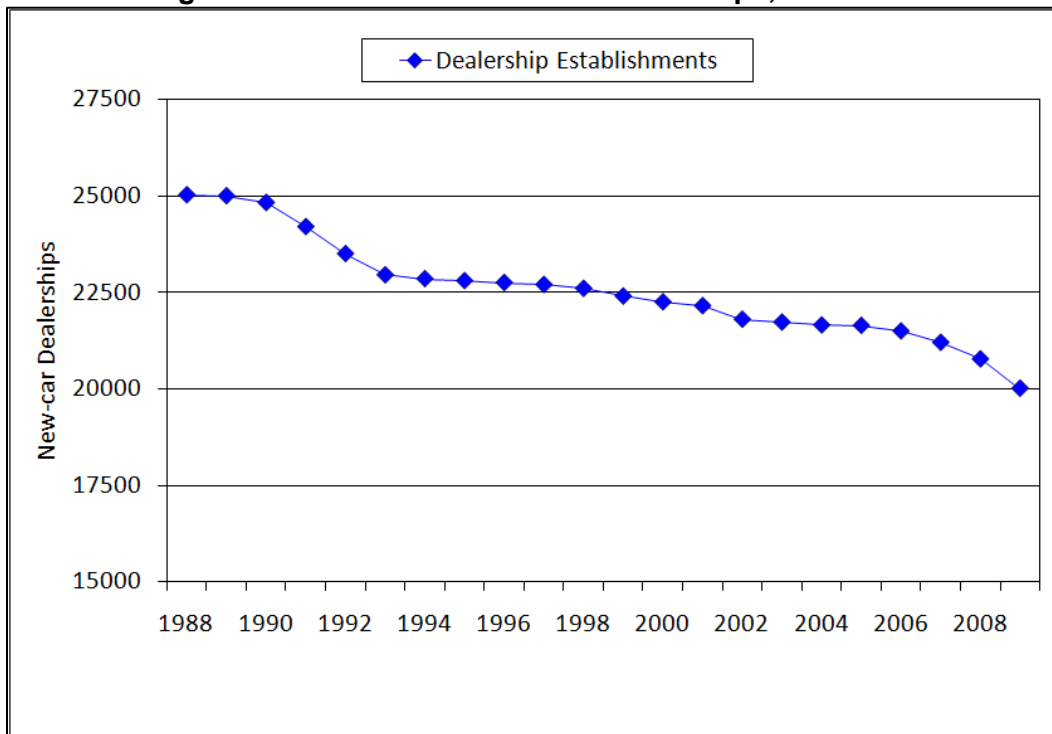
## **Dealers**

To the lay person, the automobile dealership is the most visible and tangible component of the sophisticated automotive manufacturing and distribution system. Dealerships are a perfect reflection of the fabric of the U.S. — family-owned businesses operating in communities across the nation, for generation after generation. Beyond their heartfelt “American Story” aspect, it is important to understand the contribution of dealerships to the regional economies and government revenues, especially given the decline in automobile sales and announced dealership closures by OEMs.

Even though the bankruptcies of General Motors and Chrysler were structured, their occurrence shook the foundation of the automotive industry to its core. As assembly facility operations slowed and ultimately stopped, the fate of franchise dealerships was closely followed in communities across the nation. According to company restructuring plans, during 2009-2010, approximately 2,000-plus GM and Chrysler dealerships are scheduled to close. Industry expectations are that some of the closed dealerships may pick up franchises from other OEMs, offsetting the losses at GM and Chrysler and creating a smaller net closure effect. Yet, even the most optimistic assumptions about offsets through new franchise expansion will not sufficiently dampen the blow to many communities throughout the U.S. To gauge the magnitude of the planned closures, Figure 1.16 below provides a new-car dealership count of 20,010 as of January 1, 2009 — before the planned closure estimate was announced. A direct count of 736,952 workers, provided by the National Automobile Dealers Association (NADA), was used to estimate the total employment effects associated with dealership operations in the U.S.



**Figure 1.16: Total U.S. New Car Dealerships, 1988-2009**



Source: NADA DATA 2009

The abundant supply of dealerships within a very close proximity to one another, provided both choice and variety for the consumer and permitted highly competitive pricing, as buyers would routinely visit one dealer after another, haggling over prices and features, before ultimately making a decision. This model has now become unsustainable, primarily due to the downturn of the industry and a new topography of dealership locations.

A review of NADA's volume of new-unit sales by dealership data indicates that the industry has been trending away from smaller-volume dealerships (150 new vehicle sales per year or less) in favor of larger-volume establishments (400-plus new vehicle sales per year). Based on GM and Chrysler company announcements, CAR researchers estimate that the recent wave of closures associated with the automakers' restructuring plans now put the estimated number of remaining automotive dealerships to be in the range of 17,500-18,500.

The plight of dealerships received extensive media coverage and generated a high level of political activity in Washington D.C. The closure process is still ongoing; if industry sales levels begin to increase, there is a real potential that some of the dealerships which were consolidated or closed could be reopened. Congressional activity has also provided glimmers of hope for some affected dealerships; an amendment has been inserted into an appropriations bill that will

grant dealers a process of binding arbitration to determine whether dealership agreements terminated by auto manufacturers receiving Federal assistance should be reinstated.

Every state in the nation has new car and used car dealerships operating in its communities. Their contributions to charities, property tax, and sponsorship of local youth sports teams are critical to maintaining a high quality of life in towns and cities across the nation. These contributions should be considered when assessing the value of dealerships to regional economies and communities.

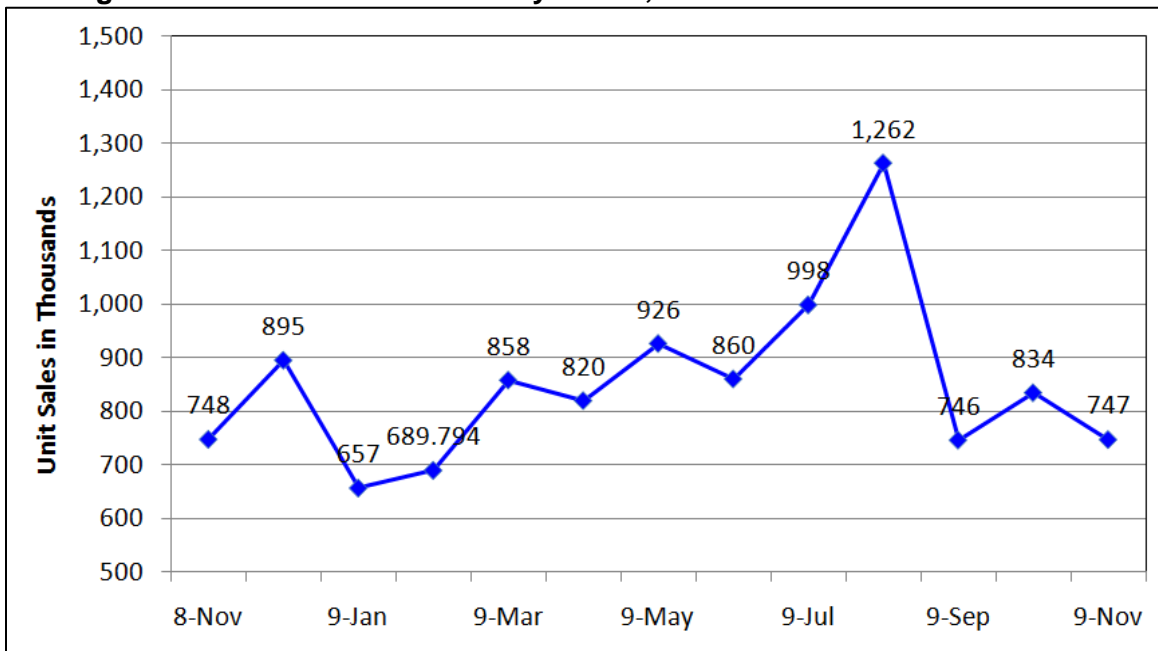
### **A Look into the Future: Sales Rebound**

High unemployment, at the current (November 2009) rate of 10%, continues to affect the rebound of the auto industry. Employment, income stability and consumer confidence are major determining factors in the purchase of durable goods like automobiles. Due to economic concerns and more durable components, the natural rate of vehicle replacement is being strained as households are stretching the useful life of a vehicle. The higher acquisition rate of new vehicles—witnessed during the mid-2000s due to the stock market performance, draws on home equity, and multiple workers in households necessitating multiple vehicles—may not return for quite some time. Recovery will occur, but most economists and industry experts believe it will be several years before the industry reaches 15 million units of sales. Current estimates for 2010 sales range from 12.0 to 13.2 million units.

### Incentives

In addition to the bankruptcy and restructuring activity during the summer of 2009, the U.S. Federal government also intervened in the U.S. auto sales market by introducing the Car Allowance Rebate System, commonly referred to as the Cash for Clunkers program. Congress appropriated \$3 billion for this program; the impact on new vehicle sales proved to be immediate and significant. Roughly 690,000 eligible vehicles were turned in by consumers who then received either a \$3500 or a \$4500 voucher to use towards the purchase or lease of a new, fuel- efficient vehicle.

**Figure 1.17: New Vehicle Sales by Month, November 2008-November 2009**



Source: Automotive News Data Center

The program ran during the months of July and August and generated new vehicle sales of 998,000 units and 1,262,000 units respectively. Cash for Clunkers had a large stimulating effect on the industry as dealers sold hundreds of thousands of additional vehicles beyond the norm for this time of year. The higher than anticipated new vehicle sales created a tax revenue boost that helped states' finances.

According to the most recent estimate released by the Bureau of Economic Analysis, the real gross domestic product (the output of goods and services produced by labor and property located in the U.S.) increased at an annual rate of 2.8 percent in the third quarter of 2009. Motor vehicle output added a robust 1.45 percentage points to the third-quarter change in real GDP. Although the program is no longer in effect, the positive ripple effects have led to companies revising their production plans upwards. Based upon company announcements and additional research, it is CAR's expectation that strong motor vehicle production and employment figures will be observed in the fourth quarter of 2009 and first quarter of 2010. Whether an additional round of stimulus is needed remains to be determined, but it is clear that the Cash for Clunkers program successfully boosted 2009 annual sales, added tax revenues to states' treasuries, contributed to the first positive GDP change since the second quarter of 2008, and gave hope to an industry that was teetering on the edge of collapse.

### New Opportunities for Suppliers

The future of the industry is not all dark clouds and bad news; numerous technology developments in the fields of safety, fuel efficiency, and materials are in the works and have a real chance of creating new opportunities for suppliers. For instance, employment opportunities are growing in the supplier sector for batteries and components that will assist the development of plug-in hybrid electric vehicles. In addition, public and private efforts supporting research and component design to allow for the integration of transportation network information into vehicle operation systems has the potential to grow over the next decade.

## ***SECTION II - Estimates of the Economic Contribution of the Motor Vehicle Industry to the Economies of the United States and Individual State Economies***

The tables in this section detail the estimated employment contributions to the economies of each of the 50 states, and the country as a whole, by the U.S. motor vehicle industry. Employment estimates are broken out by direct employment (people employed directly by automotive companies); intermediate employment (people employed by suppliers to the motor vehicle industry); and spin-off employment (expenditure-induced employment resulting from spending by direct and intermediate employees).

Employment and income estimates are derived from analyses using a regional economic model, supplied by Regional Economic Models, Inc. (REMI), of Amherst, MA. The model and methodology used will be further discussed in a later section. The employment and compensation data used to perform the research were provided by motor vehicle companies or gathered through publicly available data; the intermediate and spin-off effects were generated by the model. The remaining data on the U.S. economy and the automotive industry were collected by CAR from a wide variety of publicly available sources, listed in the Reference section. Direct employment data include headquarters, office, research, design and development, manufacturing, assembly and logistics job classifications. All employment numbers cited below are rounded to the nearest thousand; income and tax receipt numbers are also rounded.

### **Vehicle Manufacturer Activities**

Complete U.S. automotive manufacturing and related operations employment and payroll data supplied by the OEMs totaled 313,000 employees. Employment and payroll data was coded (according to NAICS) into multiple job-type categories for input into the model — motor vehicle and motor vehicle parts manufacturing (category numbers: NAICS 3361-3363); management of companies (NAICS 551); professional, scientific and technical services (NAICS 541); securities, commodity contracts and investments (NAICS 523); warehousing and storage (NAICS 493); administrative services, facilities and support services (NAICS 521) and wholesale trade (NAICS 42).

As can be seen in Table 2.1, there are 1,067,000 intermediate jobs that support the direct employment in the industry (suppliers of goods and services). The spin-off jobs associated with spending (from the people who work in the direct and intermediate jobs) add another 1,765,000 jobs, bringing the total jobs associated with motor vehicle manufacturing activities in the United States (direct plus intermediate plus spin-off) to nearly 3,145,000 jobs. The ratio of total jobs

created to direct employment produces an employment multiplier, which for motor vehicle manufacturing and assembly is 10.0 (3,145,000 ÷ 313,000). There are 9 additional jobs in the U.S. economy for every 1 job in automobile manufacturing operations.

Compensation in the private sector associated with the total jobs (direct plus intermediate plus spin-off) amounts to \$206 billion. Estimated personal taxes to be paid, resulting from employment in automotive manufacturing operations, are \$29 billion.

**Table 2.1: Total Contribution of Original Equipment Manufacturer-related Operations to the Economy in the United States**

Economic Impact	
Employment	
Direct	313,449
Intermediate	1,067,321
Total (Direct + Intermediate)	1,380,770
Spin-off	1,764,643
Total (Direct + Intermediate + Spin-off)	3,145,413
Multiplier: (Direct + Intermediate + Spin-off)/Direct	10.0
Compensation (\$billions nominal)	205.970
Less: transfer payments & social insurance contributions	-25.206
Less: personal income taxes	-29.163
Equals private disposable personal income (\$billions nominal)	151.600
Contribution as % of total private economy	
Employment	1.7
Compensation	1.4

To put the compensation and employment numbers in context, the direct, intermediate, and spin-off jobs associated with U.S. original equipment manufacturer-related operations account for nearly 2 percent of employment in the entire U.S. economy and nearly 1.5 percent of total U.S. compensation.

Table 2.2 offers a more detailed look at the intermediate and spin-off employment associated with original equipment manufacturer-related operations. In the intermediate employment category, there are 1,067,000 jobs spread across numerous manufacturing and non-manufacturing industries. As mentioned earlier, the intermediate category captures the

employment necessary to satisfy manufacturers' demands for the materials and services needed to design, produce and sell motor vehicles. This can be broadly considered the automotive/supplier network. This supply network consists of the first tier suppliers who supply parts and services directly to vehicle assemblers along with the lower tier suppliers who supply the basic materials and services to the first tier group. Some of these companies supply basic commodities and can be several steps removed from the vehicle design and manufacturing process.

**Table 2.2: Intermediate and Spin-off Employment Contribution of Original Equipment Manufacturer-related Operations in the U.S.**

<b>Economic Impact</b>	<b>Intermediate</b>	<b>Spin-off</b>
<b>Manufacturing</b>	<b>192,150</b>	<b>328,188</b>
Primary metal mfg	15,798	26,692
Fabricated metal prod mfg	39,000	42,530
Motor vehicle parts mfg	79,973	130,966
Plastics, rubber prod mfg	14,751	15,789
Other Manufacturing	42,628	112,211
<b>Non-Manufacturing</b>	<b>875,171</b>	<b>1,436,455</b>
Professional and Technical Services	154,130	88,362
Administration and Services	159,400	35,485
Wholesale Trade	86,190	61,670
Retail Trade	110,090	214,710
Transportation, Warehousing	50,920	82,399
Finance, Insurance	56,960	73,920
Management of Companies	30,623	14,534
Other Services (excluding Government)	90,615	106,166
Other Non-Manufacturing	136,243	759,209
<b>Total</b>	<b>1,067,321</b>	<b>1,764,643</b>

*Note: Due to rounding, columns or rows may not sum exactly.*

At the automotive manufacturing facility, primary assemblers require plastic and metallic parts, electronic components, and other materials to produce vehicles; it is these intermediate demands, satisfied by a vast area of specialized manufacturers, that form the basis of U.S. intermediate employment impacts. As shown in Table 2.2, CAR finds 192,000 intermediate jobs in the manufacturing sector, primarily in the industries necessary to produce automobiles—parts

manufacturing with 80,000 jobs (many, Tier 1 suppliers), 16,000 jobs in primary metal manufacturing, 39,000 in fabricated metal products manufacturing, and 15,000 in plastics and rubber products manufacturing. These employees are manufacturing the parts and components necessary to produce the services and material inputs at assembly operations; the numbers do not include any of the 313,000 people directly employed by the OEMs. There are an additional 43,000 people employed in other manufacturing industries.

The bulk of employment in the intermediate category is in the non-manufacturing sector, totaling 875,000 jobs. Industries within this category are not normally thought to be associated with automobile manufacturing in such high numbers. However, as a result of the separation of the complete vehicle design and parts manufacturing processes (from the automobile manufacturing company to the supplier sector), many more distinct industries have become major suppliers to the automobile industry. Industries of note in the non-manufacturing category are professional and technical services employing 154,000; administration and services, 159,000 jobs; wholesale trade, 86,000 jobs; and finance and insurance, 57,000 jobs.

Table 2.2 shows there are 1,765,000 total spin-off jobs associated with U.S. automobile manufacturing operations. These are expenditure-induced jobs, created as a result of spending by the people employed in the direct and intermediate categories. As could be expected, a large portion of the spin-off jobs are in the non-manufacturing sector of retail trade, which employs 215,000 people. When employees use their paychecks to purchase goods (including electronics equipment, clothing, food, and even new automobiles), employment is created to supply their demands. Table 2.2 shows there are 131,000 jobs related to manufacturing motor vehicles and parts as a result of employee demand in the direct and intermediate sectors. This employment number does not include any of the 313,000 jobs at the OEMs which have been accounted for in the direct employment category.



## **Parts and Supplier Activities**

The motor vehicle parts manufacturing industry includes: light vehicle original equipment parts manufacturers, medium and heavy duty original equipment parts manufacturers and aftermarket parts manufacturers (NAICS 3363). Many of the suppliers in this industry group manufacture parts for all three segments.

Employment estimates are broken out by direct employment (people employed directly by parts manufacturers); intermediate employment (people employed by those who provide goods and services to parts manufacturers); and spin-off employment (expenditure-induced employment resulting from spending by direct and intermediate employees).

The aftermarket manufacturers' direct employment data are included in this analysis only if the industry group supplied parts necessary for the maintenance of the motor vehicle or the replacement of original equipment on the motor vehicle. The suppliers of tools and other related equipment needed to maintain motor vehicles are not included in the aftermarket segment for this analysis.

The employment and compensation data used to perform the research were collected by CAR from a wide variety of publicly available sources, listed in the Reference section. All employment numbers cited below are rounded to the nearest thousand, while exact figures are provided in detailed tables; income and tax receipts numbers are also rounded.

In addition to automotive parts manufacturers as defined by NAICS 3363, several other industries classified by other NAICS codes manufacture parts and components for motor vehicle assemblers. Direct employment by the subsectors of these industries that manufacture exclusively for the motor vehicle industry is included in this analysis. These industries are:

- tire manufacturing (NAICS 32621);
- hose manufacturing for on- and off-highway motor vehicles (made of rubber and other materials—including plastics and nylon) (NAICS 3262203);
- transportation fabricated plastics products manufacturing (excluding foam and reinforced plastics) (NAICS 3261991);
- motor vehicle hardware manufacturing (lock units, door and window handles, window regulators, hinges, license plate brackets, etc.) (NAICS 3325106);
- motor vehicle instruments manufacturing (NAICS 3345145);
- motor vehicle light bulbs manufacturing (NAICS 3351101);

- motor vehicle batteries manufacturing (NAICS 3359111); and
- other truck and vehicle bodies for sale including dump truck mechanisms and kit cars (NAICS 3362115).

For the purposes of this report, this aggregation of industries will be referred to as motor vehicle suppliers.

The aggregate direct employment in this motor vehicle suppliers' industry group is 686,000 people. Employees in the various industries used to compile the industry group are as follows:

- 522,000 in motor vehicle parts manufacturing,<sup>22</sup>
- 62,000 in motor vehicle plastics manufacturing,
- 52,000 in motor vehicle tires manufacturing,
- 7,000 in motor vehicle instrument manufacturing,
- 11,000 in motor vehicle battery manufacturing,
- 12,000 in other motor vehicle bodies manufacturing,
- 12,000 in motor vehicle hardware manufacturing,
- 6,000 in motor vehicle hose manufacturing, and
- 2,000 in motor vehicle light bulb manufacturing.

A great deal of attention was given to determining the direct employment numbers for each of the 8 additional industries to avoid the possibility of double counting (1 job being counted twice in the final employment estimates). The methodology section of this report provides greater detail on calculation methods used to avoid double counting direct, indirect and spin-off employment impacts.

As can be seen in Table 2.3, there are 899,000 intermediate jobs that support direct employment in the industry (suppliers of goods and services to parts manufacturers). The spin-off jobs associated with spending (from the people who work in the direct and intermediate jobs) add another 1,702,000 jobs, bringing the total jobs associated with motor vehicle parts manufacturing activities in the United States (direct plus intermediate plus spin-off) to 3,286,000

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<sup>22</sup> This employment number does not include any captive parts suppliers within the automotive manufacturing operations —such as stamping, transmissions, and engines manufacturing —at original equipment manufacturers (OEMs). These parts manufacturing employees at the OEMs are considered to be motor vehicle manufacturing employees.

jobs. The ratio of total jobs created to direct employment produces an employment multiplier, which for motor vehicle parts manufacturing is 4.8 (3,286,000 ÷ 686,000). This means there are nearly 4 additional jobs in the U.S. economy for every 1 job in parts manufacturing operations.

Compensation in the private sector associated with total jobs (direct plus intermediate plus spin-off) amounts to nearly \$217 billion. Estimated personal taxes to be paid resulting from employment in automotive manufacturing operations are \$30 billion.

**Table 2.3: Total Contribution of Motor Vehicle Suppliers and Parts Manufacturer-related Operations to the Economy in the United States**

Economic Impact	
Employment	
Direct	685,892
Intermediate	898,614
Total (Direct + Intermediate)	1,584,506
Spin-off	1,701,816
Total (Direct + Intermediate + Spin-off)	3,286,322
Multiplier: (Direct + Intermediate + Spin-off)/Direct	4.8
Compensation (\$billions nominal)	216.78
Less: transfer payments & social insurance contributions	-28.10
Less: personal income taxes	-30.46
Equals private disposable personal income (\$billions nominal)	158.20
Contribution as % of total private economy	
Employment	1.8
Compensation	1.4

To put the compensation and employment numbers in context, the direct, intermediate, and spin-off jobs associated with U.S. parts and supplier operations account for nearly 2 percent of employment in the entire U.S. economy and nearly 1.5 percent of total U.S. compensation.

This section provides an update to an earlier study by CAR, “The Contribution of the Motor Vehicle Supplier Sector to the Economies of the United States and Its Fifty States“, which in 2007, was the first comprehensive analysis of the estimated economic contribution associated with the activities of the motor vehicle parts and supplier industries in the United States. The

tables in this section update the original analysis and provide further insight into this broad industry.

Since the 2007 study, parts and supplier companies have lost nearly 15% of their direct employees. This is due to increases in productivity, off-shoring and outsourcing (often overseas), and the often weaker (than OEMs) financial positions of supplier companies. Additionally, many lower tier automotive suppliers, that is, the suppliers to motor vehicle parts supply operations manufacture for other industries. However, many of them are likely very small, local companies, disproportionately affected by the recession in 2008 and 2009.

These intermediate jobs have traditionally been the most vulnerable to pressures faced by the motor vehicle industry because they are jobs located in smaller firms that have less access to capital and government programs. To survive, these firms are the first and the fastest to cut operations (e.g. jobs). These intermediate firms are highly likely to suffer job losses due to their customers' sourcing of products from overseas. Firms in this segment of the industry are also prone to bankruptcy or acquisition by larger companies—suffering job losses in the process.

For those companies that have survived and maintained employment levels, compensation remains solid, as can be seen in the numbers of expenditure-induced jobs that remain in the economy from the spending by direct and intermediate employees.

#### Intermediate and Spin-off Employment by Occupation

Table 2.4 below provides a more detailed look at the intermediate and spin-off employment associated with parts and supplier operations. In the intermediate employment category, there are 899,000 jobs spread across numerous manufacturing and non-manufacturing industries. As discussed earlier, the intermediate category captures the employment necessary to satisfy parts manufacturers' and suppliers' demands for the materials and services needed to produce and sell parts, components and supplies to the OEMs. Due to the demands of one industry on other industries, many jobs are created across the economy by the motor vehicle parts suppliers. Fifteen percent of the estimated intermediate and spin-off jobs are in manufacturing. There are a substantial number of jobs estimated to be in other sectors; an estimated 23 percent of the jobs are located in the business and professional services sector, 29 percent in the education, health and personal services sectors, 22 percent in the retail or wholesale trade, warehousing, and transportation sectors, and the remaining 11 percent of the jobs are in the raw materials or construction sectors.

**Table 2.4: Intermediate and Spin-off Employment from Motor Vehicle Suppliers and Parts Manufacturer-related Operations in the U.S.**

<b>Economic Impact</b>	<b>Intermediate</b>	<b>Spin-off</b>
<b>Manufacturing</b>	<b>145,100</b>	<b>235,200</b>
Primary metal mfg	35,200	65,300
Fabricated metal prod mfg	44,700	43,600
Plastics, rubber prod mfg	16,200	15,100
Electrical or computer products	3,200	20,700
Motor vehicle parts mfg	14,500	7,100
Other Manufacturing	31,300	83,400
<b>Non-Manufacturing</b>	<b>753,400</b>	<b>1,466,600</b>
Professional and Technical Services	141,200	86,300
Administration and Services	145,500	34,900
Wholesale Trade	83,000	60,400
Retail Trade	75,900	220,000
Transportation, Warehousing	52,600	83,100
Finance, Insurance	54,000	72,000
Management of Companies	35,800	18,200
Other Services	142,600	618,600
Other Non-Manufacturing	22,800	273,100
<b>Total</b>	<b>898,500</b>	<b>1,701,800</b>

*Note: Due to rounding, columns or rows may not sum exactly.*

The bulk of the employment in the intermediate category is in the non-manufacturing sector, totaling 753,000 jobs. As mentioned earlier, industries within this intermediate category are not normally thought to be associated with automobile parts manufacturing and supply in such high numbers. However, as a result of the separation of the complete vehicle design and parts manufacturing processes from within the automobile manufacturing company to the supplier sector, many more distinct industries have become major suppliers to the automobile industry. Industries of note in the non-manufacturing category are professional and technical services which employ 141,000; administration and services, 146,000 jobs; wholesale trade, 83,000 jobs; and finance and insurance, 54,000 jobs.

Table 2.4 shows there are 1,702,000 total spin-off jobs associated with U.S. automobile parts manufacturing operations. These are expenditure-induced jobs which are the explicit result of spending by the people employed in the direct and intermediate categories. As could be expected, a large portion of the spin-off jobs are in the non-manufacturing sector of retail trade, which employs 220,000 people and in service industries, which employ nearly 620,000 people.

## **Automobile Dealerships**

Auto assembly operations and motor vehicle parts manufacturing operations are business operations often clustered together within certain areas in manufacturing-oriented regions of the country. Auto dealerships, on the other hand, are found in nearly every community across the country—in rural and urban areas alike. Just as the manufacturing segment of the motor vehicle industry has suffered in the recent economic downturn, the retail and service segment of the industry has also incurred heavy losses. If the amount of column space in news media is considered a measure of issues of importance, the economic and cultural impact of the downturn on auto dealerships did not go unnoticed anywhere. The omnipresence of auto dealerships in communities across the U.S. allow for a deep connection between their business operations and civic events. “If there were a competitive event to measure the philanthropy of businesses in America, the local car dealer would always take the top prize. If you go to a Little League or youth hockey game or any other locally organized sporting event, the sponsors always seem to be local auto dealers.”<sup>23</sup>

The tables in this section detail the estimated employment contributions by new vehicle dealer operations to the economies of each of the 50 states and the country as a whole. Employment estimates are broken out by direct employment (people employed directly by dealerships); intermediate employment (people employed by those who provide goods and services, excepting inventory, to dealerships); and spin-off employment (expenditure-induced employment resulting from spending by direct and intermediate employees).

Employment and income estimates are derived from analyses using the REMI model mentioned earlier. The employment and compensation data used to perform the research was provided by the National Automobile Dealers Association (NADA); the intermediate and spin-off effects were generated by the model. The remaining data on the U.S. economy and the automotive industry was collected by CAR from a wide variety of publicly available sources, which are listed in the Reference section. All employment numbers cited below are rounded to the nearest thousand; income and tax receipt numbers are also rounded.

Complete U.S. automotive dealership employment (for new vehicle sales) totaled 737,000 employees. As can be seen in Table 2.5, there are 239,000 intermediate jobs that support direct employment in the industry (suppliers of goods and services, not including motor vehicle inventory). The spin-off jobs associated with spending (from the people who work in the direct and intermediate jobs) add another 552,000 jobs, bringing the total jobs associated with new

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<sup>23</sup> Automotive News. Keith Crain, “Closing Dealerships? Be Careful”. September 7, 2009. P. 12.

motor vehicle retail operations in the United States (direct plus intermediate plus spin-off) to more than one and a half million jobs. The ratio of total jobs created to direct employment produces an employment multiplier for motor vehicle retail operations; this number is 2.1 (1,528,700 ÷ 737,000). This multiplier of 2.1 means there is slightly more than 1 additional job in the U.S. economy for every 1 job in automobile dealership operations.

Compensation in the private sector associated with total jobs (direct plus intermediate plus spin-off) amounts to \$90 billion. Estimated personal taxes to be paid resulting from employment in automotive manufacturing operations are \$13 billion.

**Table 2.5: Total Contribution of New Motor Vehicle Dealership Operations to the Economy in the United States**

Economic Impact	
Employment	
Direct	736,952
Intermediate	239,356
Total (Direct + Intermediate)	976,308
Spin-off	552,348
Total (Direct + Intermediate + Spin-off)	1,528,656
Multiplier: (Direct + Intermediate + Spin-off)/Direct	2.1
Compensation (\$billions nominal)	90.600
Less: transfer payments & social insurance contributions	-9.716
Less: personal income taxes	-13.440
Equals private disposable personal income (\$billions nominal)	67.444
Contribution as % of total private economy	
Employment	0.9
Compensation	0.7

The direct, intermediate, and spin-off jobs associated with U.S. auto dealerships account for nearly 1 percent of employment in the entire U.S. economy and nearly 1 percent of total U.S. compensation.

Table 2.6 provides a more detailed look at the intermediate and spin-off employment associated with dealership operations. In the intermediate employment category, there are 239,000 jobs spread across numerous industries.

**Table 2.6: Intermediate and Spin-off Employment Contribution of New Motor Vehicle Dealership Operations in the U.S.**

<b>Economic Impact</b>	<b>Intermediate</b>	<b>Spin-Off</b>	<b>Total</b>
Admin, Waste Services	59,550	13,910	73,460
Employment Services	21,470	4,990	26,460
Business Support Services	15,380	3,620	19,000
Building Services	17,810	3,660	21,470
All Other Administrative and Waste Mgmt. Services	4,890	1,640	6,530
Profess, Tech Services	41,640	23,980	65,620
Legal services	5,750	5,690	11,440
Acc, tax prep, bookkeeping, payroll serv	7,450	2,890	10,340
Arch, engineering, related services	6,540	2,866	9,406
Specialized design services	1,960	695	2,655
Computer systems design, related serv	1,780	4,220	6,000
Mngemnt, scientific, tech cons serv	8,550	2,880	11,430
Scientific R&D, other prof, scien, tech serv	3,110	2,745	5,855
Advertising, related services	6,500	1,671	8,171
Finance, Insurance	18,380	23,620	42,000
Manufacturing	15,350	36,680	52,030
Metals, Machinery and Fabricated metal prod mfg	4,885	7,530	12,415
Motor vehicles and related equipment mfg	1,050	4,595	5,645
All other durable goods mfg.	1,350	7,115	8,465
Consumer non-durable goods mfg	3,600	14,180	17,780
Paper mfg and Printing activities	4,460	3,265	7,725
Retail Trade	13,990	80,258	831,200
Real Estate, Rental, Leasing	12,470	36,000	48,470
Mngmt of Co, Enter	12,300	5,100	17,400
Transp, Warehousing	11,271	16,589	27,860
Truck Transportation	6,250	8,370	14,620
Warehousing	2,991	3,190	6,181
All Other Transp & Warehousing	2,030	5,029	7,059
Information: Publishing, Broadcasting, Internet	11,060	10,470	21,530
Accom, Food Services	9,948	60,272	70,220
Wholesale Trade	9,743	12,997	22,740
All Other Services, including Health Care and Education	16,539	123,944	140,483
Construction and Utilities	5,941	101,259	107,200
Forestry, Fishing, and Mining	1,174	7,269	8,443

Note: Due to rounding, columns or rows may not sum exactly.



The multiplier effect for new vehicle dealers is much lower than the multiplier associated with manufacturing activities because 90 percent of the industries that comprise the supplier network for vehicle dealers are non-manufacturing industries. In general, manufacturing industries demand the most from underlying intermediate and supplying industries, as manufactured goods reach deep into the supply chain — all the way to the origin and sourcing of raw materials.

As shown in Table 2.6, there are 15,000 intermediate jobs in the manufacturing sector, slightly more than 5 percent of all intermediate jobs. As might be expected, the largest sectors for intermediate jobs (recalling that intermediate jobs comprise the supplier network for dealerships) are business services. Administrative services; waste management; professional, technical and management services real estate; finance; and insurance and information providers together encompass two-thirds of all intermediate jobs. These people are providing the services necessary for retail dealerships to operate.

Tables 2.6 and 2.8 show there are 552,000 total spin-off jobs associated with U.S. automobile dealer operations. These are expenditure-induced jobs, created as a result of spending by the people employed in the direct and intermediate categories. A large portion of the spin-off jobs are in the non-manufacturing sector of retail trade, which employs 80,000 people. The largest sector for spin-off jobs is the service sector. Service providers of education, health care, arts and entertainment, construction and utility services, restaurant and accommodation providers and government jobs account for half of all spin-off jobs.

New vehicle dealer employment figures for each of the 50 states and national employment results are shown in Table 2.7. Direct dealer employment and total employment figures in the states (direct + intermediate + spin-off) closely correlate to the population of each of the states, as more vehicle dealerships are needed to service larger populations. However, intermediate employment does not mirror the states' populations. Rather, as with the manufacturing operations, the locations of suppliers with respect to dealerships are a result of factors other than state population. Therefore, an even dispersion of supplier jobs across the states is not to be expected.

**Table 2.7: Dealership Employment by State**

State	Direct	Indirect	Spin-off	TOTAL
Alabama	11,064	2,564	7,791	21,419
Alaska	1,532	438	1,085	3,055
Arizona	17,901	6,920	15,337	40,159
Arkansas	5,863	1,370	4,773	12,006
California	85,383	39,095	60,862	185,340
Colorado	11,551	4,897	10,997	27,444
Connecticut	9,616	2,619	6,840	19,076
Delaware	2,938	657	1,997	5,592
District of Columbia	21	481	1,898	2,401
Florida	51,775	20,327	39,476	111,578
Georgia	22,614	7,900	17,912	48,426
Hawaii	3,000	1,026	2,159	6,185
Idaho	3,884	1,061	3,330	8,275
Illinois	30,293	10,977	21,718	62,989
Indiana	15,084	3,561	11,034	29,679
Iowa	7,933	1,652	5,812	15,397
Kansas	6,846	1,496	4,787	13,129
Kentucky	8,589	1,948	6,336	16,873
Louisiana	10,913	2,930	8,225	22,068
Maine	3,693	854	2,831	7,378
Maryland	16,474	3,957	11,088	31,520
Massachusetts	15,278	5,529	11,921	32,728
Michigan	23,947	6,359	15,641	45,947
Minnesota	12,913	4,566	9,491	26,970
Mississippi	5,684	1,046	4,412	11,142
Missouri	14,657	4,116	11,103	29,876
Montana	2,599	540	2,127	5,266
Nebraska	4,627	1,157	3,333	9,117
Nevada	6,767	2,728	8,109	17,605
New Hampshire	4,639	935	3,577	9,151
New Jersey	21,410	5,705	16,322	43,437
New Mexico	4,941	1,082	3,505	9,529
New York	32,793	12,783	27,354	72,930
North Carolina	22,538	6,514	16,381	45,434
North Dakota	2,179	372	1,454	4,006
Ohio	28,565	8,198	18,946	55,708
Oklahoma	8,675	2,048	6,058	16,781
Oregon	9,303	3,021	6,511	18,834
Pennsylvania	33,415	8,307	22,696	64,418
Rhode Island	2,269	607	1,803	4,679
South Carolina	10,408	2,411	8,044	20,863
South Dakota	2,365	390	1,723	4,478
Tennessee	15,164	4,288	12,882	32,334
Texas	59,209	21,759	45,371	126,339
Utah	5,971	2,512	6,052	14,535
Vermont	1,905	338	1,558	3,802
Virginia	21,557	5,522	15,179	42,257
Washington	15,339	5,178	10,037	30,554
West Virginia	4,079	521	2,696	7,296
Wisconsin	15,229	3,843	10,257	29,329
Wyoming	1,559	244	1,521	3,324
<b>TOTAL U.S.</b>	<b>736,952</b>	<b>239,352</b>	<b>552,352</b>	<b>1,528,656</b>

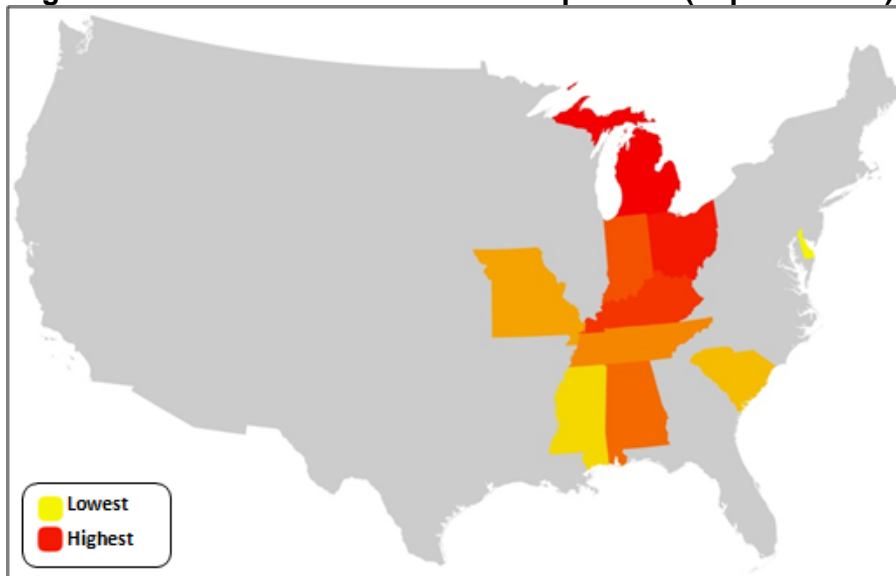
## State-level Impacts

The motor vehicle industry's breadth and depth of operations extends into every state economy in the nation. The industry impacts an unusually large number of individual communities because the supplier network is spread across many states. Beyond that, motor vehicle dealerships have a presence in nearly every community in the country. The tables in this section examine the estimated employment and income contributions of the industry to individual state economies.

Even for those states with relatively few direct jobs in the industry, the number of jobs supported by the industry is significant. In many states, large numbers of jobs are generated due to the state's proximity to manufacturing or technical facilities located in a neighboring state. All states see major additional impact from substantial numbers of spin-off jobs resulting from the spending of direct and indirect employees of the industry.

The automotive industry is a mature industry, with assembly and parts manufacturing plants well established throughout most of the states east of the Mississippi, as seen in Figure 2.1, which shows the top states for OEM employment, as a percentage of state population. Many states in the Midwest are well known for supporting a strong base of manufacturing. The entire Midwest is connected by a strong and efficient network of road and rail systems. This transportation integration provides intra-state and inter-state options for sourcing intermediate goods and supplies to manufacturing operations.

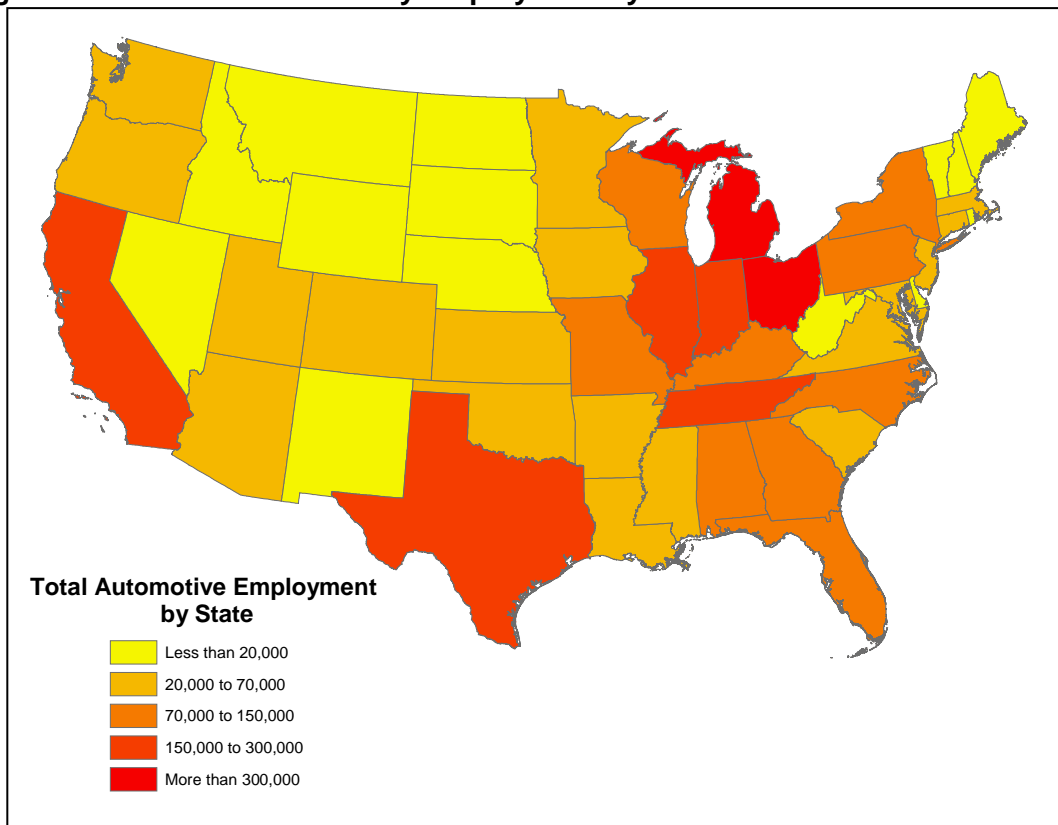
**Figure 2.1: OEM Jobs as Percent of Population (Top 10 States)**



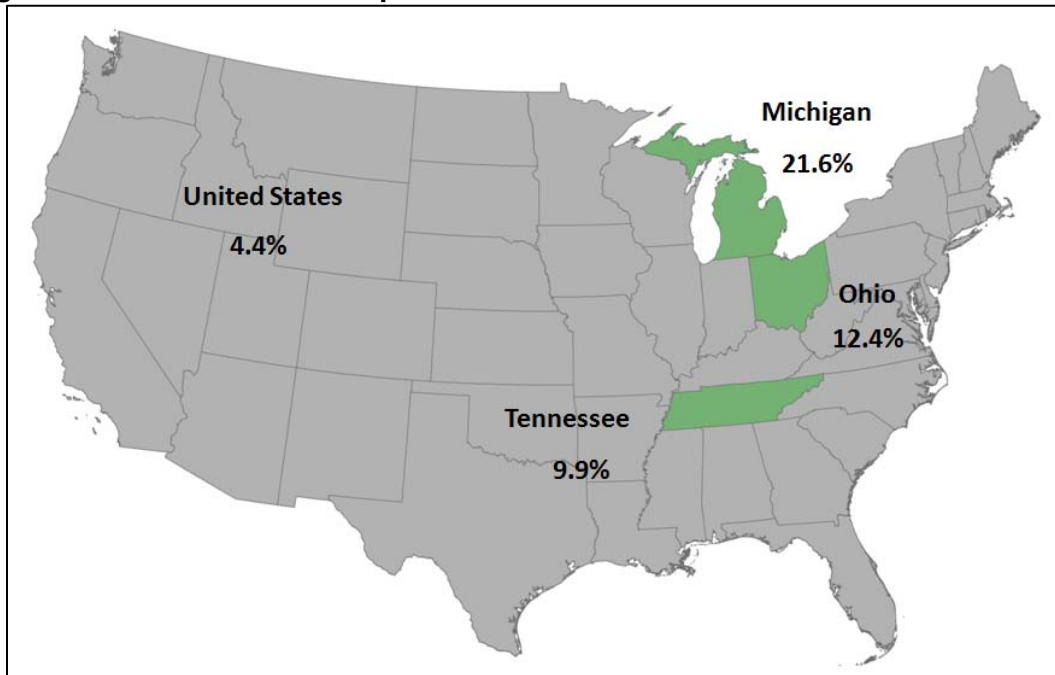
It is this broad, efficient network of suppliers (located across many states) which leads to the dispersion of total employment contributions from manufacturing operations to all areas of the nation. Figure 2.2 below shows the impact of employment in the industry for motor vehicle assemblers, parts, systems and components manufacturers, motor vehicle dealerships, and the suppliers to these operations. This map does not include expenditure-induced employment. It is a portrayal of the direct impacts of employment and suppliers to the industry. As can be seen, the industry provides significant numbers of jobs to every state in the nation.

Each individual state's economic impact is one effect of the total contribution of the industry to the nation. That is, jobs in one state are not only attributable to investment in that state, but are supported by the auto industry's investments and activities in nearby states as well. Therefore, an employment multiplier is not calculated for any individual state. Employment multipliers apply to the national economy and are not applicable to, nor can be derived from, any one state's economy.

**Figure 2.2: Automotive Industry Employment by State for Direct and Indirect Jobs**



**Figure 2.3: Three State Examples – Automotive Jobs as a Percent of Labor Force**



**Total Contribution to the U.S. Economy by Motor Vehicle Assembly and Manufacturing Operations, Parts and Systems Supply, and Dealership Operations**

Table 2.8 sums the combined effects from all motor vehicle manufacturing and retail operations. Summing the direct employment from all operations (3,145,000), intermediate employment (3,286,000) and spin-off employment, nearly 8 million jobs are supported or directly provided by the industry to the U.S. economy. Comparing total employment to direct employment produces an overall employment multiplier of 4.6 (7,960,391 / 1,736,293). This means that there are 3.6 additional jobs in the U.S. economy for every one job in the industry. The industry comprises 4.4% of all private sector employment in the U.S.

**Table 2.8: Total Contribution of all Motor Vehicle Manufacturing and Dealership Operations to the Economy of the United States**

Economic Impact	OEM	Parts Suppliers	Auto Dealerships	TOTAL
Employment				
Direct	313,449	685,892	736,952	1,736,293
Intermediate	1,067,321	898,614	239,356	2,205,291
Total (Direct + Intermediate)	1,380,770	1,584,506	976,308	3,941,584
Spin-off	1,764,643	1,701,816	552,348	4,018,807
Total (Direct + Intermediate + Spin-off)	3,145,413	3,286,322	1,528,656	7,960,391
Multiplier: (Direct + Intermediate + Spin-off)/Direct	10.0	4.8	2.1	4.6
Compensation (\$billions nominal)	206.0	216.8	90.6	513.4
Less: transfer payments & social insurance contributions	-25.2	-28.1	-9.7	-63.0
Less: personal income taxes	-29.2	-30.5	-13.4	-73.1
Equals private disposable personal income (\$billions nominal)	151.6	158.2	67.4	377.3
Contribution as % of total private economy				
Employment	1.7	1.8	0.9	4.4
Compensation	1.4	1.4	0.7	3.5

*Sums may not be exact due to rounding.*

Total compensation for all 8 million private sector jobs is more than \$500 billion, which represents 3.5% of the private sector compensation in the U.S. economy. From this amount, more than \$70 billion is paid for personal income taxes. Net disposable income for these workers totals \$377 billion.

### **Methodology Overview**

Estimates of the indirect and induced employment associated with direct employment at parts suppliers, assemblers, and dealerships are produced using a dynamic, inter-industry model developed by Regional Economic Models, Inc. (REMI). The REMI model is designed for industry- and region-specific impact analysis. The major interactions between primary data input and model structure are described below.

### The Macroeconomic Model

To estimate the total employment and compensation provided by parts suppliers, motor vehicle assemblers and new vehicle dealership operations, the research team at CAR used a 51-region, 169 industry sector model developed by REMI to capture effects in all fifty U.S. state economies, the District of Columbia and the U.S. national economy. The model provides a baseline forecast of regional and national economies. Various economic scenarios are then input into the model and simulations based on the new data are calculated by the model. Changes from the baseline are measured using results from these simulations. Underlying demographic and industry-specific information for every region are contained in the baseline forecast.

Trade flows, migration patterns and commuter flows connect each state economy, allowing for dynamic multi-regional analysis. Simulation results can be interpreted as the new economic equilibrium (given a change to the baseline) and are the product of multiple structural equation iterations across the state economies. A simulation begins with the user inputting a direct change to the baseline economy. Once this change is entered into the model, new vectors of transactions between businesses are calculated along with consumer purchases of goods and services. These vectors may change as estimated household income increases or decreases under the new scenario being modeled. The model reports the economic changes from the baseline in a number of variables, with the most easily understood being employment.

The dynamic multi-regional character of the REMI model is a defining element not found in other commercial impact analysis models and enables CAR to produce the results contained in this study. In essence, the model can simulate economic impacts that may occur in any one state resulting from changing the levels of employment in any or all of the other states.

### Methods & Assumptions

The general analysis method is to run independent simulations for parts suppliers, motor vehicle assemblers, and new vehicle dealership operations by subtracting the employment of each group from the baseline regional economies at the state level. This counter-factual technique allows for the separation of economic activity—influenced by the operations of suppliers, assemblers and dealers—from the aggregate economy, and permits the capture of economic contributions from continued employment in the sectors of interest for any given time period. In general, the difference between the baseline forecast and the simulation represents the economic contribution of suppliers, assemblers, and dealers.

This study should not be interpreted as representing the economic activity that would be lost if the automotive industry did not operate in the United States. That scenario would generate significant compensating adjustments (over time) in the economy and is not examined in this study. CAR's purpose is to dissect and present the industry's current presence in the domestic economy. This study represents a snapshot of the automotive industry's total employment impact on the nation's economy.

Consideration was paid to the potential of double-counting activities between supplier, dealership and assembler runs. Within the framework of the REMI model, there is an inter-industry, input-output (I-O) table that calculates demand for intermediate inputs used in the production of a finished good. By running the assembler simulation first, then discounting the calculated demand for parts suppliers associated with OEM assemblers, the CAR research team was able to adjust for systemic double counts and calculate only the net employment effects when combining supplier and assembler simulation runs. As a consequence of this effort made up-front to avoid double counting between segments of the industry (OEM, parts supply and dealerships), the results for each of these segments can be added together to arrive at the total economic contribution of the industry. These results fairly represent the size of the industry and its impact on the U.S. and individual state economies.

All simulation results are relevant to the economic conditions of calendar year 2009. The REMI Standard Regional Control Forecast was adjusted to reflect the forecast values and underlying assumptions of the University of Michigan's Research Seminar in Quantitative Economics (RSQE) macroeconomic forecast, released March 18, 2009.



## APPENDIX A: State Level Employment Contributions

AUTO INDUSTRY EMPLOYMENT CONTRIBUTION			
State	Total Industry Employment Contribution	State Labor Force	Auto Contribution as % of Labor Force
Alabama	178,739	2,640,717	6.8%
Alaska	5,742	452,986	1.3%
Arizona	67,449	3,437,191	2.0%
Arkansas	60,335	1,599,446	3.8%
California	412,580	21,063,338	2.0%
Colorado	61,294	3,285,413	1.9%
Connecticut	66,267	2,279,011	2.9%
Delaware	19,862	553,149	3.6%
District of Columbia	13,927	814,340	1.7%
Florida	269,334	10,424,100	2.6%
Georgia	225,049	5,571,666	4.0%
Hawaii	9,080	873,749	1.0%
Idaho	13,888	939,793	1.5%
Illinois	459,876	7,657,328	6.0%
Indiana	515,822	3,718,148	13.9%
Iowa	72,328	2,025,350	3.6%
Kansas	56,324	1,875,134	3.0%
Kentucky	241,167	2,442,252	9.9%
Louisiana	75,366	2,576,960	2.9%
Maine	18,482	840,874	2.2%
Maryland	93,309	3,471,985	2.7%
Massachusetts	97,510	4,251,139	2.3%
Michigan	1,176,924	5,397,807	21.8%
Minnesota	103,196	3,567,295	2.9%
Mississippi	65,377	1,558,262	4.2%
Missouri	193,760	3,672,794	5.3%
Montana	10,454	651,425	1.6%
Nebraska	37,799	1,253,549	3.0%
Nevada	39,881	1,638,004	2.4%
New Hampshire	23,504	857,040	2.7%
New Jersey	145,456	5,176,293	2.8%
New Mexico	16,469	1,117,433	1.5%
New York	302,254	11,289,001	2.7%
North Carolina	217,493	5,497,808	4.0%
North Dakota	10,232	498,718	2.1%
Ohio	848,304	6,819,050	12.4%
Oklahoma	63,250	2,206,469	2.9%
Oregon	38,716	2,339,488	1.7%
Pennsylvania	257,940	7,407,409	3.5%
Rhode Island	12,446	612,258	2.0%
South Carolina	138,630	2,579,280	5.4%
South Dakota	12,376	566,490	2.2%
Tennessee	309,362	3,759,569	8.2%
Texas	394,938	14,469,900	2.7%
Utah	37,742	1,702,493	2.2%
Vermont	10,025	434,917	2.3%
Virginia	153,197	4,916,428	3.1%
Washington	48,127	4,012,270	1.2%
West Virginia	42,141	934,944	4.5%
Wisconsin	208,211	3,619,782	5.8%
Wyoming	8,456	404,855	2.1%
<b>TOTAL U.S.</b>	<b>7,960,391</b>	<b>181,755,100</b>	<b>4.4%</b>

ALL JOBS - OEM				
State	Direct	Indirect	Expenditure-Induced	TOTAL
Alabama	12,337	22,479	39,642	74,459
Alaska	25	392	786	1,203
Arizona	1,459	3,637	5,314	10,410
Arkansas	512	3,676	13,843	18,031
California	18,537	49,373	39,051	106,961
Colorado	1,133	4,601	9,022	14,756
Connecticut	446	4,818	13,828	19,092
Delaware	968	2,940	4,624	8,532
District of Columbia	71	1,173	4,436	5,680
Florida	1,949	19,939	50,321	72,209
Georgia	2,563	21,796	51,602	75,960
Hawaii	14	400	691	1,105
Idaho	7	692	963	1,661
Illinois	7,189	58,760	116,517	182,466
Indiana	21,762	77,641	133,485	232,888
Iowa	753	4,716	17,375	22,844
Kansas	1,159	5,095	14,711	20,965
Kentucky	14,596	37,905	61,753	114,254
Louisiana	1,556	7,820	17,671	27,047
Maine	13	942	3,442	4,397
Maryland	1,570	7,769	20,726	30,065
Massachusetts	690	8,831	18,722	28,244
Michigan	119,303	274,922	301,195	695,420
Minnesota	549	9,967	21,189	31,704
Mississippi	4,230	5,181	18,015	27,426
Missouri	10,599	34,337	43,564	88,500
Montana	14	418	1,839	2,272
Nebraska	289	2,320	7,511	10,120
Nevada	705	2,069	7,370	10,145
New Hampshire	60	1,078	4,820	5,959
New Jersey	5,003	12,685	32,716	50,404
New Mexico	16	641	1,790	2,447
New York	3,933	29,480	65,695	99,107
North Carolina	1,436	16,347	42,668	60,452
North Dakota	8	439	1,994	2,441
Ohio	39,685	167,891	221,018	428,594
Oklahoma	1,151	4,891	10,585	16,627
Oregon	777	2,905	2,221	5,904
Pennsylvania	1,085	19,461	62,311	82,857
Rhode Island	80	792	2,640	3,513
South Carolina	7,561	13,684	28,528	49,773
South Dakota	11	519	2,478	3,008
Tennessee	13,847	41,168	72,002	127,017
Texas	8,025	40,958	61,393	110,376
Utah	131	1,867	3,711	5,710
Vermont	6	448	2,479	2,932
Virginia	718	11,346	36,979	49,043
Washington	153	2,718	505	3,377
West Virginia	1,418	2,489	13,821	17,728
Wisconsin	3,344	20,625	53,198	77,167
Wyoming	3	277	1,882	2,162
<b>TOTAL U.S.</b>	<b>313,449</b>	<b>1,067,321</b>	<b>1,764,643</b>	<b>3,145,413</b>

<b>ALL JOBS - PARTS</b>				
<b>State</b>	<b>Direct</b>	<b>Indirect</b>	<b>Expenditure- Induced</b>	<b>TOTAL</b>
Alabama	21,654	20,241	40,967	82,861
Alaska	0	405	1,079	1,484
Arizona	3,517	5,237	8,125	16,880
Arkansas	8,536	5,919	15,842	30,297
California	24,677	46,206	49,397	120,279
Colorado	1,920	5,590	11,585	19,094
Connecticut	5,538	7,106	15,455	28,099
Delaware	338	1,228	4,171	5,737
District of Columbia	7	1,145	4,694	5,846
Florida	7,225	22,694	55,628	85,547
Georgia	16,165	26,318	58,180	100,663
Hawaii	73	449	1,267	1,790
Idaho	840	1,014	2,097	3,952
Illinois	36,033	62,715	115,672	214,420
Indiana	66,721	66,048	120,487	253,255
Iowa	12,022	6,643	15,422	34,087
Kansas	4,500	4,456	13,274	22,230
Kentucky	34,656	24,089	51,295	110,041
Louisiana	1,418	6,584	18,250	26,252
Maine	686	1,391	4,631	6,708
Maryland	2,048	6,997	22,679	31,724
Massachusetts	3,313	10,405	22,821	36,539
Michigan	111,224	138,765	185,567	435,557
Minnesota	5,218	13,246	26,058	44,522
Mississippi	6,738	4,584	15,487	26,809
Missouri	17,828	18,880	38,675	75,384
Montana	151	503	2,262	2,917
Nebraska	5,437	4,508	8,617	18,562
Nevada	679	2,418	9,035	12,131
New Hampshire	760	1,497	6,137	8,394
New Jersey	3,209	11,166	37,239	51,614
New Mexico	196	910	3,388	4,493
New York	20,367	38,062	71,788	130,217
North Carolina	26,078	28,462	57,068	111,608
North Dakota	1,173	635	1,977	3,785
Ohio	80,600	108,439	174,963	364,002
Oklahoma	10,797	6,452	12,591	29,841
Oregon	3,748	4,399	5,832	13,978
Pennsylvania	15,673	26,396	68,597	110,666
Rhode Island	49	891	3,313	4,253
South Carolina	19,492	15,539	32,963	67,995
South Dakota	1,238	819	2,834	4,891
Tennessee	44,172	35,053	70,786	150,011
Texas	24,664	50,278	83,281	158,223
Utah	4,236	5,406	7,855	17,498
Vermont	0	471	2,820	3,291
Virginia	8,354	14,209	39,334	61,897
Washington	3,475	5,194	5,527	14,196
West Virginia	626	2,629	13,863	17,118
Wisconsin	17,662	25,562	58,490	101,715
Wyoming	160	359	2,451	2,970
<b>TOTAL U.S.</b>	<b>685,892</b>	<b>898,614</b>	<b>1,701,816</b>	<b>3,286,322</b>

**ALL JOBS - DEALERS**

<b>State</b>	<b>Direct</b>	<b>Indirect</b>	<b>Expenditure- Induced</b>	<b>TOTAL</b>
Alabama	11,064	2,564	7,791	21,419
Alaska	1,532	438	1,085	3,055
Arizona	17,901	6,920	15,337	40,159
Arkansas	5,863	1,370	4,773	12,006
California	85,383	39,095	60,862	185,340
Colorado	11,551	4,897	10,997	27,444
Connecticut	9,616	2,619	6,840	19,076
Delaware	2,938	657	1,997	5,592
District of Columbia	21	481	1,898	2,401
Florida	51,775	20,327	39,476	111,578
Georgia	22,614	7,900	17,912	48,426
Hawaii	3,000	1,026	2,159	6,185
Idaho	3,884	1,061	3,330	8,275
Illinois	30,293	10,977	21,718	62,989
Indiana	15,084	3,561	11,034	29,679
Iowa	7,933	1,652	5,812	15,397
Kansas	6,846	1,496	4,787	13,129
Kentucky	8,589	1,948	6,336	16,873
Louisiana	10,913	2,930	8,225	22,068
Maine	3,693	854	2,831	7,378
Maryland	16,474	3,957	11,088	31,520
Massachusetts	15,278	5,529	11,921	32,728
Michigan	23,947	6,359	15,641	45,947
Minnesota	12,913	4,566	9,491	26,970
Mississippi	5,684	1,046	4,412	11,142
Missouri	14,657	4,116	11,103	29,876
Montana	2,599	540	2,127	5,266
Nebraska	4,627	1,157	3,333	9,117
Nevada	6,767	2,728	8,109	17,605
New Hampshire	4,639	935	3,577	9,151
New Jersey	21,410	5,705	16,322	43,437
New Mexico	4,941	1,082	3,505	9,529
New York	32,793	12,783	27,354	72,930
North Carolina	22,538	6,514	16,381	45,434
North Dakota	2,179	372	1,454	4,006
Ohio	28,565	8,198	18,946	55,708
Oklahoma	8,675	2,048	6,058	16,781
Oregon	9,303	3,021	6,511	18,834
Pennsylvania	33,415	8,307	22,696	64,418
Rhode Island	2,269	607	1,803	4,679
South Carolina	10,408	2,411	8,044	20,863
South Dakota	2,365	390	1,723	4,478
Tennessee	15,164	4,288	12,882	32,334
Texas	59,209	21,759	45,371	126,339
Utah	5,971	2,512	6,052	14,535
Vermont	1,905	338	1,558	3,802
Virginia	21,557	5,522	15,179	42,257
Washington	15,339	5,178	10,037	30,554
West Virginia	4,079	521	2,696	7,296
Wisconsin	15,229	3,843	10,257	29,329
Wyoming	1,559	244	1,521	3,324
<b>TOTAL U.S.</b>	<b>736,952</b>	<b>239,352</b>	<b>552,352</b>	<b>1,528,656</b>

## **APPENDIX B: Determination of Direct Employment for the Motor Vehicle Parts Industry**

Data for this study were collected using the NAICS system of classifying employment, compensation and output. In addition to employment in motor vehicle parts manufacturing, NAICS 3363, 8 subsectors, or industry groups, were included in the analysis. These are shown in Table B1.

**Table B.1: Sectors Comprising Auto Parts Manufacturing Industry**

NAICS	Description	Employment
3261.991	Transportation plastics products, includes for boats, rail and aerospace.	62,000
3262.1	Tires	52,000
3262.203	Hoses for motor vehicles	6,000
3325.106	Motor vehicle hardware	12,000
3345.145	Motor vehicle instruments	7,000
3351.10	Lighting	2,000
3359.114	Batteries	11,000
3362.115	Other truck and vehicle bodies for sale	12,000
3363	Auto Parts	522,000

*Sources: Bureau of Economic Analysis, Input/Output Matrices, Census data at the 7-digit NAICS level, 2002 and 2007, County Business Patterns, 2006, Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW), Annual Survey of Manufacturers, Rubber Manufacturers Association, Battery Council International*

Before running the economic estimation model, it was first necessary to determine the number of jobs in each subsector or industry group, as some of these contain companies that do not produce parts exclusively for motor vehicles. For instance, tire manufacturers also produce tires for airplanes, and light bulb manufacturers produce for a variety of applications besides motor vehicles.

**Battery manufacturing:** Employment in this category was taken from forecasts of battery shipments by type of battery, prepared by the Battery Council International. Motor vehicle-related employment was estimated based on actual historical employment and shipments, compared to forecasts by type of battery. Only batteries destined for motor vehicle use were considered. Approximately 70 percent of all battery production in the U.S. is for light motor vehicle use.

**Tire manufacturing:** U.S. government data for this industry is at a 4-digit NAICS code level, which includes tires made for aircraft and non-motorized vehicles (wheelbarrows, etc.).

Employment in this category was taken from forecasts of tire shipments prepared by the Rubber Manufacturers Association. Employment was estimated based on actual historical employment and shipments compared to forecasts by type of tire. Only tires destined for motor vehicle use were considered. Approximately 93 percent of all tire production in the U.S. is for light motor vehicle use.

Light bulb manufacture: U.S. government data for this industry is at a 4-digit NAICS code level, which includes all types of light bulbs. Several major international light bulb manufacturers provide a breakdown of production or sales by type of light bulb. This information was used to develop a production profile of auto light bulb manufacturing as a component of the entire industry. Furthermore, many of the major producers provide detailed information on their manufacturing operations. When available, employment at facilities specifically identified as motor vehicle-related manufacturing was used. Approximately 17 percent of all bulbs produced are for the motor vehicle industry. When specific site-related employment was not available, employment was estimated using the percent of motor vehicle bulbs produced within the entire industry production.

Transportation fabricated plastics products: According to historical statistics, which break this industrial class into specific transportation sectors, plastics for motor vehicles accounted for approximately two-thirds of total transportation plastics. This percentage was then applied to current employment data to estimate the motor vehicle-related employment contribution from the plastics products manufacturing.

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*Note: The research staff of the Center for Automotive Research performed a number of these studies while located at the University of Michigan’s Office for the Study of Automotive Transportation.*