

THE U.S. MOTOR VEHICLE PARTS AND ACCESSORIES MANUFACTURING INDUSTRY: NATIONAL TRENDS AND CHARACTERISTICS

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Introduction

This report from the Center for Competitive Analysis (CCA) of the University of Missouri is intended to provide background information about the Motor Vehicle Parts and Accessories Manufacturing (MVPA) industry. This introductory section will report some basic information about the industry.

The MVPA industry is classified under SIC code 3714.¹ Firms in this industry are often split into two major groups: original equipment manufacturers (OEMs), who make parts that are installed in newly manufactured motor vehicles, and aftermarket manufacturers, who make parts that can replace original equipment when repairs are necessary, as well as additional parts not included with new vehicles (e.g., bed covers for pickup trucks).

The MVPA industry is an important component of the U.S. economy. In 1997, industry shipments accounted for slightly over 4% of total U.S. manufacturing shipments, and the 691,000 jobs provided by the industry accounted for almost 4% of total manufacturing employment.

According to 1992 U.S. Census data for SIC code 3714, there were 2,714 establishments nationally with a total of \$75.0 billion in sales, or an average of about \$27.6 million per establishment. Also in 1992, industry concentration was moderate, with the four largest firms controlling 48% of industry sales and the fifty largest controlling 79%. The industry's HHI² was 943, which is below the level that might trigger antitrust concerns about concentration and its impact on competition. For comparison note that the HHI indices for related or similar industries are generally higher. The 1992 HHI for SIC code 3711 (motor vehicle bodies, which includes assembly of all types of vehicles) was 2,676. For SIC code 3724 (aircraft engines and parts) it was 2,378, for SIC code 3751 (motorcycles, bicycles, and parts) it was 1,419, and for SIC code 3728 (aircraft parts and equipment not elsewhere classified) it was 772.

¹Most 6-digit divisions of SIC category 3714 will be placed into the new North American Industry Classification System (NAICS) code 3363, "Motor Vehicle Parts Manufacturing." A small portion of SIC code 3714 will be moved to NAICS code 3362, "Motor Vehicle Body and Trailer Manufacturing." In addition, this classification omits some items that are included (for some statistical compilations) as automotive parts: stampings, carburetors/pistons/valves, lighting equipment, storage batteries, and internal combustion engine electrical equipment.

²The Herfindahl-Hirschmann Index (HHI) is calculated by summing the squares of each firm's market share, expressed as a percent. Its range is therefore 0 (a very large number of extremely small firms) to 10,000 (pure monopoly).

Data for the second quarter of 1999³ reveals that the national total of businesses (comparable to the Census “establishments”) in this industry had grown to 5,262, with sales of approximately \$144.1 billion. Revenues per business were \$41.1 million.⁴ The industry employed 596,581 persons, 56% of whom worked in Michigan, Ohio, or Indiana. The national average weekly earnings in the industry were relatively high at \$785.64 in August 1999, which is a 10.5% increase over 1994 weekly earnings.⁵

A 1997 Bureau of Labor Statistics study spanning the 1977–93 period reveals that the industry called “Motor vehicles and equipment” was highly procyclical in both employment and final industry demand. This implies that the OEM motor vehicle parts sector is also likely to be procyclical, but we cannot necessarily reach the same conclusion with respect to aftermarket parts. It is possible that consumers postpone purchases of new vehicles during economic slowdowns, choosing instead to repair the older vehicles they own. If that is the case, the aftermarket auto parts sector may exhibit a countercyclical tendency.

In the second quarter of 1999, Missouri was ranked 13th nationally with 102 motor vehicle parts manufacturers, or 1.9% of the national total. These businesses had 8,997 employees and sales of \$860.8 million (15th nationally); the per-business average is \$12.1 million, significantly below the national average of \$41.1 million. Although the data we currently have on Missouri auto parts firms is somewhat incomplete, it appears that Missouri firms are concentrated in the segments involving engine rebuilding, brake systems, wheels, and fuel systems.

In the sections that follow, characteristics of the national MVPA industry will be summarized. The primary sources of data are trade publications, proprietary business databases, and U.S. government statistics. We first examine recent sales trends and customer characteristics. An analysis of the extent and types of competition in the industry is presented, followed by an examination of the impact of technology on the industry. We conclude the report with a discussion of the challenges facing the MVPA industry and a discussion of the issues warranting further research. While this initial report focuses primarily on the picture for the industry in the U.S. as a whole and occasionally on the worldwide market, its main purpose is to identify issues that will be examined in the context of Missouri motor vehicle parts manufacturers.

³Source: *MarketPlace* analysis.

⁴Note that the revenue-per-business figure does not appear to equal total sales revenues divided by the number of businesses. This is because *MarketPlace* uses only the number of businesses for which it has sales data as the denominator in the ratio calculation, but the raw number of businesses accounts for all businesses. A similar pattern is followed for employees-per-business data reported by *MarketPlace*, as well as for the Missouri data reported in a later paragraph. It is not possible to determine whether the “true” ratios are higher or lower because the sales and employees data for the firms omitted from the ratio calculations are unknown; the omitted firms could be larger or smaller on average than the included firms.

⁵These figures are taken from Bureau of Labor Statistics 1995 and 1999 Employment and Earnings data.

Sales Trends and Consumer Characteristics

Recent Sales Trends

Sales of the broadly defined U.S. automotive parts industry (see footnote 1) grew during the first half of the 1990s at about 9% annually, but that growth rate has fallen to around 3% over the later half of the decade. The former figure is roughly in line with the overall world market; between 1993 and 1997 global sales by the world's top 10 automotive parts manufacturers jumped nearly 47%. The lower rate of increase is expected to prevail over the next few years in the U.S., given modest projected growth in U.S. vehicle sales and 2% to 3% projected annual increases in aftermarket parts sales.

Automotive electronics will be an important component of growth in the parts industry over the next several years. This growth will be driven primarily by increased customer demands for safety and security features, including air bags, anti-lock brakes, and electronic security systems. The world OEM market for automotive safety and security electronics is projected to increase 11.2% per year through 2002, to over \$33 billion, the fastest growth expected for any major OEM auto electronics segment over the span. The U.S. OEM automotive electronics market is expected to increase 6.5% per year through the year 2002 to \$22.8 billion.

Five developments that are causing changes in the aftermarket segment are economic growth, changes in age demographics, vehicle population growth, increased popularity of light trucks, and longer lasting vehicle parts. Most respondents to a 1999 survey of aftermarket jobbers and retailers expected 1999 to be a better year than 1998. Reasons for their optimism include more vehicles on the road and an aging fleet. Some were concerned that the do-it-yourself market would decline as repair jobs become more complicated and people consequently return to car dealers for repairs. Of course, parts manufacturers taken as a whole would be unaffected by such a shift, but some individuals parts makers could be hurt, particularly if private-label parts are displaced by name-brand parts.

The Customers

The two major auto parts markets are the original equipment market and the aftermarket. Original equipment manufacturers sell to vehicle makers, while aftermarket parts are sold to retail customers as well as to auto repair shops. Some parts makers sell in both the OEM and aftermarket segments, while others concentrate on just one. Unfortunately, estimates of the split of industry sales between the OEM and aftermarket segments are not available.

Each group of customers has differing requirements. Vehicle manufacturers obviously want parts that meet their final products' design characteristics. In addition, they are increasingly seeking parts suppliers who can provide complete component systems, or modules, such as entire interiors, instead of individual components. By assembling modules instead of building from individual parts, automakers can cut costs and simplify assembly of the completed vehicle. In this sense, the automobile manufacturing process is becoming less centralized, which may allow more specialty firms to enter and succeed in this market.

Aftermarket customers are of two types—auto repair shops and do-it-yourself “driveway mechanics”—whose demands are somewhat similar. Both want parts that are very close substitutes to the original equipment being replaced, which means that the replacements must be built to virtually the same specifications as the original parts.

The majority of do-it-yourself auto parts customers perform relatively simple jobs, such as battery replacements, oil and other fluid changes, brake jobs, and minor tune-ups. A 1999 survey of retail parts customers revealed that batteries were purchased by 38% of respondents, compared with motor oil (86%), windshield wipers (44%), and brake system parts (43%). Cooling system parts are expected to have high growth as well. In 1999 battery sales were anticipated to increase 6%, and antifreeze’s growth rate was expected to be 5%. Brakes are the biggest seller for many retail auto parts stores. Brakes are big sellers “because of the way people drive these days,” said one respondent, but a common answer was that brakes are “the only sure thing to wear out these days.” Another respondent simply said, “more horsepower not enough brake power in new vehicles.” On average, brake products and tune-up parts account for a combined 358 feet of display space per store. By comparison, the other 20 product categories combined take up an average of 516 feet. One retailer expected that car wash soaps would be hot sellers because new paint technology has in many ways in consumers’ minds made traditional wax and polish obsolete.

Changes in the age, composition, and other characteristics of the population of do-it-yourself aftermarket parts buyers are likely to have large impacts on the way the industry does business. The so-called Generation X consumers (roughly 19 to 38 years old, numbering 17 million in 1999) will clearly help change the marketplace. They are an “electronic generation,” made up of the type of people more comfortable shopping over the Internet than in an actual store. The result will be an overall rise in electronic commerce, reaching \$26 billion in 2002 from \$4.5 billion in 1998, according to the vice president of marketing for a large parts seller. Generation Y (persons under 19 years old) is likely to have an even bigger impact. This is partly because of their sheer numbers—approximately 60 million—and their even greater use of electronic shopping means than Generation X. The message is clear: auto parts, like many other consumer products, will be increasingly sold over the Internet, and companies who want to survive must engage in e-commerce. Also, as in other consumer product industries, the move to e-commerce has the potential to greatly affect the distribution structure of the industry as the more innovative parts manufacturers begin to sell directly to customers over the Internet.

While much of the attention in the popular media is focused on e-commerce involving final consumers, it is well-established that the vast majority of business conducted over the Internet is between businesses. This pattern is clearly present in the MVPA industry, and the picture changes almost daily as automakers form alliances and new parts auction ventures are created. Several recent examples are relevant here. In November 1999, Ford and Oracle Corp. announced plans to set up a joint venture to use the Internet to automate procurement and planning activities between Ford and its suppliers. General Motors had been using the business-to-business online auction company FreeMarkets Inc. for purchases of items like molded plastic parts and fasteners, but has recently bought a large stake in a similar company, Commerce One, and announced plans to move over to that

service in the first part of 2000. Then, in late February 2000, GM, Ford, and DaimlerChrysler agreed to create a single Internet-based auto parts exchange that is expected to handle \$240 billion in annual spending when fully operational. This last development has led many auto parts suppliers and stock market analysts to be very pessimistic about parts firms' ability to maintain already thin margins. Another recent development is a joint venture formed by suppliers of computer services to firms in a variety of automobile industry sectors (including auto insurers). The venture, to become operational in the summer of 2000, will provide a Web-based system that will allow repair shops to locate needed parts, have the parts delivered, and be paid by the relevant auto insurer, all through a single Internet site. This may put additional pressure on parts makers' margins and make it all the more important for these firms to participate in at least some forms of e-commerce.

Industry Competitive Analysis

Industry Structure

The U.S. industry consists of approximately 5,000 firms, including about 500 Japanese, European, and Canadian manufacturers. The industry is dominated by 100 large manufacturers that supply both the original equipment market and the aftermarket. As stated above, the U.S. MVPA industry appears to be moderately concentrated. Data from the 1992 Census of Manufactures shows that the largest 4, 8, 20, and 50 firms in the industry account for, respectively, 48%, 57%, 69%, and 79% of total industry sales. Auto parts markets, both in the OEM and aftermarket sectors, tend to be national and international rather than local in scope. Therefore the data for the U.S. alone probably overstate the degree of concentration in this market, especially given the increasing "globalization" of the motor vehicles and parts industries over the past two decades. And while it is probably fair to say that global concentration has increased during the 1990s, given the increase in consolidation activity (see below) and the fact that the global top ten parts makers grew sales by 47% from 1993 to 1997, parts manufacturers are still sufficiently numerous to ensure vigorous competition.

The U.S. automotive parts aftermarket consists of some 2,000 firms that manufacture exclusively for the replacement parts market and numerous original equipment parts manufacturers that also supply the aftermarket.⁶ Sales in 1997 were in the broad range of \$150–\$250 billion, depending on the industry definition used.⁷ The market has experienced a stable and relatively low growth, primarily because of the dramatic improvement in quality and durability of original equipment parts. It has also been argued that El Niño has slowed the sales of aftermarket parts by reducing the extent of

⁶This figure and the figure at the beginning of the previous paragraph are both from the U.S. Department of Commerce publication *U.S. Industry & Trade Outlook '99*. Taken together, the numbers imply that there are 3,000 firms who make OEM parts but not aftermarket parts, but that point is not made directly in the publication.

⁷The definitions were used to derive this range would all appear to go beyond SIC code 3714.

severely cold weather, which typically leads to stress and failure on many parts such as batteries and brakes.

Particular segments of the industry are probably more concentrated than overall auto parts manufacturing, but not enough to cause valid concerns about insufficient competition. For example, in 1997 the four largest automotive electronics firms accounted for 33.2% of the segment's worldwide sales of roughly \$65 billion, while the ten largest accounted for 52%.

Brand loyalty may be important for some aftermarket parts and accessories. This is partly because auto manufacturers often recommend certain brands (which may be owned by the auto maker) as replacements. Our research has not yet yielded a determination of the extent to which auto makers are vertically integrated, but we suspect that there is a combination of vertical integration and outsourcing for original (OEM) parts. The presence of auto makers in aftermarket parts sectors likely varies considerably, depending on the specific part in question. Outsourcing arrangements may include exclusive licensing of brand names owned by auto makers to outside producers. It is not clear at this stage of our research how many aftermarket parts are made by auto makers, how many are made by outside firms under some sort of licensing arrangement with auto makers, and how many are made by truly independent manufacturers.

Trends in Consolidation and Outsourcing

The motor vehicles parts industry is experiencing a combination of developments that is by no means unique among U.S. industries: smaller producers are merging with or being bought by larger producers, while simultaneously more firms are created as auto makers spin off previously integrated parts divisions. Furthermore, auto makers are increasingly requiring suppliers to assemble parts into integrated component systems ready to be installed as a whole into new cars. Each of these trends will be considered in this section.

There has been a recent strong wave of consolidation in this industry caused by the need for suppliers to expand their geographic reach, manufacture a greater variety of products, and capture economies of scale. In addition, there has been a push from the seller side of the auto parts merger market, as conglomerates have been especially eager to rid themselves of their automotive assets so that they might turn their attention to other lines of business. Slightly over half of the 620 automotive merger and acquisition (M&A) deals consummated worldwide in 1998, representing about 38% of the total value of \$80 billion in deals, involved parts suppliers. U.S. parts suppliers accounted for more than half of the M&A activity among parts makers. Some companies have been very active players. For example, Dana, already one of the industry's largest members, completed 24 purchases or joint ventures between 1993 and 1996, and in 1998 acquired Echlin. The result has been a company with \$13 billion in annual sales, participating in both the OEM and aftermarket segments. Other big M&A deals included Johnson Controls buying the Becker Group and the purchase of Delphi's seating business by Lear Corp. Each of these purchasing firms (Johnson and Lear) has a significant presence in Missouri. Retail sellers of auto parts have also been involved in extensive consolidation activity.

The impact of consolidation on competitiveness in auto parts industry segments is unclear. On one hand, consolidation can lead to stronger competitors with lower costs, and if auto parts are viewed as commodities by auto makers, greater price competition (as opposed to greater efforts at product differentiation) may result. On the other hand, forecasters for the federal government see some danger in the rapid consolidation of automotive parts suppliers. If manufacturers come to rely on a single source for a part, monopolistic conditions could arise, leading to reduced price competition. In addition, production problems at a single large parts supplier would have a greater impact than a similar problem at one of many smaller suppliers.

Another clear trend in auto parts manufacturing is increased outsourcing by auto makers. Until relatively recently, the dominant model in auto manufacturing has been a high degree of vertical integration, under which auto makers also owned the producers of the vast majority of car components. But in the last twenty years or so, many auto makers have sold off their parts subsidiaries while concentrating on design and assembly. As a result of this divestiture process, independent parts makers have been forced to take on much greater responsibilities. Some salient features in the transition are “system integration” and increasing responsibility of more research and development. Auto makers are heading in the direction of having Tier 1⁸ suppliers take responsibility for assembly of major modules, such as entire front end systems. In addition, auto makers are turning over the design and manufacture of complete sections of a car model to outside firms, outsourcing modules to non-affiliated companies, and spinning off formerly captive module and subassembly operations. Because of the need to work more closely with auto makers in the restructured auto industry, parts makers have had to respond to requests (perhaps “demands” is a better word) from auto makers to conform to a business model that is more compatible with auto makers’ needs. For example, General Motors, Ford Motor Co., and DaimlerChrysler AG are putting more pressure on suppliers to join the Automotive Network Exchange, a private, business-to-business computer network that was launched in 1998. Parts manufacturers that were unable to adapt to these far-reaching trends have disappeared from the market.

Outsourcing combined with pressure on parts makers to produce integrated systems can pose problems for car manufacturers. In their quest to get more parts suppliers involved in the production of modules, automakers have encouraged those suppliers to grow. Now they are beginning to see some things that they do not like resulting from that growth. As the suppliers grow, they can become threats to other parts makers. As parts makers’ numbers fall through attrition and M&A activity, there is a potential for less price competition. This is in conflict with the major goal on which auto makers’ outsourcing strategy is based—reducing the cost of component parts systems.

⁸Although “Tier 1” parts suppliers are technically defined as those having the ability to integrate parts into component systems, many parts makers calling themselves Tier 1 suppliers do so simply because they sell directly to auto makers, even though they do not have systems integration capabilities. In fact, the Motor & Equipment Manufacturers Association notes that so many OEM suppliers have misused the tier structure designations in making claims for their companies that the association no longer acknowledges a tier system.

Furthermore, outsourcing is one of the major reasons of strained relationship between union and management within auto makers. This can lead to pressure on parts makers to allow labor unions into their plants so that auto makers can minimize the union labor problems caused by outsourcing.

Outsourcing by auto makers has led parts makers to take on another responsibility that was previously confined for the most part to the auto makers. The increased demand for research and development has prompted some suppliers to construct technology centers and hire more people. For example, Lear Corp. recently opened a \$40 million technology center and headquarters campus, mainly to support research and development. While the larger parts manufacturers have the financial wherewithal to take on the R&D function, this development could threaten the viability of smaller parts suppliers.

Another broad conclusion can be reached by looking at the results of outsourcing by auto makers and consolidation in the parts industry, one that may have important implications for Missouri firms in the MVPA industry. In an article in the First Quarter 1999 issue of the Federal Reserve Bank of Chicago's *Economic Perspectives*, Thomas Klier finds suggestions that:

... the degree of spatial concentration of supplier plants around assembly plants has increased since 1980. The timing of that change is consistent with the application of lean manufacturing techniques and just-in-time production linkages. However, the order of magnitude of the increased concentration does not support the concept of a supplier base that is tightly clustered around its customers. (p. 31)

One might reasonably conclude that the production and inventory management techniques Klier refers to are related to and probably contributing causes of the changes in the structures of the auto making and parts manufacturing industries. Klier also suggests that the results do not mean that suppliers need to be just around the corner from the assembly plants, but that they should be within a day's drive. He thus supports the idea of regional (rather than local) clustering in the automobile manufacturing complex.

An important potential corollary implication of the outsourcing of parts making by auto assemblers is that responsibility for parts inventory management may also be moved to parts makers. While this is clearly an increased burden for which some parts makers will not be prepared to assume, it also represents an opportunity for parts makers to add service related value to their lines of business.

Product Line Breadth

Our research reveals that product breadth strategies should vary according to the size a parts manufacturer has or wants to have. It appears that small manufacturers can find niches in individual parts or small groups of parts, but larger firms must be able to produce component systems. To survive, it is important for small business to be identified with certain products and not necessarily with entire systems. Molding and air bag components, for example, are niches for small companies. To remain competitive in a global market, however, more and more aftermarket suppliers are finding it necessary to build the OEM side of their business. This helps them offset slower sales as the demand

for replacement parts declines due to better designed parts and higher manufacturing standards.

Competition

General. Downward pressures on the prices received by auto parts makers have been strong, but only in part because of competition between firms. A very important factor contributing to lower prices has been U.S. motor vehicle manufacturers' continued demand for lower costs. Although some bigger and more efficient suppliers with low unit costs (e.g., Dana and TRW) have been able to increase their profit margins despite lower prices, many smaller suppliers have encountered diminishing returns as each additional improvement is becoming more costly and technologically more difficult to achieve. Auto makers such as Ford and Chrysler have asked parts suppliers to find ways to reduce costs by about 5%. Delphi average prices in European parts markets fell about 2.5% in 1998 and the company expected the same to happen again in 1999. The combination of downward price pressures and increased responsibilities (see previous section) results in a lower growth in profits.

Foreign Firms in the U.S. Market and U.S. Firms in the World Market.

Competition for U.S. parts makers from foreign companies is strengthening. Even though, as was discussed in an earlier section, automobile industry clusters tend to be regional in nature, there is a clearly global aspect to parts markets as well, particularly in certain segments such as automotive electronics. Indeed, given the global nature of both the motor vehicles and electronics businesses, it is hardly surprising that the commercialization of automotive electronics at the OEM level has occurred on an international scale.

The value of global parts sales is huge, and the importance of the global market to individual companies is large, as the following examples show. Delphi Automotive Systems, the world's number one supplier, has attempted to augment its overseas sales by \$8 billion to \$9 billion. The sales increase will mainly come from the new investment and establishment in those foreign regions where the major auto makers are aggressively increasing their presence. Robert Bosch of Germany, the global number 3 supplier, currently gets more than half its business from outside Germany, with close to 20% coming from North America.

One major source of foreign trade is the tendency for automobile industries in certain nations to establish transplant facilities in countries other than their home base of operations and then source OEM component purchases back to suppliers based in the headquarters country. As motor vehicle manufacturers have begun to supply overseas markets with vehicles produced in those markets, the parts manufacturers have followed their customers into those markets by establishing new production facilities or entering into joint ventures with local manufacturers. For example, European parts firms have put facilities in the U.S. following BMW's development of its plant in South Carolina.

Foreign, mainly Japanese, competition in the U.S. market was a major catalyst for the industry's restructuring, and U.S. suppliers have increasingly been challenged by imports and U.S.-based foreign-affiliated automotive parts manufacturers. Imports account for

approximately 20% of the parts sold in the U.S., and many foreign parts makers have established facilities in the U.S. Furthermore, U.S. firms face strong competition in overseas markets: Japanese firms are the strongest in Asian markets, European parts makers are moving into emerging eastern European markets, and everyone, including the Brazilians, are interested in Mexico and Latin America. OEM automotive electronics markets in developing Asia, Latin America, Africa/Mideast, and Eastern Europe will exhibit the rapid growth per annum into the early years of the next century, despite ongoing economic difficulties plaguing many countries located in these areas. The remainder of this section offers some facts about international competition in two important regional markets that are likely to exhibit very high growth rates over the next decade.

Few industries or sectors illustrate the high degree of economic interdependency between the U.S., Canada, and Mexico more forcefully than motor vehicles, with respect to both complete vehicles and original equipment parts and components. As of the late 1990s, Canada absorbed roughly 55% of total U.S. car and truck exports (in unit terms), while the U.S. accounted for nearly all of Canada's external sales. Similarly, the U.S. takes some 85% of Mexico's motor vehicle exports, with Canada absorbing close to 5%. Mexico has been one of the U.S. automotive industry's most significant foreign markets since the early 1980s. The country is clearly on its way to a full recovery from the December 1994 devaluation of the peso and the subsequent economic crisis that severely affected its automotive industry. Mexico is rapidly developing as an important trading partner for parts, as both an exporter and importer, particularly in automotive electronics. In the case of light vehicles, the lesser developed Mexican industry will exhibit more rapid growth in the electronics production relative to its developed counterparts to the north. Furthermore, Mexico comprised a \$1.2 billion market for OEM automotive electronic products in 1997, one that has risen nearly ninefold over the past decade. Finally, it is important to note that NAFTA requires the harmonization of Canadian and Mexican auto emission standards with those in the U.S., which are more stringent. The increased standards will require parts replacement and upgrade on older light vehicles that do not meet the standards.

As a result of NAFTA and Mexico's aging vehicle fleet, that country will be a prime market for U.S. aftermarket parts manufacturers, who already account for 23% of the Mexican aftermarket. Projections are that the Mexican aftermarket will double in size, to \$11.4 billion, between 1997 and 2003. Mexico also promises to be a springboard for supplying other Latin American countries. In recent years Brazil has emerged as one of the world's fastest growing automotive markets. U.S. parts exports to Brazil should continue their rapid increase as the Brazilian automotive boom continues into the twenty-first century.

Asia is perhaps the most promising parts market for the next decade. A sudden economic crisis in 1997 greatly drained purchasing power across the region, but the region appears to be rebounding, with its recovery led by Thailand. As a result of the Asian recovery, European, Japanese, and American auto makers poured more than \$9 billion into new production plant, wanting to take a larger piece of this huge market, with its population of 1.6 billion. The Asian markets that have the most favorable long-term

potential are those of China and the nine-member Association of Southeast Asian Nations. Despite the recent financial crisis in Asia, the long-term outlook for U.S. automotive products in China remains strong. U.S. exports to China increased 139% in 1997, growing from \$130 million to \$311 million. Admission to the World Trade Organization of new countries should continue to help U.S. manufacturers gain a stronger foothold in those markets because WTO membership will force the reduction or elimination of the vary high tariffs now in effect.⁹ The Philippines also represents a potentially large growth area. Despite the recent economic turmoil in the area (automotive sales in the Philippines in 1998 fell 44% below 1997 figures to 80,231 units), Ford alone is putting up a \$333 million assembly plant. In addition, the country's local content rule of 40% will be rescinded by 2000.

Technology: Products and Industry Productivity

Both the products produced by auto makers (and hence by parts makers) and the processes used by auto and parts makers are continually being changed by new technologies. Future growth for U.S. automotive parts firms will continue to be technology-driven as a result of increasingly stringent safety, fuel efficiency, and environmental regulations as well as increasing demand for enhanced passenger comfort systems. Automotive industry members deploy a wide variety of technologies. For assemblers, CAD, CAM, and CAE technologies are cornerstones of design. For parts suppliers, data, voice, and video networks enable regional factory and design center linkages. In final products—the vehicles—increasingly complex electronic systems require sophisticated diagnostics and control systems.

A 1999 survey of a wide range of parts makers indicates that an important transition in information management is underway and that its ultimate results are unclear. Parts industry members do not even exhibit a consensus regarding whether spending on information technologies should be considered a “cost” or an “investment,” and are generally unable to state an expectation regarding the return on such investments. At the same time, however, the survey's respondents clearly recognize that information technologies are likely to be important for both production processes and marketing efforts.

As discussed above, one important change has been the shift to increased outsourcing by auto makers combined with their demands on parts suppliers to provide modules or complete systems of components. System integration—the supply of modular or pre-assembled units that can be installed in a vehicle as a single system—is desired by car makers. Auto makers are looking for suppliers that can produce modules, such as entire interiors, instead of individual components. By assembling modules instead of building from individual parts, automakers can cut costs and simplify assembly of the completed vehicle. Modularization is a global trend, involving parts made of aluminum, steel, iron,

⁹For example, China levies 80–100% tariffs on sedans, and the price—including tariffs—of a Ford Explorer in Vietnam is \$96,000.

copper, powdered metals, magnesium, plastics, and other materials. The trend is still in its early stages, and many people are wondering how far it will go and how well it will succeed, but it will clearly have an impact on where and how production materials are shipped as well as on the number and kind of parts-making production plants. Along with this trend comes the need to facilitate better access to data and improve the information interface with both suppliers and customers of parts makers. With consolidations creating more and more very large suppliers, these newly formed parts companies must refashion their connections to suppliers as well as to the engineering departments of auto makers.

An important development within the outsourcing/modularization trend is the need for more strictly followed standards. The "big three" U.S. auto makers are attempting to get their suppliers to follow the newly created QS-9000 set of standards, which is the auto makers' attempt to bring about a single standardized quality system for continuous cost improvement, waste reduction, and defect prevention. By the end of 1997, only half of the roughly 8,000 so-called Tier 1 suppliers had met the standard.

As is evident to most purchasers of new vehicles, plastics are finding more widespread use in auto parts manufacturing. As plastics technology advances, it is possible to use new plastic materials to produce a variety of car parts. In the past, the use of plastics was often viewed by consumers as an indicator of inferior products, but they have by now been largely accepted by automotive consumers. Advances in polymer technology bring quality plastics to the design table. Plastics are increasingly penetrating the automotive market because of the materials' favorable properties, such as corrosion resistance, low weight, and the ability to combine functions to reduce assembly costs. Uses for plastics that would not have been considered 10 or 15 years ago include plastic fuel tanks and intake manifolds. Compared to steel fuel tanks, which are made in more than one piece, plastic tanks are made in one piece, which yields a lower assembly operation cost. A manufacturing technology used for some time in Europe, welded plastic air-intake manifolds, has been widely adopted in the U.S. now. The wider use of plastics in automotive applications is leading plastic parts makers to improve their manufacturing processes to cut costs and improve quality. Imagine being able to reduce downtime by 56% and boost capacity by 36% without buying any new molding machines. It is a dramatic turnaround in which smarter business control can help save a company from the brink of bankruptcy.

Computer vision technologies are gaining wider use in many manufacturing applications, including auto parts manufacturing and auto assembly. The prices on such systems are falling rapidly, averaging only 25% of prices just a decade ago. These systems are very good for detecting defective parts, particularly in high-speed manufacturing lines in which visual inspection by human eyes would slow the pace of the process to unacceptable levels. The scope of machine-vision solutions is being extended by combining them with X-rays. A good example is in the manufacture of air bag systems. Since the components being inspected are sealed in a metal canister before final inspection, X-ray technology is the only way to view the sealed components.

Technological advances are also dramatically transforming the products themselves. The trend towards smarter, more electronic vehicles is growing. This trend especially

will be seen in several fields: in-vehicle communications systems; electric toll collection; automatic vehicle identification; automatic vehicle location, and so on.¹⁰ Sensors, including image sensors, accelerometers, and gyro sensors, are important components in many new onboard vehicle electronic devices, from obstruction detection equipment to run-flat tires.

Safety features such as anti-lock braking systems and airbags are standard equipment on a large number of vehicles sold throughout the developed world, and will continue to be improved as technological innovations, such as the so-called smart airbags that can sense passenger size and position and adjust the speed and force of deployment accordingly, are brought to market. Other electronic safety features that are likely to increase market penetration include controls for steering and traction, windshield wipers, lighting, and mirrors, and just beginning to emerge are collision avoidance systems. All of these new safety features provide additional opportunities for growth for parts makers.

Increasing installations of convenience and entertainment electronic devices will also provide impetus for the growth of parts makers. Based on the earlier success of Visteon's Rear Seat Entertainment system console for minivan applications, the company is launching an overhead version of the system designed for sport utility vehicles. Delphi Automotive Systems commitment to increase drive-time productivity and to bring more information, communication, and entertainment content into vehicles is demonstrated by its Communiport Mobile MultiMedia product line. Mobile MultiMedia, which has MP3 playback capabilities, mobile internet browsing, and a universal connectivity feature that will allow hands-free operation of cell phones and other devices, is said to have the potential to revolutionize the customer experience in the automobile by providing much of the information, entertainment, and communication capabilities people have in their home or office. Another development that could affect automotive-connector suppliers is the recent formation of a consortium by six automakers—Daimler-Benz, Daimler-Chrysler, Ford, GM, Renault, and Toyota—that is working to create a standard for information communications, and entertainment systems to interact with a vehicle's electronics.

Environmental restrictions and concerns, including regulations that are likely to result in many nations (if not the U.S.) from implementation of the Kyoto CO₂ protocols, are driving the development of new low emissions motive technologies. In 1990, California adopted more stringent standards that required car companies to make progressive reductions in the emissions from vehicles sold within the state. As laid down in the Clean Air Act Amendment of 1990, Federal emissions limits are currently being reviewed and new regulations should be established by the end of the year. The push for low- or zero-emissions vehicles has led to developments beyond merely improving the gasoline internal combustion engine. A recent study of global power train trends projects that the use of automotive fuel cells, a hydrogen-based approach that could help governments

¹⁰Many of the electronic additions also provide auto makers with the opportunity to augment post-sale revenue streams. New or planned services for cars are global navigational aid, emergency signaling, phones and entertainment. If GM could collect \$25 a month for such services on every vehicle sold, that would amount to \$1.5 billion annually for just one year's sales.

meet Kyoto targets, will advance rapidly beyond 2005. Auto parts and component systems suppliers should begin investigating the materials, systems, and processes needed to produce zero-emission engines and their drive systems or risk being left behind.

General Strategic Issues

The profitability of a business depends upon both the overall degree of competition in an industry and the position of the business relative to its rivals. A business has little control over the general degree of competition in its industry but can take strategic actions to position itself favorably relative to its rivals and thereby influence its profitability. Businesses that earn profits above the industry average do so because they find a sustainable competitive advantage. This advantage allows such firms to position themselves relative to their rivals in ways that emphasize their relative strengths; and this in turn allows them to better cope with the various forces of competition.

Firms in the auto parts industry face significant competitive pressures because the industry sells products to a few large buyers (particularly in the OEM segment) that possess significant bargaining power. Success in the auto parts industry then depends greatly on strategy and how a firm positions itself relative to its rivals.

It is common to distinguish between two broad strategies to achieve competitive advantage. The first is cost leadership, and the second is product differentiation. Each of these strategies represents a different route to sustainable competitive advantage and above-average profitability. Moreover, no matter which of these approaches is adopted, a firm also needs to determine whether it will compete for all buyers in a particular market or focus on just a target segment of market. Successful firms will choose a strategy and target segment based upon their own individual strengths and weaknesses.

Cost leadership is a strategy of attempting to become the low-cost supplier in the industry. Sources of cost leadership are varied but would include such things as pursuit of scale economies, use of proprietary technology, and preferential access to raw materials and other inputs. Firms pursuing this strategy must seek out all sources of cost advantage while at the same time produce a product that is perceived as comparable to that of rival firms.

In a **differentiation strategy** a business attempts to make itself unique in an industry along dimensions that are considered valuable by buyers. The business needs to find attributes that buyers perceive as important and position itself to meet those needs. The attributes along which differentiation may be achieved are extremely broad, including the product or service itself, the delivery system used, the marketing approach adopted, and so forth. To be successful in a differentiation strategy, a business must choose attributes to emphasize which will allow it to be perceived as distinct from its rivals. For products sold to consumers or end users, differentiation is often a promising strategy.

No matter whether cost leadership or product differentiation is pursued, a firm must also decide how broadly over the market it should compete. Most markets contain so-called segments. These segments are distinct customer groups who possess a common set of characteristics or special needs. In consumer goods industries, for example, buyers may be segmented by income levels, frequency of purchase, knowledge of the product,

and so forth. Industrial goods buyers may be segmented by size of buyer, willingness to trade price for quality, location, or special product needs. A firm needs to determine whether it will attempt to serve all of the market segments or focus upon target segments.

When a firm focuses, it aims to better serve a single or small number of buyer segments in an industry. For some segments this will require a firm to be a low-cost producer. In other segments a firm may compete by offering a differentiated product. Firms that become very narrowly focused (specializing perhaps in as little as one segment with a single product) are often said to be following a “niche strategy.”

Because of resource limitations, small businesses typically must focus on only one or a few segments of an industry. Whether a strategy of low cost or product differentiation is appropriate depends upon the nature of the buyers in the segments being pursued and the positions of rival firms competing for those same buyers. Consider for example the following sets of questions in reference to a particular buyer segment:

1. Are the products or services produced for this segment virtually standardized? Purchase of standardized goods and services are generally made on the basis of price alone.
2. Can the attributes of the product or service and its quality be ascertained by the buyer prior to purchase? Such products can be judged as to acceptability by prospective buyers, and for a given quality a supplier must also offer the lowest price.
3. Are the buyers extremely price sensitive and unwilling to pay much of a premium for enhanced quality or image? In some cases nothing matters other than price. As a result, only firms that are able to offer the lowest prices will survive.
4. Is little post-sale service required for this product? Competition in segments in which post-sale service has little or no significance often will turn on price alone.

If each of these questions is answered affirmatively, then cost leadership is likely to be a dominant strategy. Segments displaying these characteristics offer little scope for creating value to buyers through differentiation efforts. Successful firms will be those that manage to serve this segment at minimal cost.

Product differentiation becomes a more viable strategy in industries where the conditions given in the questions above do not prevail. Under these circumstances, firms have the opportunity to offer differentiated products with attributes that are especially desired by at least some buyers. Firms successful in product differentiation benefit through the ability to obtain price premiums for their products.

The growth and new direction of outsourcing by auto makers suggests that broad-based product differentiation may be a viable strategy in the OEM segment only for the larger and more sophisticated auto parts manufactures. Small businesses may also find broad-based cost leadership a difficult strategy to pursue due the existence of economies of scale in the manufacture of many parts, the QS-9000 set of standards, which the major auto manufacturers are promoting, and the recent moves by auto makers to carry out parts procurement in electronic markets. These industry developments suggest that small businesses should generally look for target segments in the industry which they can better

serve.

Small businesses may find profitable segments through the adoption of a very narrow product line or by focusing on a small segment of the buying population to service. Adopting a narrow product line may allow a business to achieve better quality or more flexible production scheduling and thereby obtain some product differentiation advantages. In addition, a narrow product line allows a business to specialize and obtain cost savings. Other businesses may focus in terms of a target audience. It may be worthwhile, for example, to specialize in serving as little as one model of automobile in the OEM segment. Other firms are likely to find it advantageous to target only aftermarket buyers. Even within the aftermarket segment, businesses may gain advantages by becoming even more focused. For example, a firm may choose to focus its resources on better serving the rapidly growing Mexican aftermarket segment.

The auto parts manufacturing industry is undergoing substantial changes. Firms that succeed in this industry will be those that are best able to deal with the changes. Coping with these changes requires planning. Firms that go through the process of evaluating their strengths and weaknesses and developing a coherent strategy for operating in this market will have a greater chance at success.

Challenges: Opportunities and Threats

Many challenges confront motor vehicle parts manufacturers in the years ahead. These challenges, which have been hinted at in the previous sections of this report, primarily involve adapting to a new, less vertically integrated industry structure, including the development of systems assembly capabilities, achieving (through the adoption of new approaches to production) cost reduction targets sought by their auto maker customers, and providing rapid increases in the production of new electronic safety and convenience systems demanded by consumers.

One area not touched upon earlier is the labor shortage that is currently a prominent feature in virtually every U.S. industry. Automotive suppliers across the country are trying everything they can think of to find, hire, accumulate, train, and retain good hourly workers. Until lately, employee retention was nearly a lost discipline as employees tried to keep payrolls lean through most of the 1990s boom. "There is no shortage of individuals applying for jobs," according to the human resources manager for Mexican Industries, a Detroit supplier of armrests and other interior components. "But good resources are hard to find. We'd still like for them to have a little bit of background in manufacturing." Delphi Automotive Corp. is trying to keep its plants fully staffed in part by simplifying manufacturing operations so that they do not require skilled tradespeople. Delphi's new approach already is proving so effective that its greatest need among the 3000 or so it hires each year is for unskilled workers rather than for tradespeople.

The challenges facing the MVPA industry have been well summarized by Joseph Day, CEO of a large parts concern. In an August 1999 speech to a large audience of auto executives, Day suggested that with a major shift occurring in the automotive supplier tier structure, warranty cost issues, increased expectations, and merger mania, the automotive industry must "think out of the box," target total costs, embrace lean systems, and focus

on value for the consumer. While this advice may seem to be an excellent example of clichéd business-speak, it is probably true that auto parts firms that fail to follow some form of it are likely to find themselves either out of business or takeover targets in the merger mania to which Day refers.

Recent announcements by two major U.S. auto makers highlight the likelihood that environmental standards are destined to have a significant effect on the MVPA industry. A challenge that Ford parts suppliers must meet is the requirement to become certified in international environmental standards, specifically ISO 14001, by July 1, 2003. General Motors is also pressuring suppliers to meet ISO 14001 requirements, although, to date, the automaker does not require actual certification. General Motors has posted December 31, 2002, as the deadline for suppliers to implement an environmental management system.

Directions for Future Research

This initial research has yielded much useful information about the characteristics of the U.S. MVPA industry. But it also raises a series of questions about the details of what has been uncovered thus far, particularly as they relate to the submarkets inhabited by Missouri MVPA firms. These questions include, but are by no means limited to, the following:

1. How well are Missouri auto parts firms positioned to survive the transition to a less vertically integrated MVPA industry? In order to answer this question, the segments in which Missouri firms are most commonly found will first need to be determined more clearly.
2. What industry niches hold the greatest prospects for success for firms that wish to avoid the complexities of producing modular systems? What are the key elements upon which competition is based in those product niches?
3. How important is the adoption of electronic interfaces with customers, either retail outlets or auto manufacturers, for the survival and growth of small auto parts producers?

The answers to these and other questions will provide important information to motor vehicle parts manufacturing firms as they develop strategic thinking about their production and sales activities and determine what steps must be taken to position themselves for success in the coming years. The answers can also help the Center for Competitive Analysis and other University of Missouri and Missouri state government offices determine how they might help these firms achieve their business goals.