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Who Really Made Your Car?

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Thomas Klier and James Rubenstein

Who Really Made Your Car?

This article highlights some of the research presented in the authors' new book, Who Really Made Your Car? Restructuring and Geographic Change in the Auto Industry, which is available now from the Upjohn Institute. To order the book, see p. 8.

These are challenging times for the U.S. motor vehicle industry. Employment declined by 26 percent during the first seven years of the twenty-first century, from 1,160,000 in 2000 to 860,000 in 2007. During the same period, the share of the U.S. market held by the U.S.-owned Detroit 3 carmakers (General Motors, Ford Motor Co., and Chrysler LLC) declined from 65 percent to 51 percent.

Employment in the U.S. auto industry declined 26 percent between 2000 and 2007.

While traditionally the focus has been on the carmakers, they now provide just 22 percent of industry jobs. In 2006, employment in the motor vehicle parts sector in the United States was 673,000, compared to 186,000 in final assembly (Table 1). Suppliers also provide around 70 percent of value added of vehicles. Despite the importance of parts suppliers, we know relatively little about this sector of the motor vehicle industry. Our book, *Who Really Made Your Car?* sheds light on how parts suppliers are impacting the structure of the motor vehicle industry and the resulting changes in the geography of production.

The book's analysis is based on a unique database. It includes observations

from several thousand individual parts plants in the United States, Canada, and Mexico. A large number of variables have been collected for every factory operated by the 150 largest North American suppliers, as well as more than a thousand smaller companies. The starting point for constructing the database was information acquired from ELM International, Inc., a Michigan-based vendor of information about automotive suppliers. Altogether we have data for 3,179 parts plants located in the United States, plus 416 in Canada and 673 in Mexico. Combined, these plants account for the overwhelming majority of parts production in North America (see Figure 1).

Structural Changes in the Auto Industry

Until the late twentieth century, U.S. carmakers produced most of their own parts themselves and dominated the suppliers from whom they purchased parts. In the twenty-first century, responsibility for making most of the parts has been passed to independently owned suppliers.

Several structural changes underlie the increased role played by parts suppliers, including the following:

- Instead of gathering together thousands of individual parts and components at their final assembly plants, carmakers are now purchasing large modules and systems ready to be installed on the final assembly line.
- Instead of buying from thousands of suppliers, carmakers are offering large

Table 1 U.S. Assembly and Parts Employment, 2007

	Employment (000)	Share (%)
Carmakers		
Total light vehicle assembly	186.0	21.7
Parts suppliers		
Electronics	83.9	9.8
Exterior	153.0	17.8
Powertrain	139.3	16.2
Chassis	76.4	8.9
Interior	61.4	7.1
Other	159.0	18.5
Total parts suppliers	673.0	78.3

SOURCE: Bureau of Labor Statistics via Haver Analytics.

contracts to a handful of suppliers, which are consolidating into fewer larger firms. These supplier companies in turn interact with smaller suppliers.

- Instead of awarding contracts annually to the lowest-price bidders, carmakers are developing long-term relationships with suppliers, at least for the several-year life of specific vehicle models, if not longer.

- Instead of providing detailed specifications, carmakers are giving their direct suppliers responsibility for research and development to design and build innovative modules and systems.

- Instead of maintaining a large inventory of parts, carmakers are requiring suppliers to deliver modules and systems on a just-in-time basis, often within only a few minutes before needed on the final assembly line.

Geographical Impacts of Structural Changes

These structural changes have changed the geography of motor vehicle production on several scales.

Michigan. When the Detroit 3 sold more than 90 percent of the vehicles in the United States, southeastern Michigan was the center of the industry’s manufacturing, research, and administration. The decline of the Detroit 3 carmakers has hit employment in Michigan especially hard. During the 1950s, three-quarters of all parts were made in or near Michigan, whereas the state is now responsible for only one-quarter. As recently as 1990 Michigan

had 289,000 jobs in the motor vehicle industry, compared to 181,000 less than 20 years later.

However, not all motor vehicle production has abandoned Michigan. The

During the 1950s, three-quarters of all parts were made in or near Michigan, whereas the state is now responsible for only one-quarter.

state still houses a disproportionate share of production of engines, transmissions, and bodies, as well as the parts that go

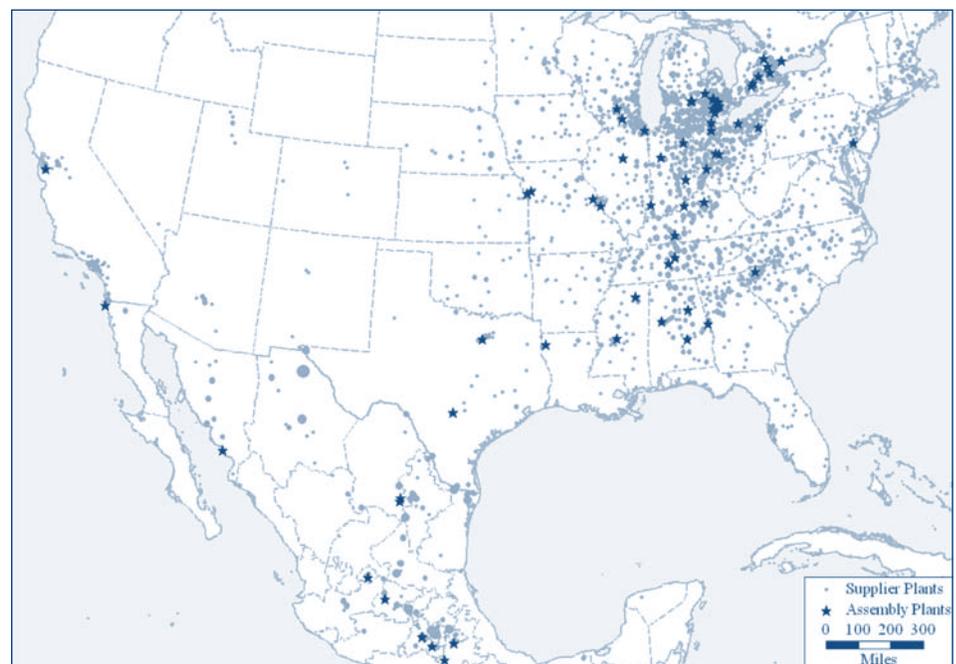
into them. The industry’s research and headquarters functions continue to be centered in Michigan.

Local-Scale Networks. Close linkage between an assembly plant and its network of suppliers is crucial for efficient operation in the contemporary environment of lean inventory with just-in-time delivery. For most suppliers, close linkage means a factory site within a one-day delivery range of the assembly plant; typically around three-fourths of an assembly plant’s suppliers are situated within that distance.

At the same time, close linkage does not mean suppliers must locate next door to the assembly plant. In fact, only few suppliers are found within a one-hour drive of an assembly plant. The seat supplier is invariably close by, as are some stamping and trim shops, while most other parts are delivered from further away.

That most suppliers are within one day but not within one hour is pertinent to local government attempts to entice new plants. Government subsidies exceeding \$100,000 per job for final assembly plants have been justified with the fact that each new assembly job generates several new supplier jobs. However, most

Figure 1 Parts and Assembly Plants in North America



SOURCE: Supplier Database, Maptitude.

of the new supplier jobs are destined for political jurisdictions other than the one enticing the final assembly plant.

Auto Alley. Though Michigan's dominance has waned it continues as the industry's hub. Today's U.S. auto industry remains very highly clustered in a small portion of the country. More than three-fourths of auto industry jobs and facilities are located in a narrow corridor between the Great Lakes and the Gulf of Mexico formed by two north-south interstate highways, I-65 and I-75. This corridor is commonly referred to as Auto Alley.

In 1979, the United States had 55 assembly plants, 34 in Auto Alley and 21 elsewhere. In 2008, the number of assembly plants in Auto Alley had increased to 43 while elsewhere their number declined to seven.

Auto alley has become the home of the U.S. auto industry primarily because of transport costs. The most critical transport factor for carmakers is the cost of shipping vehicles from final assembly plants to customers. Because assembled vehicles are bulky and fragile and tie up a lot of capital, it is imperative that they are delivered to customers as quickly as possible.

North-South Shift within Auto Alley. The seven southern states of Alabama, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee together had 7 percent of transportation sector employment in 1972. Thirty years later, the region's share had grown to 16 percent.

The South's growing importance can be seen in both assembly and supplier plants. The number of assembly plants in the South increased from 5 to 13 between 1979 and 2008. In addition, 67 percent of all parts plants in the South were opened between 1980 and 2006, compared with only 40 percent in the rest of the United States.

The auto industry has been moving south in Auto Alley primarily because of labor considerations. Wage rates have been lower in the South than in the Midwest, and union membership has been lower as well. As the auto

industry has moved southward, it has been transformed from a high-wage to an average-wage industry, and rates of unionization have gone from high to low.

As recently as the 1980s, 90 percent of production workers in the U.S. motor vehicle industry belonged to a union, and their wages were 50 percent higher than the national average for production workers. However, in 2006, only one-third of supplier plants had union representation. Approximately three-fourths of production workers at assembly plants belonged to a union in 2006, primarily at the Detroit 3. But as the Detroit 3 share of vehicle sales has declined, they had to close some of their unionized plants, whereas foreign-owned carmakers have been opening nonunion ones.

Leading the move southward within Auto Alley have been foreign-owned parts suppliers. In 2006, foreign-owned

67 percent of all parts plants in the South were opened between 1980 and 2006, compared with only 40 percent in the rest of the United States.

parts plants accounted for 44 percent of all plants in the South, compared to only 26 percent in the rest of the country. Lower wage rates and a nonunion atmosphere have attracted foreign-owned firms to the South.

Globalization. Imported parts captured 27 percent of the U.S. new vehicle market in 2002, according to the census, and foreign-owned factories in the United States another 17 percent. That left U.S.-owned factories in the United States with the remaining 56 percent.

The share of parts supplied by U.S.-owned, U.S.-based factories has declined since 2002, although the precise level can't be calculated until results of the 2007 Census of Manufactures are released. According to the U.S. Trade Commission, U.S. imports of parts (those destined for both new vehicles and aftermarket sales) increased from \$63 billion in 2002 to \$85 billion in 2006,

a much faster rate of growth than the overall parts market.

Since 1994, *Automotive News* has identified the 150 largest suppliers of original equipment in North America. The number of U.S.-owned companies on the list has declined from 108 in 1994 to 59 in 2006.

The largest sources of foreign parts were Mexico and Canada, followed by Japan. China accounted for just over 6 percent of motor vehicle parts imports in 2006. The widespread belief is that most imports are price-sensitive generic parts that can only be produced competitively in low-wage countries. In reality, a large share of imports arriving at U.S. final assembly plants actually consists of engines and transmissions made by highly skilled workers in wealthy countries like Canada and Japan.

Summary

The growing importance of parts makers has been the central element in the recent restructuring of the motor vehicle production process. Based on our analysis, we believe that the fundamental geography of auto assembly in North America is not likely to change anytime soon: most vehicles sold here will continue to be assembled here. But more parts will be coming from elsewhere in the world. And the parts made in North America and the vehicles assembled in North America will increasingly be produced by corporations with global headquarters outside of North America.

Thomas Klier is senior economist at the Federal Reserve Bank of Chicago. James Rubenstein is a professor of geography at Miami University.