A PROFILE OF THE AUTOMOBILE SECTOR IN THE U.S. AND SOUTHEASTERN STATES

Matthew N. Murray, Associate Director
Center for Business and Economic Research
The University of Tennessee

David T. Mayes, Instructor
Department of Economics and Finance
Kennesaw State University

Kathleen Hoffman, Graduate Research Assistant
The University of Tennessee

Prepared by the
Center for Business and Economic Research
College of Business Administration
The University of Tennessee
Knoxville, Tennessee

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Department of Economic and Community Development

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EXECUTIVE SUMMARY

The automotive industry has long played an important role in the U.S. economy, but its contribution to the Southeast has been modest. Beginning in the early 1980s, the Southeast staked its claim as a rising leader in automotive production with the location of new assembly plants and an extensive array of integrated suppliers. The automotive sector is helping to reshape the region's manufacturing base, creating high-wage, high value-added jobs that can compete effectively in the global economy.

The Center for Business and Economic Research at the University of Tennessee, Knoxville is conducting an on-going examination of the automotive industry in Tennessee and the Southeast. The goal of the current report is to document and detail the movement of assembly and supplier activity to the region, with particular focus on Tennessee. The report is intended to provide a compendium of data to benchmark this important industry and its regional development.

Key findings include:

- **Automobile manufacturing is one of the largest three-digit SIC manufacturing industries in the U.S. economy.**

  In 1998, more than 988,300 workers were employed in the U.S. automotive industry, accounting for about 5.3 percent of all manufacturing employment. These jobs support economic activity in virtually all sectors of the national economy.

- **Earnings in the automotive industry tend to be higher than those in the U.S. economy.**

  The automotive industry's average weekly earnings are about 39 percent higher than earnings in the nation's broader manufacturing sector. Earnings were nearly 77 percent higher in the automotive industry than the average for all private non-agricultural workers.

- **Twelve automobile assembly plants were located in the Southeast at the end of the 1997 model year.**

  Output from these twelve facilities accounted for 17.5 percent of the total automobile production in the United States for 1997. The Southeast's role in automobile parts manufacturing and automobile assembly will expand further as Mercedes Benz reaches capacity and the new Honda facility comes on line in Alabama in 2002.

- **Half of the heavy truck assembly facilities in the U.S. are located in the Southeast.**

  North Carolina and South Carolina each have two assembly plants and Tennessee has one plant. The Southeast is responsible for 56.1 percent of total heavy truck production in the U.S.

- **Tennessee leads the Southeast in employment for both transportation equipment (SIC 37) and motor vehicles and equipment (SIC 371) manufacturing.**

  In the transportation sector (SIC 37), Tennessee had a total of 47,034 jobs in 1996. This is a 38.1 percent increase since 1990 and accounts for 3.1 percent of this sector's U.S. jobs. Tennessee's transportation equipment sector represents 9.1 percent of total manufacturing jobs and 2.1 percent of total non-agricultural jobs. Looking at the narrower motor vehicles and equipment sector (SIC 371), Tennessee accounted for 38,795 jobs in 1996, (a 66.5 percent increase from 1990), which represents 4.9 percent of this sector's jobs in the United States. The motor vehicles and equipment sector (narrowly defined as SIC 371) represents 7.4 percent of all manufacturing jobs in Tennessee and 1.8 percent of the non-agricultural employment. These numbers understate the automotive sector's contribution to the state by a wide margin as they don't account for many supplier jobs, nor jobs supported through the ripple effect of the multiplier.

- **Tennessee is home to three assembly facilities responsible for 15,832 jobs.**

  Tennessee has three assembly plants which produce cars, light trucks or heavy trucks. Saturn, which produces passenger cars, accounts for 8,461 jobs; Nissan provides 6,000 jobs in Tennessee and produces both cars and light trucks; and in heavy truck production, Tennessee is the home of a Peterbilt plant which provides 1,371 jobs.

- **Tennessee remains in the top ten for car production.**

  Tennessee ranked fourth in the nation in car production for 1998, while the state did not even appear in the rankings as recently as 1980. The state accounted for production of 466,709 cars in 1998, which is 5.9 percent of total industry production. In light truck production Tennessee was sixteenth with production of 86,104 units for the 1998 model year. The Southeast is responsible for 19.4 percent of total industry light truck production.

- **Information on supplier firms show varying numbers of establishments in Tennessee, due to differences in industry definition, data sources and data collection procedures.**

  The *1999 Harris Tennessee Manufacturers Directory* lists 335 automotive supplier firms in the state, based on firm reporting of SIC

code. Data from *Elm International*, which includes only *tier 1* supplier establishments, lists Tennessee as having only 149 suppliers. The *1998 Automotive Supplier Directory*, put out by the Tennessee Department of Economic and Community Development, lists 622 automotive supplier firms in the state of Tennessee. This directory goes beyond *tier 1* suppliers and includes firms which supply any share of their output to the automotive industry.

*A PROFILE OF THE AUTOMOBILE SECTOR IN THE U.S. AND SOUTHEASTERN STATES**

I. INTRODUCTION

The automotive industry has long held its place as an important part of American life and a key element of the national economy. In the early part of this century, Henry Ford's introduction of the moving assembly line and mass production techniques enabled widespread availability of economical motor coach transportation and heralded the dawn of the *American Dream*. Yet as late as 1980, there was little automotive related production activity in the Southeast region. In fact, in 1980 only one Southeastern state—Georgia—ranked in the top ten of U.S. car producing states, with production of over 500 thousand units (or 6.9 percent of U.S. industry production). By 1998 two newcomers—Tennessee and Kentucky—had climbed to 4th and 5th in the rankings, respectively, together accounting for over 880 thousand units and 11.1 percent of domestic production. Georgia's contribution, while showing some decline, still placed it 6th with over 250 thousand units.

The contribution of automobile assembly simply touches the surface of a much larger iceberg. The Southeast has also established itself as a major source of light truck assembly (which includes the new sport utility model lines) and heavy truck assembly. Moreover, other forms of transportation equipment manufacture—including boats, planes, motorcycles and bicycles—are important elements of the regional economy and are closely tied through common supplier linkages. These supplier linkages are rather dramatic, having been aided by the location of new assembly facilities dating back to the early 1980s.

The benefits of this industry's growth to the Southeast are undeniable. The introduction of new assembly facilities has helped transform the Southeast's manufacturing sector, moving it away from its historical reliance on low wage and low capital intensity production of nondurable goods. In fact, this movement is much stronger and much more important than simple numbers can suggest. The assembly facilities themselves represent new investments, embodying new technologies and production processes, and new styles of management. The supplier linkages that have followed the assembly facilities have been forced by market pressures to become ever more productive and efficient. The result is a broad-based industry in the Southeast that competes well in the global economy. The economic contribution is notable, with jobs in Tennessee's automotive parts manufacture and automobile assembly sector providing worker earnings that are about 40 percent higher than the average earnings in the state's overall manufacturing sector.

This report is a continuation of CBER's ongoing examination of the automotive industry in Tennessee and the Southeast. The purpose of the current study is to document and detail the movement of assembly and supplier activity to the region, with particular emphasis on Tennessee. The discussion begins with a national perspective on the automotive industry's development to place trends for the Southeast in context. The focus then turns to the movement of assemblers and suppliers to the region.

II. THE SIZE, SCOPE AND PERFORMANCE OF THE MODERN U.S. AUTO INDUSTRY

Commercial production of automobiles in the U.S. is believed to have begun with the Duryea Motor Wagon Company of Springfield, Massachusetts in 1895. Duryea was the industry sales leader that year, with the production of four motor cars.[1] Henry Ford's introduction of the moving assembly line in 1912 heralded the beginning of the American Dream, as car prices fell and automobiles became accessible to the average consumer. By 1935 motor vehicle and parts production had become the most important manufacturing industry in the country, ranking first in the number of production workers, size of payroll, value added during manufacture, cost of materials and overall value of shipments. The U.S. automobile industry endured serious hardship in the 1970s and early 1980s in the face of rising fuel prices, problems of product quality and sharp inroads from foreign producers, most notably the Japanese. As the decade of the 90s approaches its close, the U.S. automobile industry has repositioned itself as a global leader in automobile production. Within the southeast in 1992, Tennessee's transportation equipment sector accounted for over 45,000 jobs, making it the largest component of the state's durable goods manufacturing sector. By 1998, Tennessee's transportation equipment sector accounted for over 54,000 jobs.

There are both narrow and broad definitions of the automobile industry. Narrowly, the automobile and equipment manufacturing industry (Standard Industry Classification 371) includes

establishments whose primary activities are producing motor vehicles and car bodies (SIC 3711), truck and bus bodies (SIC 3713), motor vehicle parts and accessories (SIC 3714), truck trailers (SIC 3715), and motor homes (SIC 3716). A broader definition would include all *transportation equipment* (SIC 37), which includes automobile equipment and manufacturing, as well as aircraft and parts, ship and boat building, railroad equipment, motorcycles and bicycles and guided missiles and space vehicles. This broader transportation equipment sector, which has a strong presence in Tennessee, utilizes similar inputs, similar worker skills and similar production techniques.

Because of the complexity of automobile production and the fact that most modern automobile plants are actually engaged in assembly of motor vehicles from purchased components (or components shipped from other divisions within the same company) rather than complete vehicle production, the actual scope of automobile-related manufacturing industries is much broader than these narrow classifications suggest. Based on figures from input-output tables of the U.S. economy—which show the detailed inputs required to produce the final automobile—motor vehicle and car body producers utilize inputs from over 170 different industries in their manufacturing process. Table 1 lists the key supplier industries to automobile manufacturers, along with estimates of the percentage of their output supplied to the automotive industry (SIC 371) in 1992. Note that only sixteen industry classifications are shown in this table. The contribution of these and other industries to the broader transportation equipment sector (SIC 37) would be much larger than that indicated in the table.

Given the number and variety of industries supplying inputs to the automobile industry it is no surprise that the fortunes of automobile manufacturers have a significant impact on the U.S. economy. In 1998, the industry employed just over 988,300 workers, representing nearly 9.0 percent of total employment in durable goods manufacturing and about 5.3 percent of all manufacturing employment.[2] These figures make automobile manufacturing one of the largest three-digit SIC manufacturing industries in the economy. In total for the U.S., about 1 percent of the 105,970,000 workers on total private payrolls in 1998 were employed directly by automobile and equipment manufacturers.

Because of the vast network of automobile industry suppliers, however, these data understate the employment impact of automobile production on the national economy. Still, estimation of the number of automobile-related jobs in supplier industries is difficult because most supplier establishments do not produce exclusively for automobile industry consumption, as is clear from Table 1. Some suppliers may produce for broader elements of the transportation equipment sector while others will supply a significant share of their output to sectors unrelated to the transportation sector. As shown in Table 1, even the automotive stampings industry on average supplied about three-fourths of its output to motor vehicle and car body producers. In total, these supplier industries employed an estimated 1,875,600 U.S. workers in 1998. If this figure is

Table 1: Key Automotive Supplier Industries

Supplier Industry	SIC	Value of Purchases by Auto Industry (Millions)	Percent Output to Auto Industry
Steel springs, except wire	3493	406	86.1
Automotive Stampings	3465	11,762	73.7
Motor vehicle parts and accessories	3714	40,186	53.4
Fabricated Textiles, nec	2399	1,478	46.5
Auto Apparel & Trimmings	2396	2,582	42.3
Engine Electrical Equipment	3694	2,294	33.4
Radio & Television Receivers	3651	1,770	22.9
Internal Combustion Engines	3519	2,020	17.2
Carburetors, pistons, rings, valves	3592	300	16.4
Hardware, nec	3429	1,311	15.3
Tires & Inner Tubes	3010	1,511	12.8
Refrigeration & Heating Equipment	3585	2,225	12.1
Glass & glass products	3210	1,504	11.5
Fabricated Rubber Products, nec	3060	1,263	11.2
Lighting fixtures and equipment	3640	558	6.5
Storage batteries	3691	195	5.7

Source: Author's calculations from data in 1992 Benchmark Input-Output Tables.

adjusted to account for the percentage of production by these industries that is dedicated to automotive inputs, these supplier establishments employed about 740,173 automobile-related workers in 1998, or about 40 percent (on average) of their total 1998 employment.[3] Adding these supplier industry jobs yields a conservative estimate of total employment in automobile manufacturing and *directly-related industries* in 1998 of almost 1.7 million. Thus in terms of jobs, the automotive industry directly represented about 9.2 percent of the manufacturing sector of the national economy in 1998 and about 1.6 percent of workers on all private nonagricultural payrolls. But even this measure understates the industry's contribution to the economy by ignoring the ripple effects of the multiplier.

Other measures of the size and impact of the automobile industry on the U.S. economy can be found in data on consumption expenditures, wages, and personal income. Between 1972 and 1992, consumption of motor vehicles and equipment consistently accounted for between 3.0 and 4.0 percent of inflation-adjusted gross domestic product (GDP). This is a substantial impact for a three-digit SIC industry, accounting for over forty percent of all expenditures on durable goods. In 1998, consumption of new automobiles alone accounted for 1.1 percent of inflation-adjusted GDP, with sales of approximately $82.8 million in 1992 dollars.

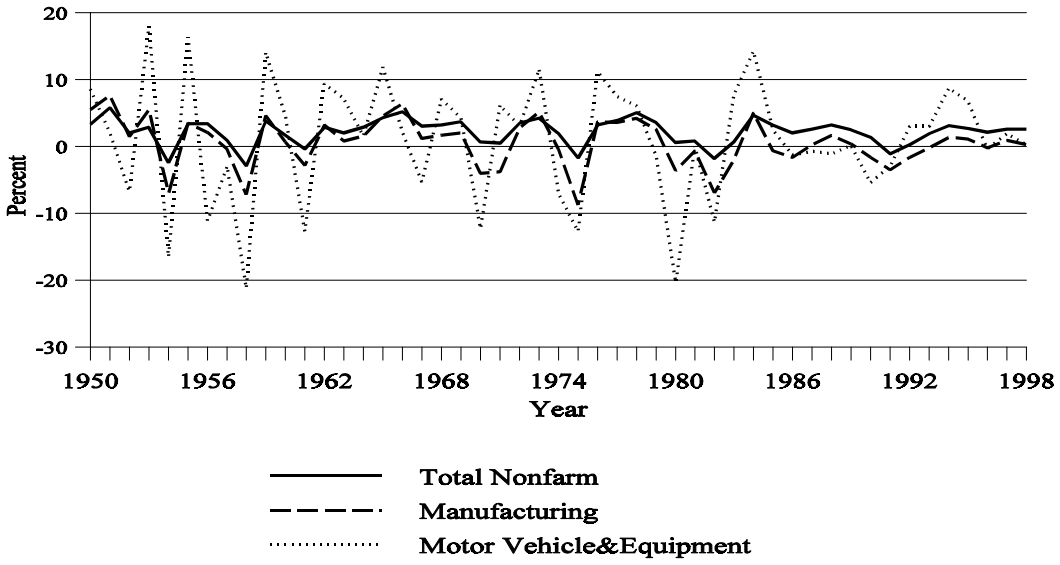
The automobile industry also has a relatively large impact in terms of wages and personal income. The average auto manufacturing job generates double the wage, property, and profit income produced by the average job in the U.S. [4] In 1998, the industry's average weekly earnings of $780.39 were 39 percent higher than the average earnings in all manufacturing industries and 77 percent higher than the average for all private non-agricultural workers. In terms of personal income generated, which includes property, interest, and other income in addition to wages and salaries, the automotive industry generated 1.4 percent of all private non-farm income in 1997, or about 1.2 percent of total non-farm personal income.[5] Again, for a three-digit manufacturing industry this represents a significant impact on the overall economy.

The first years of this decade were not banner years for the profitability of the nation's automakers. During the period of general economic growth in the 1980's, the industry managed an annual after-tax rate of profit of about $5.5 billion. By the fourth quarter of 1990, however, the economy had entered a recession and the automakers' profits dipped into the red as well. Between 1990 and 1992, the industry lost $3.3 billion per year, on average. As the recession ended, however, profitability quickly returned to the industry, as is typically the case. In the spring of 1999, U.S. automobile production was being stretched to its capacity by strong domestic consumer demand.

The wide fluctuation in profits demonstrates how closely linked the automobile industry is with the national economy. Because of its size and scope, the automobile industry tends to lead the economy throughout the business cycle, precipitating its decline during recessions and driving it toward the next peak during periods of growth. This pattern is shown in Figure 1, using time-trend employment data for the nonagricultural sector of the national economy, the overall manufacturing sector and the narrowly defined automotive sector (SIC 371). Employment in manufacturing is clearly more volatile than is overall employment. Similarly, the automotive sector displays greater variation in employment over time than manufacturing. During periods of expansion, employment expands sharply, but during periods of contraction, job losses are rather dramatic. Note also that automotive sector employment has been uncharacteristically stable since the mid 1980s (which corresponds to the beginning of the industry's growth in Tennessee).

A snapshot of the 1997 North American automobile industry in terms of assembly capacity and the intensity of production, is provided in Appendix Tables 1 and 2, which list car and truck

Figure 1: Percent Change in Average Annual U.S. Employment 1950-1998



Source: Bureau of Labor Statistics, *Current Employment Statistics*.

production and capacity by manufacturer, including models produced, for each plant in the U.S., Mexico and Canada. As Appendix Table 1 shows, there were forty-nine passenger car production lines in operation for the 1997 model year in the U.S., Canada and Mexico: five owned by Chrysler, ten by Ford, seventeen by General Motors, and seventeen belonging to foreign transplants or joint ventures between foreign car makers and their Big Three partners. In total these plants produced 8.1 million vehicles in 1997, including 5.4 million in output from Big Three facilities and 2.7 million from transplant or joint venture plants. As the figures on capacity utilization demonstrate, the 1997 model year was outstanding in terms of output as thirteen of these plants operated either at or above their normal capacity. The most extreme example of over-utilization is the Toyota production line in Georgetown, Kentucky, where the Camry is assembled. This plant operated 30.7 percent above its rated capacity of 198,016 vehicles per year. In total, the 5.4 million cars assembled at Big Three facilities accounted for 87.6 percent of their normal capacity (down from 95.3 percent in 1994); the output at transplant and joint-venture plants of 2.7 million represented 88.7 percent of their typical year's production.

Another notable feature of the plant data reported in Appendix Table 1 is that only a few of the models produced by any of these manufacturers required more than one production facility to satisfy demand. At Chrysler, only the Stratus and Neon were assembled at more than one facility. Despite the popularity of the Ford Taurus and Mercury Sable, Ford's most popular corporate twins, only two of Ford's ten production

facilities were needed for production. This limitation of production to a single facility for all but the most popular models is a direct consequence of the maturation of the U.S. vehicle market. The mature stage of the auto industry's evolution is, in part, characterized by the need for increased variety in the number of different platforms offered by automakers. Because of the proliferation of models, very few reach the sales volumes required to warrant more than a single production line. Further, the minimum efficient scale of production at the plant level has declined and the production line has become more flexible allowing multiple platforms to be produced in a single facility, as is the case for the majority of the plants listed in Appendix Table 1.

Geographically, there are fourteen U.S. states (California, Delaware, Georgia, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, Ohio, Oklahoma, South Carolina, Tennessee, and Texas) and three Canadian provinces (Nova Scotia, Ontario, and Quebec) represented in this listing. The geographic dispersion of the plants is shown in Figure 2.

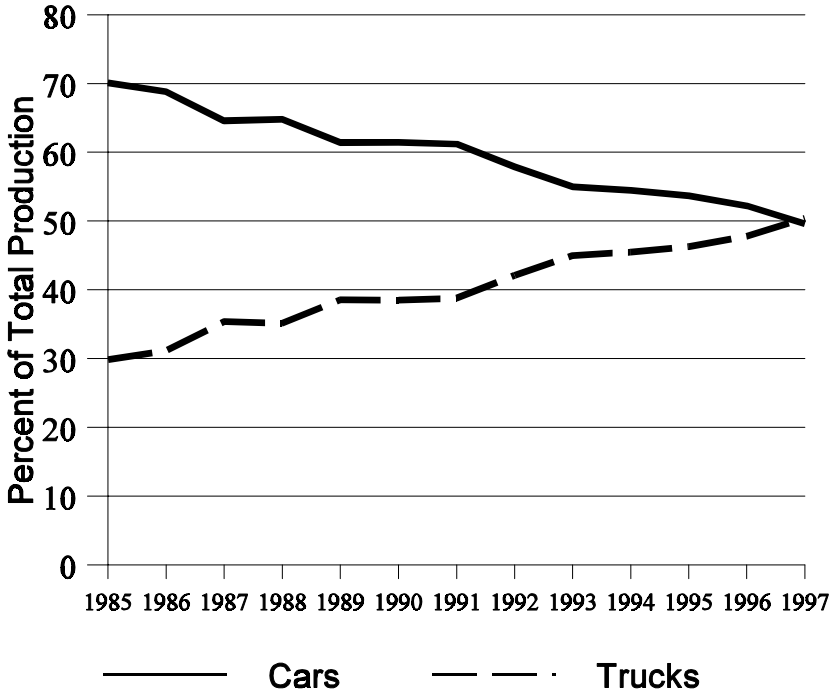
An additional outgrowth of the structural change that has taken place in the American automobile market since reaching its mature stage is the increased popularity of light trucks and sport-utility vehicles, especially since 1981. Not only are consumers demanding a wider variety of passenger car offerings, but segmentation of the market has spilled over to more heavy-duty vehicles, which at one time was only a specialized niche market catering to agricultural users and off-road enthusiasts. Sales of light trucks (0-14,000 lbs.) accounted for about half of the light vehicle market in 1997, compared to only twenty percent in 1980 (see Figure 3). This increase in truck demand is clearly evident from the capacity utilization data shown in Appendix Table 2. Of the forty-two lines assembling trucks in the U.S., Canada and Mexico in the 1997 model year, sixteen (or 38 percent) operated at or above their normal capacity. Overall, the industry output of 7.2 million light trucks (up from 6.5 million in 1994), 6.8 million from Big Three facilities and 0.5 million from transplant facilities, accounted for 98.7 percent of total U. S.-Canadian-Mexican truck assembly capacity. In addition, the popularity of trucks is evidenced by the fact that, in contrast to passenger cars, multiple plants are required to produce many of the various truck models. A prime example of this is the popular Ford F-series pickup which was produced in five of Ford's thirteen truck facilities. The continued expansion of the light truck market induced Toyota to build a truck assembly facility in Indiana.

The top ten states for both car and light truck production are shown in Tables 2-5. Tables 2 and 3 show top car producing states in 1980 and 1998, respectively; Tables 4 and 5 show the top light truck producing states for the 1990 and 1998. In 1980, Tennessee did not even appear in the ranking for cars, but rose to fourth in 1998, with production of more than 466 thousand units,

Figure 2: Number of Assembly Plants by State, 1997

Source: Crain Communications, Automotive News 1998 Market Data Book, May 27, 1998.

Figure 3: U.S. Light Vehicle Production



Source: Crain Communications. *Automotive News Market Data Book*, various issues.

which represented nearly 6 percent of industry production for the year. Tennessee was ranked tenth in 1990 in light truck production, but in 1998 the state had fallen out of the rankings. (Nissan truck production in Tennessee in 1996 was 136,162, falling to 118,798 units in 1997.) Despite the strong showing in 1998, automobile production in Tennessee actually slipped by 84,272 units from 1997. Automobile production in Kentucky witnessed a decline of 16,870 units from 1997 to 1998.

The split in sales across domestic versus imported light vehicles is shown in Figure 4. Over the period illustrated there appears to be little movement in the trends. However, beneath the surface is a fundamental shift in the location of production on the part of international producers.[6] As shown in Figure 5, there has been a marked shift in production into the U.S., particularly after 1985. In 1985, 4.2 million imported vehicles were sold in the U.S. and another 700 thousand units were produced by foreign automobile producers with U.S.-based facilities. By 1996, the U.S. production of vehicles by international producers outweighed import sales by over 600,000 units.

The international automobile sector's U.S. facilities and capacity are shown in Table 6. Total capacity across these producers was 2.7 million, with actual production of 2.4 million units in 1996. Note that most of these facilities are

Table 2: Top Ten States in Car Production: 1980

State	Production	% of Industry Production
1. Michigan	1,731,830	26.9
2. Ohio	501,278	7.8
3. Georgia	501,278	6.9
4. Delaware	430,067	6.7
5. New Jersey	370, 783	6.2
6. Missouri	370,783	5.8
7. Illinois	363,146	5.7
8. Oklahoma	329,201	5.1
9. Kansas	312,849	4.9
10. New York	287,491	4.5

Source: Crain Communications, *Automotive News 1981 Market Data Book*, April 29, 1981.

concentrated in the same general region of the lower midwest and upper Southeast of the U.S.

A total of 140,963 heavy trucks were produced in the U.S. in 1997. Heavy truck production, like the production of light vehicles, has important impacts both in terms of assembly activity, and supplier activity as well. As shown in Table 7, the Southeast has a quiet, but well-established presence, in this field of production, with North Carolina, South Carolina and Tennessee accounting for the production of 79,031 heavy trucks, or over 56 percent of total U.S. production. The proximity of the Kenworth production line in Ohio likely provides important supplier-linked spillovers into the southeastern states.

III. THE EXPANSION OF THE AUTOMOBILE ASSEMBLY SECTOR INTO THE SOUTHEAST

While the Southeast played a minor role in automotive production during the branch plant era, the modern development of the automotive production infrastructure in the region has been far more dramatic due to structural change that began to hit the industry in the mid-1970's. We document these trends, using a variety of data sources. Table 8 shows establishment and employment data for the broad transportation equipment sector (SIC 37), for the years 1980, 1990 and 1996, for selected southeastern states. Tennessee clearly stands out in terms of its dominance in employment, which totaled 47,034 in 1996. Tennessee also has enjoyed one of the strongest gains in employment, trailing only

Table 3: Top Ten States in Car Production 1998

State	Production	% of Industry Production
1. Michigan	1,718,889	21.6
2. Ohio	1,016,066	12.8
3. Illinois	698,298	8.8
4. Tennessee	466,709	5.9
5. Kentucky	412,776	5.2
6. Georgia	257,035	3.2
7. Kansas	232,203	2.9
8. Oklahoma	215,242	2.7
9. California	203,266	2.6
10. Missouri	169,763	2.1

Source: Author's calculations from data in 1999 Market Data Book. Crain Communications, *Automotive News 1999 Market Data Book*, May 1999.

Table 4: Top Ten States in Truck Production: 1990 Model Year

State	Production	% of Industry Production
1. Michigan	747,500	22.8
2. Missouri	582,033	17.8
3. Ohio	565,464	17.3
4. Kentucky	277,691	8.5
5. Indiana	251,073	7.7
6. Minnesota	173,925	5.3
7. Maryland	170,055	5.2
8. Virginia	156,793	4.8
9. New York	147,972	4.5
10. Tennessee	127,084	3.9

Source: Crain Communications, *Automotive News 1991 Market Data Book*, May 29, 1991.

Kentucky. Georgia and Alabama have each witnessed a decline in industry employment between 1980 and 1996. Alabama's situation should improve as the supplier network for Mercedes Benz establishes itself and as the newly announced Honda facility comes on line. The establishment data for this sector tell a somewhat different story. North Carolina has the largest number of plants (303), yet it ranks fourth in employment. Surprisingly, Tennessee's growth in the number of establishments in the 1990s places it second, ahead of Alabama. Together these figures suggest relatively large facilities within Tennessee.

Table 9 presents similar data, focusing on the more narrowly defined motor vehicle and equipment sector, SIC 371. Tennessee once again stands out as the regional leader in employment (38,795 jobs in 1996), and accounts for 148 facilities, trailing only North Carolina (which accounts for 164 plants). Tennessee's establishment growth is quite weak compared to the other states shown, although its employment growth puts it in second place.

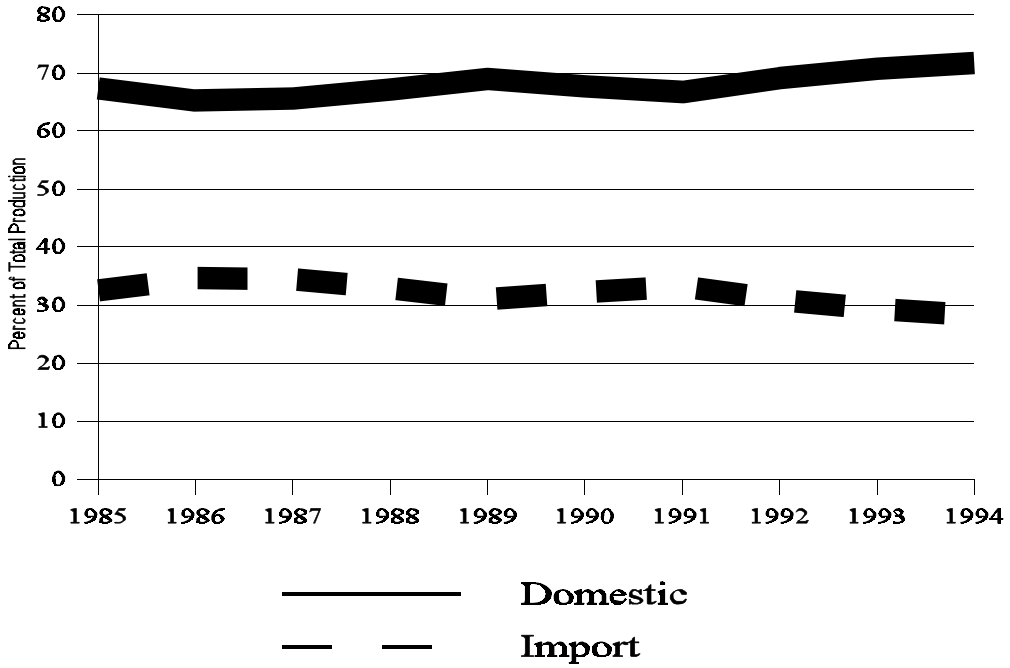
Table 10 places these trends for the Southeast in a broader context, by including all states. As the table shows, the traditional automotive manufacturing states—Illinois, Indiana, Michigan, Ohio, and Wisconsin—remain home to the majority of the automotive manufacturing industry.[7] Combined, these states housed 66.1 percent of all facilities and 74.8 percent of all jobs in auto manufacturing in 1990, with Michigan's 125 facilities and 283,265 jobs accounting for a

Table 5: Top Ten States in Truck Production 1998

State	Production	% of Industry Production
1. Missouri	1,020,215	13.4
2. Michigan	928,038	12.2
3. Ohio	896,267	11.8
4. Kentucky	773,088	10.2
5. New Jersey	328,786	4.3
6. Indiana	269,568	3.5
7. Georgia	257,236	3.4
8. Virginia	222,961	2.9
9. Wisconsin	207,974	2.7
10. Louisiana	187,932	2.5

Source: Author's calculations from data in 1999 Market Data Book. Crain Communications, *Automotive News 1999 Market Data Book*, May 1999.

Figure 4: Domestic vs. Import Light Vehicle Production

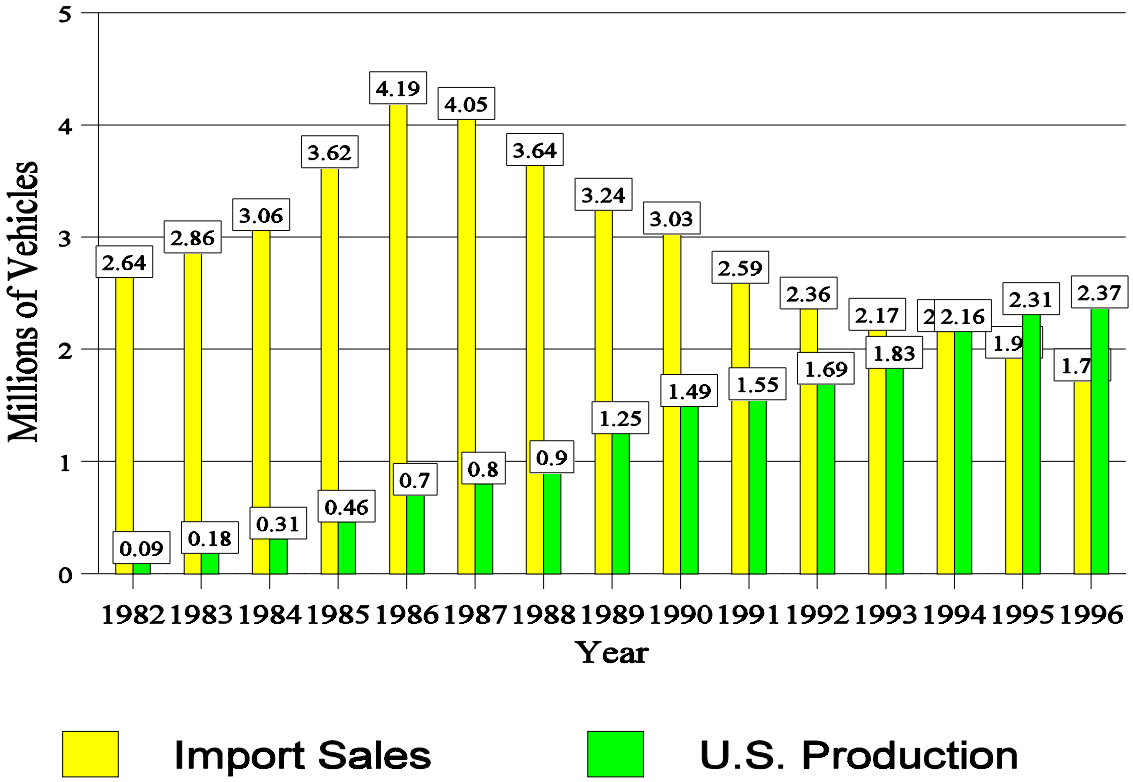


Source: Crain Communications. *Automotive News Market Data Book*, various issues, and American Automobile Manufacturers Association *AAMA Motor Vehicle Facts and Figures*, various issues.

majority of each. Through the 1980's, however, when the industry lost over 100,000 jobs nationwide, each of these states, except Ohio, suffered a dramatic decline in their total number of automobile industry jobs. As a group, automobile and parts manufacturers in these states lost 99,665 jobs between 1981 and 1990, accounting for over 90 percent of the job losses nationwide. Michigan was the biggest job loser, suffering a decline of almost 68,000, or nearly twenty percent of its automotive industry employment. Indiana had a similar percentage decline in its automotive industry, losing about twenty-one percent of its automotive industry jobs with a decline of 15,180. Illinois lost a slightly higher percentage of its automotive industry during the 1980's. Employment in its eight motor vehicle and parts facilities declined by nearly 6,000 or about twenty-eight percent. Although not the biggest loser in terms of the number of jobs, Wisconsin's loss of over 10,000 represented a loss of fifty-three percent of its auto manufacturing employment. The presence of Honda, the first Japanese manufacturer to establish U.S. production, prevented a similar decline in automotive industry employment in Ohio where the loss of jobs totaled only 685 during the period.

In contrast, the number of Motor Vehicle Manufacturers' Association (MVMA) facilities in the Southeast increased by twenty-five percent between 1981 and 1990 bringing a corresponding rise in the number of automotive industry jobs in the region of nearly 14,000, an increase of

Figure 5: USIAS U.S. Vehicle Production and Sales of Imports*
1982-1996



*Vehicl
es imported from outside North America.
Source: *The Contribution of the International Auto Sector to the U.S. Economy*, University of Michigan Transportation Research Institute, 1998.

approximately 39 percent. Overall, the Southeast region was home to 7.6 percent of the automobile industry employment and 11.3 percent of automobile manufacturing facilities in 1990. With the exception of Georgia, which already had a sizeable automobile manufacturing presence, all of the southeastern states had an increase in their number of automotive manufacturing jobs during the period. Tennessee had by far the largest job increase in the industry. Employment in the Tennessee automotive industry grew by 7,445 jobs after the location of the Nissan and Saturn facilities in the state, an increase of nearly 250 percent. These assembly plants were the first to move to Tennessee since the Ford facility in Memphis was closed in 1958. North Carolina had the second largest job gain during the period. Its automotive industry employment increased by 3,365 on the opening of two new facilities, giving the state the largest percentage increase in the

Table 6: USIAS Assembly Facilities: 1996 Capacity

Company	Location	Car Capacity	Truck Capacity	Total Capacity	Actual 1996 Production	Employ-ment	Invest-ment ($ Millions)	Start-up Date
AutoAlliance	Flat Rock, MI	240,000	--	240,000	129,441	3,665	1,000	9/87
BMW	Spartanburg, SC	90,000	--	90,000	50,278	1,350	400	9/94
Honda	Marysville, OH	430,000	--	430,000	424,462	5,800	1,700	11/82
	East Liberty, OH	230,000	--	230,000	209,912	2,500	659	12/89
Mercedes-Benz	Vance, AL	--	70,000	70,000	--	1,500	300	2/97
Mitsubishi	Normal, IL	240,000	--	240,000	192,961	4,000	650	9/88
NUMMI	Fremont, CA	240,000	150,000	390,000	365,469	4,600	1,700	12/84
Nissan	Smyrna, TN	310,000	140,000	450,000	414,031	6,000	1,350	6/83
Subaru-Isuzu	Lafayette, IN	90,000	90,000	180,000	194,871	2,300	670	9/89
Toyota	Georgetown, KY	400,000	--	400,000	385,657	6,000	3,000	5/88
AIAM Total		2,270,000	350,000	2,720,000	2,367,082	37,715	11,429	

Source: *Contribution of the International Auto Sector to the U.S. Economy*, University of Michigan Transportation Research Institute, 1998.

Southeast (over 405 percent). Four other states in the region, Alabama, Florida, Kentucky and Louisiana, also added substantially to their auto manufacturing payrolls, each gaining more than 1,200 jobs in the industry. South Carolina, Virginia, and West Virginia all had much smaller increases of less than one thousand jobs, though the addition of 450 jobs in West Virginia still amounted to a 150 percent increase in the size of its auto industry. The only job loser in the Southeast, Georgia, saw its auto industry employment decline from 10,180 to 6,030 primarily from the closing of GM's Lakewood plant in 1989.

More recent data on facilities by state are shown in Table 11 for 1992 and 1995. In 1992, Alabama, Georgia, Kentucky, South Carolina and Tennessee accounted for 9.6 percent of total establishments, rising to a 10.2 percent share by 1995. These same states employed a total of 80,226 workers in these facilities (11.8 percent of national employment in SIC 371), increasing sharply to 142,073 jobs (12.0 percent of national employment in SIC 371) by 1995. South Carolina enjoyed the largest percentage gain (129.3 percent) while Tennessee enjoyed the largest absolute gain (21,775 jobs). Illinois, Indiana, Michigan and Wisconsin each saw the number of plants decline between 1992 and 1995. At the same time employment in these states advanced indicating a consolidation of suppliers.

Table 7: Heavy Trucks 1997

State	City	Make	Production	Percent of Total Production
North Carolina	Cleveland	Freightliner	23,521	16.7
	Mt. Holly	Freightliner	18,462	13.1
Ohio	Chillicothe	Kenworth	11,565	8.2
Oregon	Portland	Freightliner	17,453	12.4
Pennsylvania	Macungie	Mack	11,342	8.0
South Carolina	Winnsboro	Mack	15,496	11.0
	Gaffney	Freightliner	10,665	7.6
Tennessee	Madison	Peterbilt	10,887	7.7
Texas	Denton	Peterbilt	10,846	7.7
Washington	Renton	Kenworth	10,726	7.6
Total			140,963	--

Source: Crain Communications, *Automotive News 1997 Market Data Book,* May 28, 1997, and American Automobile Manufacturer's Association, *AAMA Motor Vehicle Facts & Figures,* 1997.

Notable for several states is the share of statewide employment dedicated to automotive parts production and assembly. In 1981, automotive parts and assembly employment in Tennessee accounted for only 0.4 percent of total employment, rising to 9.5 percent in 1995. Kentucky has had similar growth, with employment in automotive parts and assembly representing 10.5 percent of 1995 jobs.

These data clearly demonstrate that the Southeast has emerged as a significant component of the nation's automobile production infrastructure. Although the region was part of the original branch plant strategies of Ford and GM, it did not garner a substantial share of the industry's investments until the early 1980's and the arrival of the Japanese transplants. Since then, the region has attracted new investments from both the Big Three and other foreign manufacturers, the most recent being the locations of BMW in Spartanburg, South Carolina, and Mercedes-Benz in Tuscaloosa, Alabama. And as noted above, the Southeast accounted for 56 percent of U.S. heavy truck production in 1997. At the end of the 1994 model year there were eleven automobile assembly facilities located in the Southeast. (The Mercedes Benz facility in Alabama is classified as a light truck facility, as

Table 8: Establishment and Employment Data for Transportation Equipment

	Transportation equipment (SIC 37)									
	Total establishments					Employment				
				Percent change					Percent change	
State	1980	1990	1996	80-96	90-96	1980	1990	1996	80-96	90-96
Alabama	134	205	220	64.2	7.3	22,641	22,583	19,680	-13.1	-12.9
Georgia	128	220	257	100.8	16.8	31,955	41,224	40,421	26.5	-1.9
Kentucky	69	112	142	105.8	26.8	14,161	21,442	31,112	119.7	45.1
North Carolina	152	249	303	99.3	21.7	15,092	22,459	28,807	90.9	28.3
South Carolina	64	115	164	156.3	42.6	4,271	12,409	17,213	303.0	38.7
Tennessee	163	238	273	67.5	14.7	27,405	34,064	47,034	71.6	38.1
United States	8,369	10,787	11,908	42.3	10.4	1,855,912	1,797,524	1,521,541	-18.0	-15.4

Source: U.S. Department of Commerce, Bureau of the Census, *County Business Patterns* series.

Table 9: Establishment and Employment Data for Motor Vehicle and Equipment

	Motor vehicles and equipment (SIC 371)									
	Total establishments					Employment				
				Percent change					Percent change	
State	1980	1990	1996	80-96	90-96	1980	1990	1996	80-96	90-96
Alabama	57	80	101	77.2	26.3	6,718	11,434	10,563	57.2	-7.6
Georgia	68	118	121	77.9	2.5	14,933	15,758	14,154	-5.2	-10.2
Kentucky	44	68	87	97.7	27.9	12,769	19,196	28,811	125.6	50.1
North Carolina	69	116	164	137.7	41.4	11,437	14,808	23,215	103.0	56.8
South Carolina	15	36	71	373.3	97.2	2,340	6,324	12,582	437.7	99.0
Tennessee	84	131	148	76.2	13.0	16,604	23,306	38,795	133.6	66.5
United States	3,524	4487	5,049	43.3	12.5	778,449	707,160	785,168	0.9	11.0

Source: U.S. Department of Commerce, Bureau of the Census, *County Business Patterns* series.

the plant currently produces only sports utility vehicles). Table 12 gives an accounting of these plants, including their 1994 output and production capacity. The total output of these facilities of over 2.3 million units represented 18.6 percent of the total automobile production in the U.S. in 1994, and these plants' 1994 capacity of 2.2 million units accounted for 18.5 percent of all U.S. automobile production capacity. Notice that half of these southern plants are new investments that were constructed and began operations during the 1980's.

Table 10: Motor Vehicle Manufacturers Parts and Assembly Facilities by State, 1981-1990

State	1981				1990				Change 1981-1990
	Number of Facilities	Employ-ment	Share of total Facilities	Share of total Employ-ment	Number of Facilities	Employ-ment	Share of total Facilities	Share of total Employ-ment	Employ-ment
Alabama	4	4,470	1.4	0.6	3	5,850	1.0	0.9	1,380
Arizona	1	335	0.4	0.0	3	685	1.0	0.1	350
California	6	5,735	2.1	0.8	10	8,845	3.2	1.4	3,110
Colorado	0	0	0.0	0.0	1	20	0.3	0.0	20
Connecticut	1	2,900	0.4	0.4	1	850	0.3	0.1	-2,050
Delaware	2	8,760	0.7	1.2	2	7,020	0.6	1.1	-1,740
Florida	0	0	0.0	0.0	2	1,202	0.6	0.2	1,202
Georgia	5	10,180	1.8	1.3	4	6,030	1.3	0.9	-4,150
Illinois	8	21,210	2.9	2.8	8	15,300	2.6	2.4	-5,910
Indiana	23	72,030	8.2	9.5	20	56,850	6.5	8.8	-15,180
Iowa	1	165	0.4	0.0	1	200	0.3	0.0	35
Kansas	2	3,850	0.7	0.5	2	2,625	0.6	0.4	-1,225
Kentucky	4	9,530	1.4	1.3	4	10,875	1.3	1.7	1,345
Louisiana	2	1,950	0.7	0.3	2	3,190	0.6	0.5	1,240
Maryland	2	7,700	0.7	1.0	2	4,600	0.6	0.7	-3,100
Massachusetts	1	3,500	0.4	0.5	0	0	0.0	0.0	-3,500
Michigan	105	350,770	37.5	46.5	125	283,265	40.3	43.9	-67,505
Minnesota	2	3,360	0.7	0.4	1	2,100	0.3	0.3	-1,260
Mississippi	4	2,430	1.4	0.3	4	2,620	1.3	0.4	190
Missouri	7	16,750	2.5	2.2	6	17,480	1.9	2.7	730
New Jersey	4	11,670	1.4	1.5	5	9,980	1.6	1.5	-1,690
New Mexico	0	0	0.0	0.0	1	1,800	0.3	0.3	1,800
New York	15	42,650	5.4	5.6	14	30,430	4.5	4.7	-12,220
N. Carolina	3	830	1.1	0.1	5	4,195	1.6	0.7	3,365
N. Dakota	0	0	0.0	0.0	0	0	0.0	0.0	0
Ohio	44	118,480	15.7	15.7	45	117,795	14.5	18.3	-685
Oklahoma	3	6,920	1.1	0.9	2	5,910	0.6	0.9	-1,010
Oregon	3	2,360	1.1	0.3	3	3,100	1.0	0.5	740
Pennsylvania	5	14,090	1.8	1.9	5	5,760	1.6	0.9	-8,330
S. Carolina	0	0	0.0	0.0	2	750	0.6	0.1	750
Tennessee	2	2,995	0.7	0.4	4	10,440	1.3	1.6	7,445
Texas	4	4,860	1.4	0.6	7	10,595	2.3	1.6	5,735
Utah	1	300	0.4	0.0	1	380	0.3	0.1	80
Virginia	3	2,710	1.1	0.4	4	3,215	1.3	0.5	505
Washington	3	1,460	1.1	0.2	3	1,250	1.0	0.2	-210
W. Virginia	1	300	0.4	0.0	1	750	0.3	0.1	450
Wisconsin	9	19,750	3.2	2.6	7	9,365	2.3	1.5	-10,385
Southeast	28	35,395	10.0	4.7	35	49,117	11.3	7.6	13,722
Traditional	189	582,240	67.5	77.1	205	482,575	66.1	74.8	-99,665
Total	280	755,000	100.0	100.0	310	645,322	100.0	100.0	-109,678

Source: Motor Vehicle Manufacturers' Association, ***Motor Vehicle Facts and Figures,*** various issues. Includes MVMA member firms and other automobile and parts manufacturing facilities with employment of 1,000 or more.

Table 11: Motor Vehicle and Equipment Manufacturers by State (SIC 371)

State	1992				1995*			Change 1992-95
	Establish-ments	Employ-ment	% of state establish-ments	% of total state employ-ment	Employ-ment	Establish-ments	% of total state employ-ment	Change in Employ-ment
Alabama	76	11,240	1.2	3.0	19,599	91	5.0	8,359
Alaska	1	N/A	.2	N/A	N/A	1	N/A	N/A
Arizona	72	2,698	1.5	1.5	6,089	65	3.0	3,391
Arkansas	60	6,895	1.5	3.0	11,473	60	4.6	4,578
California	647	28,964	1.3	1.5	43,910	605	2.4	14,946
Colorado	64	N/A	1.2	N/A	3,223	68	1.7	N/A
Connecticut	35	N/A	.6	N/A	3,462	34	1.2	N/A
Delaware	4	N/A	.5	N/A	N/A	7	N/A	N/A
Florida	168	6,979	1.0	1.5	9,966	175	2.1	2,987
Georgia	127	13,131	1.3	2.4	25,221	118	4.2	12,090
Hawaii	2	N/A	.2	N/A	N/A	3	N/A	N/A
Idaho	18	355	1.0	.5	1423	15	2.0	1,068
Illinois	206	28,015	1.1	2.9	50,977	186	5.0	22,962
Indiana	332	58,181	3.5	9.4	128,687	328	19.1	70,506
Iowa	86	8,632	2.2	3.8	18,044	86	7.3	9,412
Kansas	56	5,925	1.6	3.1	8,690	58	4.4	2,765
Kentucky	80	20,368	1.8	7.4	32,246	83	10.6	11,878
Louisiana	27	N/A	.7	N/A	147	22	.1	N/A
Maine	20	N/A	.9	N/A	25	11	.0	N/A
Maryland	35	4,478	.8	2.3	4,371	35	2.3	-107
Massachusetts	51	1,619	.5	.3	1,429	48	.3	-190
Michigan	505	178,435	3.1	20.4	245,577	490	25.6	67,142
Minnesota	71	4,481	.9	1.2	6,700	85	1.6	2,219
Mississippi	55	6,554	1.4	2.7	11,141	59	4.5	4,587
Missouri	143	N/A	1.8	N/A	31,828	154	7.5	N/A
Montana	9	N/A	.6	N/A	266	9	1.2	N/A
Nebraska	32	3,787	1.6	3.8	4,945	33	4.4	1,158
Nevada	14	301	1.1	1.1	470	19	1.3	169
New Hampshire	5	N/A	.2	N/A	N/A	10	N/A	N/A
New Jersey	85	3,881	.6	.7	6,949	89	1.3	3,068
New Mexico	13	1,062	.8	2.7	823	17	1.9	-239
New York	160	20,429	.6	2.0	34,796	148	3.6	14,367
North Carolina	124	15,425	1.0	1.9	30,494	152	3.5	15,069
North Dakota	11	N/A	1.6	N/A	N/A	16	N/A	N/A
Ohio	313	92,678	1.7	8.9	145,982	318	13.3	53,304
Oklahoma	85	8,833	2.1	5.6	15,850	96	9.5	7,017
Oregon	74	4,101	1.1	2.0	15,850	86	3.8	11,749
Pennsylvania	178	15,446	1.0	1.6	36,308	170	3.9	20,862

Table 11 (Continued)

State	1992				1995*			Change 1992-95
	Establish-ments	Employ-ment	% of state establish-ments	% of total state employ-ment	Employ-ment	Establish-ments	% of total state employ-ment	Change in Employ-ment
Rhode Island	10	N/A	.4	N/A	90	9	.1	N/A
South Carolina	44	5,990	.9	1.6	13,735	65	3.7	7,745
South Dakota	17	1,092	1.9	3.2	1,283	21	2.8	191
Tennessee	133	29,497	1.7	5.9	51,272	139	9.5	21,775
Texas	265	12,628	1.2	1.3	27,205	279	2.7	14,577
Utah	29	1,507	1.1	1.4	7,068	30	5.8	5,561
Vermont	6	N/A	.4	N/A	N/A	5	N/A	N/A
Virginia	54	9,004	.8	2.2	12,168	58	3.0	3,164
Washington	78	N/A	.9	N/A	4,728	88	1.4	N/A
West Virginia	13	N/A	.7	N/A	620	14	.8	N/A
Wisconsin	113	20,143	1.1	3.7	28,517	120	4.8	8,374
Wyoming	1	N/A	.2	N/A	N/A	5	N/A	N/A
District of Columbia	1	N/A	.2	N/A	N/A	1	N/A	N/A
Total:	**4,808**	**678,636**	**1.2**	**3.7**	**1,080,923**	**4,884**	**6.3**	**426,504**

*Automotive stamping industry included in 1995.
N/A: omission of data for an individual state is due to either the absence of such business from the state or the necessity of withholding the data to avoid disclosure of individual firm's data.
Source: American Automobile Manufacturer's Association, *AAMA Motor Vehicle Facts & Figures*, 1995 and 1998.

Table 10 also shows the approximate direct employment impact of these assembly plants in the southeastern states. In total, these facilities employed over 35,000 people, including more than 13,000 in Tennessee alone. The addition of Mercedes-Benz increases this job total by around 1,500 once the plant reaches full production.

IV. AUTOMOTIVE SUPPLIER INVESTMENTS IN THE SOUTHEAST

The lure of the supply chain that lays behind automobile assembly is a primary reason states and localities are so aggressive in their pursuit of assembly facilities. The data presented above shows how important suppliers are within SIC 37 and SIC 371. But tracing back through the supply chain is tricky, as timely and detailed data on automotive suppliers is difficult to obtain. Data are often proprietary and the supplier-assembly and supplier-supplier linkages can change rapidly over time. The focus here falls primarily on *Tier 1* suppliers, or firms which supply automotive assembly plants with inputs. These firms may be classified within the transportation equipment sector (SIC 37), but many fall within

Table 12: Automobile Assembly Plants in the Southeast

Company	City/State	Year Opened	Models	1997 Production	1997 Capacity	Est. Jobs
BMW	Spartanburg, SC	1994	3-Series, M5 coupe	62,943	72,352	1,350
Ford	Atlanta, GA	1915	Taurus, Sable	247,520	248,124	2,700*
	Louisville, KY	1955	Heavy Trucks, F-Series Pickup	226,778	205,632	2,200*
	Louisville, KY	1968	Explorer, Ranger, Mercury Mountaineer	375,941	351,288	3,700*
	Norfolk, VA	1925	F Series Pickup	233,600	205,632	1,600*
GM	Bowling Green, KY	1982	Corvette	24,673	24,752	1,100*
	Doraville, GA	1947	Chevrolet Venture, Oldsmobile Silhoutte, Opel/Vauxhall Sintra, Pontiac Trans Sport	252,673	239,904	2,600*
	Spring Hill, TN	1989	Saturn coupe, sedan & wagon	271,471	288,200	8,461
	Shreveport, LA	1982	S10 Pickup, GMC Sonoma, Isuzu Hombre	149,324	199,692	2,500*
Mercedes-Benz	Vance, AL	1997	ML 320	19,462	40,432	1,500
Nissan	Smyrna, TN	1983	Altima, Sentra, Frontier Pickup	398,308	456,960	6,000
Toyota	Georgetown, KY	1989	Camry, Avalon, Sienna	431,811	438,736	6,000
Total				**2,694,504**	**2,771,704**	**39,711**

* 1994 Employment

Source: Complied from *Automotive News 1998 Market Data Book*, May 27,1998, and James Rubenstein, *The Changing U.S. Auto Industry*, 1992, and *Contribution of the International Auto Sector to the U.S. Economy*, University of Michigan, 1998.

other industry classifications, as suggested by Table 1. Because of data quality concerns and the disparate availability of descriptive data for suppliers, the information presented below come from a variety of different sources: the *Japanese Automotive Supplier Investment Directory (JASID)*, compiled by the Office for the Study of Automotive Transportation at the University of Michigan; the *Dunn and Bradstreet Registry of U.S. Companies (DBR)*; more recent data on first and second tier suppliers obtained from *Elm International*; and a database of suppliers maintained by the State Department of Economic and Community Development (ECD). As its name indicates, the *JASID* covers only supplier establishments that are at least partially owned by a Japanese firm and represents a complete accounting of Japanese investments in the U.S. automotive industry as of April 1995 (the most recent year for which data are available). For each Japanese-owned establishment the Directory presents information on location, plant size, investment, year established, type of operation, employment, parent company, product produced, destination of exports, customers, suppliers, sales, percent of output to the auto industry, customer quality ratings, and union affiliation. Because it is compiled from surveys, however, some of these items may be missing for any given plant. In addition, SIC codes were assigned for each of these facilities based on product information provided in the database. The *DBR*, alternatively, includes all firms, regardless of ownership, and were obtained for only four states in the Southeast: Alabama, Georgia, North Carolina, and Tennessee.[8] Because of the overlap between these two data sources in terms of ownership, duplicate records for Japanese supplier plants were eliminated from the *DBR* database to eliminate double counting these establishments in the statistical tabulations and analysis.

Although the DBR is not an exact match for the *JASID*, it was possible to compile some of the same information on U.S. companies that is included in the *JASID*. This information includes data on plant location, plant size, employment, year started, product, and SIC code. Note also that because the *DBR* includes companies in all industries and does not directly identify automotive supplier firms like the *JASID*, establishments had to be selected for inclusion in the supplier database on the basis of other information. Without direct identification of automotive supplier firms, this database will necessarily be less precise because of the risk that some plants are included in the database that have no ties to auto assembly facilities or are not dependent on the auto industry for a significant portion of their sales.[9]

Finally, the information from Elm International and ECD provide only spartan descriptive data on the suppliers. Accordingly we simply show the locational distribution of these suppliers within the region.

V. JAPANESE AUTOMOTIVE SUPPLIER INVESTMENTS

The *JASID* reports a year-end 1995 total of 345 facilities. Of these, 271 are components facilities and the other seventy-four produce and supply materials or capital equipment (e.g. machine tools

and dies) to assemblers. The influx of Japanese components facilities began in 1982, the same year Honda of America opened its Marysville, Ohio plant, and grew steadily until the latter part of the decade. The peak years for Japanese component plant investments occurred in 1987 (50 new facilities), 1988 (62 new facilities) and 1989 (53 new facilities). Once the Japanese assembly firms reached full production, established their supplier networks, and achieved their domestic sourcing goals, however, growth in new supplier investments slowed to a trickle. Only two new plants opened in 1992, with no new plants since the *JASID* survey.

While the rate of growth will not likely ever return to its pace of the 1980's, substantial additional investments in U.S. capacity by Japanese suppliers may be forthcoming if the political pressure on assemblers to increase the domestic content of their vehicles persists and if currency fluctuations continue to make the importation of critical large components like engines and transmissions risky in terms of profits. During the initial years of assembly operations, lack of confidence in the ability of U.S. firms to meet Japanese supplier standards made importing of key vehicle systems a standard practice. Because of continued exchange rate volatility and high transportation costs, we are likely to see some expansion of domestic engine production capacity at Japanese assembly plants, as with the relatively new Nissan facility in Decherd, Tennessee. In addition, Honda announced on May 7, 1999 that it would build a facility in Alabama to support assembly of minivans and sport utility vehicles. Production is to begin in 2002 and the plant will employ 1,500 workers. Domestic supplier firms have now proven able to conform to the quality and deliverability requirements of Japanese automakers and the increased use of U.S. suppliers may dampen future additions to the Japanese supplier network. In addition, because nearly all of these Japanese supplier plants included in the JASID survey were established in the 1980's we cannot expect any major additions to their capacity in the near future. The average age of the facilities listed in the *JASID* is only 8.5 years.

In addition to the average age of Japanese-owned supplier establishments, Table 13 lists some other important features of these new plant investments. The average employment in these facilities is 293 workers, compared with an average size of about 50 workers for all manufacturing operations in the U.S. Another interesting characteristic of these plants is that

Table 13: Selected Characteristics of Japanese Automotive Supplier Investments in the U.S.

Average Age	8.5 years
Average Employment	293
Average plant size (square feet)	209,000
Average capital investment	$39.9 million
Percent of plants unionized	12.3
Percent of plants with exports	72.4

Source: *Japanese Automotive Supplier Investment Directory*, Sixth Edition, Office for the Study of Automotive Transportation, The University of Michigan, April 1995.

sixty-five percent of them are exporters. Because of the integration of the U.S. and Canadian vehicle markets established under the AutoPact in 1962, most of these exports are destined for Canada, though many of these firms also serve automotive manufacturers in their home market of Japan. Europe and Mexico also receive exports from Japanese parts suppliers in the U.S. Note also that only 12.3 percent of these establishments are unionized, giving support to the common perception that the Japanese are averse to the traditional labor-management relationship in U.S. manufacturing plants.

Although nearly all of these Japanese suppliers serve at least one of the eight transplant facilities established by Japanese automakers in the U.S., most also provide components to Big Three firms as well. Also, as stated above, American-owned supplier firms have made inroads into the Japanese supplier network. This increased reliance on U.S. firms is due, in part, to the high degree of component outsourcing practiced by Japanese assembly plants, a fact that makes the supplier network for any one plant quite extensive. Nissan, for example had about 225 domestic suppliers for its U.S. built vehicles making it impossible for the company to rely exclusively on transplanted Japanese firms for all of its components. Similarly, Toyota's Georgetown, Kentucky facility had more than 200 domestic suppliers (Haywood, 1992).

Some specific data for Japanese automotive supplier investments in the southeast region are given in Table 14. In addition to a count of these plants in the region and descriptive data on plant size, age, employment, investment, and percentage of output to the auto industry, the plants have been grouped by SIC code to provide an overview of the characteristics of establishments by industry.

In total there are twenty-one different industries represented among the Japanese automotive supplier investments in the Southeast. Of the 103 establishments in the region, the majority (fifty-six percent) are engaged in production of motor vehicle parts and accessories. On average these facilities employ 335 workers and have $62.7 million in fixed capital. Note that nearly all of these investments were made in the last fifteen years. The overall average age of these plants (as of 1995) given in the last row of Table 12 is 8.5 years; only three of the industry groups have an average plant age greater than ten years. In fact, only three of the 103 facilities in the region represent investments made more than fifteen years ago, a finding that clearly coordinates the timing of these supplier investments with the influx of Japanese assembly facilities during the 1980's.

Two additional features of these plants should be noted from the last row of the table. First is the fact that the customer base is almost exclusively comprised of automobile assemblers or other auto supplier firms. On average 76.7 percent of the output of these plants is destined for automobile or parts manufacturing facilities, and 45.0 percent of the firms in these industries produce exclusively for the automobile industry.[10] Plants in four other industries: Ball and Roller Bearings (SIC 3562), Industrial Process Furnaces and Ovens (SIC 3567), Household Audio and Video Equipment (SIC 3651) and Motor Vehicle Parts

Table 14: Characteristics of Japanese Automotive Supplier Investments in the Southeast

SIC Code	Industry Name	Number of Plants	Averages: Plant Size (ft^2)	Plant Age (years)	Employ-ment	Invest-ment	% of Output to Auto. Industry	% Unionized
2296	Tire Cord and Fabrics	1	490,000	14.0	748.0		99.0	0.0
2399	Fabricated Textile Products, nec	3	111,000	7.3	310.0	7,600,000.0	100.0	0.0
3011	Tires and Inner Tubes	3	1,800,000	9.7	1683.0	163,000,000.0	100.0	66.6
3211	Flat Glass	4	243,725	6.3	358.0	232,075,000.0	100.0	0.0
3231	Glass Products	1	65,600	8.0	195.0		100.0	0.0
3264	Porcelain Electrical Supplies	1	160,000	9.0	150.0	12,000,000.0	52.0	100.0
3312	Steel Works, Blast Furnaces	1	200,000	7.0	105.0		20.0	100.0
3316	Cold-Rolled Steel Sheet, Strip, and Bars	3	55,600	7.7	43.0	4,000,000.0	50.0	0.0
3356	Rolling, Drawing and Extruding of Nonferrous Metals, nec	1		6.0			40.0	0.0
3429	Hardware, nec	2	30,250	4.0	70.0	2,500,000.0	100.0	0.0
3465	Automotive Stampings	3	277,000	7.0	557.0	333,970,000.0	100.0	0.0
3469	Metal Stampings, nec	1		8.0	305.0		100.0	0.0
3493	Steel Springs, Except Wire	1	330,000	7.0	194.0		100.0	0.0
3535	Conveyors and Conveying Equipment	2	135,000	9.5	150.0	8,000,000.0	36.5	0.0
3541	Machine Tools, Metal Cutting Types	4	153,750	9.5	174.0	16,500,000.0	15.0	0.0
3542	Machine Tools, Metal Forming Types	1	450,000	21.0	450.0			
3562	Ball and Roller Bearings	3	70,000	11.3	246.0	15,000,000.0	66.7	0.0
3567	Industrial Process Furnaces and Ovens (Paint Baking Systems)	1	33,000	8.0	32.0	1,700,000.0	100.0	0.0
3621	Motors and Generators	2	227,000	6.5	481.5	52,500,000.0	100.0	0.0

Table 14 (Continued)

SIC Code	Industry Name	Number of Plants	Averages: Plant Size (ft^2)	Plant Age (years)	Employ-ment	Invest-ment	% of Output to Auto. Industry	% Unionized
3647	Vehicular Lighting Equipment	1	33,000	8.0	47.0		100.0	0.0
3651	Household Audio and Video Equipment	2		8.0	435.0		80.0	0.0
3679	Electric Components, nec	3	132,500	7.0	527.0		100.0	
3691	Storage Batteries	1	150,000	7.0	205.0	30,000,000.0	100.0	100.0
3714	Motor Vehicle Parts and Accessories	58	156,938	6.7	238.0	31,339,024.0	82.2	1.7
Total		**103**	**2,252,588**	**8.5**	**334.9**	**62,764,024.2**	**76.7**	**6.3**

Source: *Japanese Automotive Supplier Investment Directory*, Sixth Edition, Office for the Study of Automotive Transportation, The University of Michigan, April 1995.

and Accessories (SIC 3714) send more than 80.0 percent of their output to automobile assembly plants or other suppliers. This heavy dependence on the automobile industry as a source of demand implies that these firms are highly susceptible to the boom and bust cycles inherent in the auto industry, more so than is the case for other automotive suppliers. Second, note that these plants have an extremely low rate of unionization, a fact that has important locational implications given that the majority of southern states have embraced "right-to-work" statutes and the Japanese tend to shy away from the conflicts inherent in collective bargaining arrangements. Only 6.3 percent of these plants are unionized in the Southeast, a much smaller ratio compared to the 12.0 percent unionization of Japanese automobile facilities nationwide. As the table shows, only five of the industry groups contained any unionized plants: Tires and Inner Tubes (SIC 3011); Porcelain Electrical (SIC 3264); Steel Works, Blast Furnaces (SIC 3312); Storage Batteries (SIC 3691); and Motor Vehicle Parts and Accessories (SIC 3714).

VI. NON-JAPANESE OWNED SUPPLIER INVESTMENTS: DBR

Table 15 presents similar characteristics for non-Japanese owned automotive supplier firms in the

Table 15: Characteristics of Non-Japanese Owned Automobile Supplier Firms in the Alabama, Georgia, North Carolina and Tennessee

SIC Code	Industry Name	Number of Plants	Averages:		
			Plant Size (ft^2)	Plant Age (years)	Employment
2296	Tire Cord and Fabrics	8	421,666.7	12.0	560.6
2396	Automotive Trimmings	5	80,000.0	17.0	117.0
2399	Fabricated Textile Products, nec	3	56,666.7	52.5	317.5
2531	Public Building and Related Furniture (Automotive Seating)	4	174,500.0	18.5	567.5
2821	Plastics Materials, Synthetic Resins, & Nonvulcanizable Elastomers	39	223,349.9	10.6	242.7
2851	Paints, Varnishes, Lacquers, Enamels, and Allied Products	20	82,125.0	22.3	128.6
2891	Adhesives and Sealants	8	109,500.0	14.2	245.8
2992	Lubricating Oils and Greases	4	18,000.0	20.7	61.0
3011	Tires and Inner Tubes	27	493,170.0	20.2	852.7
3052	Rubber and Plastics Hose and Belting	15	196,720.0	39.3	162.8
3053	Gaskets, Packing and Sealing Devices	11	58,914.3	23.3	177.0
3061	Molded, Extruded and Lathe-Cut Mechanical Rubber Goods	3	96,000.0	4.0	338.3
3069	Fabricated Rubber Products, nec	54	75,958.3	13.2	200.6
3089	Plastics Products, nec	95	60,455.6	12.3	141.4
3211	Flat Glass	6	547,000.0	21.5	373.7
3231	Glass Products, Made of Purchased Glass	13	180,000.0	26.9	239.0
3312	Steel Works, Blast Furnaces	32	351,226.8	7.1	434.2
3316	Cold-rolled Steel Sheet, Strip and Bars	4	55,000.0	31.5	166.7
3317	Steel Pipe and Tubes	2	140,600.0	15.5	125.5
3354	Aluminum Extruded Products	1	20,000.0	17.0	125.0
3356	Rolling, Drawing and Extruding of Nonferrous Metals, Except Copper and Aluminum	7	64,250.0	29.5	311.1
3357	Drawing and Insulating of Nonferrous Wire	7	717,333.3	14.3	176.2
3398	Metal Heat Treating	2	n. a.	n. a.	56.0
3429	Hardware, nec	14	107,830.0	17.3	330.3
3451	Screw Machine Products	12	33,750.0	16.9	74.5
3452	Bolts, Nuts, Screws, Rivets and Washers	8	110,140.0	25.4	179.9
3462	Iron and Steel Forgings	6	358,000.3	12.0	167.0
3465	Automotive Stampings	12	148,800.0	25.3	240.8
3479	Coating, Engraving and Allied Services, nec	15	69,928.6	5.7	70.3
3493	Steel Springs, Except Wire	2	n. a.	n. a.	240.0
3499	Fabricated Metal Products, nec	6	46,250.0	19.8	140.5
3519	Internal Combustion Engines, nec	10	286,500.0	12.8	360.5
3535	Conveyors and Conveying Equipment	4	173,666.7	16.3	185.3
3541	Machine Tools, Metal Cutting Types	6	835,000.0	15.0	94.2
3544	Machine Tools, Metal Forming Types	21	34,588.2	19.9	92.8
3545	Cutting Tools, Machine Tool Accessories and Machinists' Precision Measuring Devices	20	85,000.0	12.6	146.8
3562	Ball and Roller Bearings	14	147,000.0	19.5	307.6

Table 15 (Continued)

SIC Code	Industry Name	Number of Plants	Averages: Plant Size (ft^2)	Plant Age (years)	Employment
3563	Air and Gas Compressors	5	44,000.0	37.0	140.4
3585	Air Conditioning and Warm Air Heating Equipment	18	87,181.8	18.9	261.4
3592	Carburetors, Pistons, Piston Rings and Valves	5	50,000.0	9.8	172.5
3599	Industrial and Commercial Machinery and Equipment, nec	64	50,094.6	16.0	131.7
3621	Motors and Generators	25	105,180.1	21.3	330.0
3641	Electric Lamp Bulbs and Tubes	2	172,000.0	35.5	417.5
3643	Current Carrying Wiring Devices	21	65,333.3	35.3	193.2
3644	Noncurrent Carrying Wiring Devices	1	50,000.0	n. a.	150.0
3647	Vehicular Lighting Equipment	2	n. a.	18.0	270.0
3651	Household Audio and Video Equipment	6	63,666.7	16.0	313.6
3691	Storage Batteries	7	128,800.0	10.0	198.7
3694	Electrical Equipment for Internal Combustion Engines	14	43,166.7	18.2	254.7
3711	Motor Vehicles and Car Bodies	20	638,127.3	7.0	833.5
3713	Truck and Bus Bodies	26	80,421.1	16.0	238.9
3714	Motor Vehicle Parts and Accessories	128	117,583.1	16.0	284.6
Totals		**863**	**137,037.6**	**16.0**	**259.5**

TVA region states (Alabama, Georgia, North Carolina and Tennessee). Overall, there are fifty-two industries represented in this group of 863 plants. Note that, not surprisingly, the average age of these facilities is much higher than that of the Japanese owned facilities: 16.0 years compared to 8.5 years. This fact gives another indication that the timing of investments by Japanese supplier firms is closely linked to the timing of Japanese automobile assembly plant investments. Only six, or 11.5 percent, of the industries listed in Table 13 has an average plant age of ten years or less. Still, the relatively young age of these plants and the fact that twenty-eight of these fifty two industries (54.0 percent) have an average plant age of between ten and twenty years indicates that automobile component manufacturing is a relatively new activity to the southeastern states. Not surprisingly, the oldest of these industries in the region is Fabricated Textile Products (SIC 2399), which includes firms that manufacture automobile interior products such as carpets, headliners, floor mats, and upholstery.

With regard to the size of these plants, on average, they employ 260 workers making them comparable in size to the Japanese supplier firms,

Table 16: Number of Auto Supplier Companies and Employment by County, 1998

County	Companies		Employment	
	Number	Percent	Number	Percent
Anderson	10	2.99	1,965	2.61
Bedford	3	0.90	1,330	1.76
Benton	--	--	--	--
Bledsoe	2	0.60	472	0.63
Blount	10	2.99	4,751	6.30
Bradley	2	0.60	14	0.02
Campbell	3	0.90	211	0.28
Cannon	--	--	--	--
Carroll	3	0.90	300	0.40
Carter	1	0.30	30	0.04
Cheatham	1	0.30	15	0.02
Chester	1	0.30	73	0.10
Claiborne	--	--	--	--
Clay	1	0.30	100	0.13
Cocke	2	0.60	230	0.30
Coffee	2	0.60	630	0.84
Crockett	1	0.30	1	0.00
Cumberland	3	0.90	81	0.11
Davidson	33	9.85	4,544	6.03
Decatur	1	0.30	3	0.00
DeKalb	3	0.90	1,265	1.68
Dickson	5	1.49	948	1.26
Dyer	3	0.90	618	0.82
Fayette	3	0.90	640	0.85
Fentress	--	--	--	--
Franklin	7	2.09	829	1.10
Gibson	5	1.49	1,142	1.51
Giles	5	1.49	1,070	1.42
Grainger	--	--	--	--
Greene	11	3.28	1,775	2.35
Grundy	--	--	--	--
Hamblen	5	1.49	2,120	2.81
Hamilton	5	1.49	240	0.32
Hancock	--	--	--	--
Hardeman	1	0.30	198	0.26
Hardin	1	0.30	70	0.09
Hawkins	4	1.19	1,875	2.49
Haywood	--	--	--	--
Henderson	4	1.19	1,640	2.17
Henry	3	0.90	870	1.15
Hickman	--	--	--	--
Houston	1	0.30	40	0.05
Humphreys	--	--	--	--
Jackson	1	0.30	250	0.33
Jefferson	1	0.30	107	0.14
Johnson	1	0.30	7	0.01
Knox	13	3.88	1,453	1.93
Lake	--	--	--	--
Lauderdale	2	0.60	960	1.27
Lawrence	3	0.90	1,210	1.60

Table 16 (Continued)

County	Companies		Employment	
	Number	Percent	Number	Percent
Lewis	2	0.60	552	0.73
Lincoln	1	0.30	33	0.04
Loudon	5	1	1,345	2
McMinn	8	2.39	1,608	2.13
McNairy	3	0.90	273	0.36
Macon	2	0.60	212	0.28
Madison	3	0.90	650	0.86
Marion	2	0.60	310	0.41
Marshall	6	1.79	879	1.17
Maury	5	1.49	242	0.32
Meigs	--	--	--	--
Monroe	4	1.19	1,479	1.96
Montgomery	5	1.49	2,462	3.26
Moore	--	--	--	--
Morgan	--	--	--	--
Obion	4	1.19	3,618	4.80
Overton	2	0.60	440	0.58
Perry	--	--	--	--
Pickett	2	0.60	40	0.05
Polk	2	0.60	115	0.15
Putnam	8	2.39	1,562	2.07
Rhea	3	0.90	465	0.62
Roane	1	0.30	125	0.17
Robertson	6	1.79	1,178	1.56
Rutherford	16	4.78	3,154	4.18
Scott	--	--	--	--
Sequatchie	--	--	--	--
Sevier	3	0.90	526	0.70
Shelby	24	7.16	1,801	2.39
Smith	4	1.19	618	0.82
Stewart	1	0.30	125	0.17
Sullivan	7	2.09	1,336	1.77
Sumner	15	4.48	2,219	2.94
Tipton	--	--	--	--
Trousdale	--	--	--	--
Unicoi	3	0.90	195	0.26
Union	1	0.30	150	0.20
Van Buren	--	--	--	--
Warren	6	1.79	2,178	2.89
Washington	3	0.90	770	1.02
Wayne	--	--	--	--
Weakley	1	0.30	750	0.99
White	1	0.30	175	0.23
Williamson	3	0.90	510	0.68
Wilson	6	1.79	866	1.15
TENNESSEE	335	100.00	75,417	100.00

Note: Percent is percent of Tennessee total.
Source: Harris Info Source, *1999 Harris Tennessee Manufacturers Directory, 1998.*

which employ 278 workers, on average. With regard to plant size, the average square footage of these facilities of approximately 137,000.

By March 1994, seven months before limited production began officially at BMW, eleven suppliers had already located to the Greenville-Spartanburg area in South Carolina.[11] These supplier facilities represent a total investment of about $475 million and will employ just over 1,000 workers. Because BMW has set a domestic target of 80 percent for its U.S. built vehicles, this supplier network has likely shown significant growth.

Table 16 presents the number of supplier establishments and employment by county from the *1999 Harris Tennessee Manufacturers Directory*. Nashville-Davidson MSA (Metropolitan Statistical Area) contains 27 percent of the supplier establishments and 21 percent of the jobs. Davidson, Rutherford, and Sumner Counties hold the largest number of establishments as well as the largest number of jobs. Rutherford County, which accounts for 3,154 jobs in 16 establishments, is the home of the Nissan plant in Smyrna. The Knoxville MSA follows behind Nashville-Davidson with 13 percent of supplier establishments and 14 percent of the jobs. The greatest number of supplier plants seem to be located in or near areas with major interstates or highways, providing easy access to the automobile assembly plants.

Tables 17 and 18 list Nissan suppliers by state and county, respectively in Tennessee. Tennessee contains the largest number of Nissan suppliers with 41. It is followed by Michigan with 26 and Ohio with 15 establishments. Indiana, Illinois and Kentucky each contain 8 supplier firms. As shown in Table 18, Rutherford county contains the largest number of establishments with 6 companies. Davidson, Lawrence, Robertson and Sumner follow next with 3 firms each. All of these counties, with the exception of Lawrence, are located in the Nashville-Davidson MSA.

Table 19 shows the distribution of *Tier 1* supplier establishments and employment by county for Tennessee from *The Elm Guide: North American Supplier Database*. Nashville-Davidson MSA remains the leader with 22.8 percent of the establishments and 17.2 percent of the jobs in Tennessee. Sumner County has the greatest number of establishments. Its 11 companies account for 7.4 percent of the total number of establishments. Rutherford County has 2,871 jobs in 7 establishments. The Knoxville MSA follows Nashville-Davidson with 11 percent of the establishments and 10 percent of the jobs. Blount County emerges with the largest number of employees in the state with 3,632 jobs in 9 establishments. This accounts for approximately 7.0 percent of the total supplier employment in Tennessee. Maury County, home of Saturn, only represents 1.0 percent of the establishments and 0.2 percent of employment in the Elm database.

Finally, Table 20 shows the number of suppliers by county using the State Department of Economic and Community Development's *1998 Automotive Suppliers Directory*. This source reports a total of 662 suppliers in Tennessee. Shelby County is the leader, with 56 establishments, followed by Davidson County (44 firms) and Rutherford County (41 firms). Maury County is home to only 9 supplier establishments.

Table 17: Nissan Suppliers by State

State	Number of Suppliers
California	2
Connecticut	4
Georgia	2
Illinois	8
Indiana	8
Kentucky	8
Michigan	26
Minnesota	1
New York	1
North Carolina	2
Ohio	15
Pennsylvania	3
South Carolina	2
Tennessee	41
Texas	2
Vermont	1
Virginia	1
Wisconsin	4
Total	**131**

Source: Tennessee Department of Economic and Community Development.

Table 18: Nissan Suppliers in Tennessee: by County

County	Number of Suppliers
Bedford	1
Carroll	2
Davidson	3
Franklin	1
Giles	1
Hawkins	1
Henderson	1
Henry	1
Lawrence	3
Loudon	1
Marshall	2
Mc Minn	2
Monroe	1
Overton	2
Perry	1
Putnam	2
Robertson	3
Rutherford	6
Sullivan	1
Sumner	3
Warren	1
Williamson	1
Wilson	1
Total	**41**

Source: Tennessee Department of Economic and Community Development.

Together the supplier data tell a consistent story regarding location patterns. Generally the suppliers are concentrated in the vicinity of assembly plants, in or near the state's larger metropolitan areas, and in proximity to a large labor pool and transportation infrastructure. They provide a strong complement to the region's automobile assembly facilities and lead to sharp increases in state and local tax bases.

VII. CONCLUSION

The automotive industry took its time moving to the Southeast. But now that it is here it is reshaping the region's manufacturing base, providing new capital investment that embodies state-of-art technology and production techniques, and new modes of management. The jobs created in the automotive industry tell the story quite clearly, paying wages in Tennessee that are 40 percent above the average for the state's manufacturing industry.

The automotive industry is more than simply automobile assembly. The region also is a national leader in heavy truck production, and supports

Table 19: Number of Auto Supplier Companies and Employment by County, 1997

County	Companies		Employment	
	Number	Percent	Number	Percent
Anderson	3	2.0	700	1.4
Bedford	3	2.0	790	1.5
Benton	--	--	--	--
Bledsoe	2	1.3	402	0.8
Blount	9	6.0	3,632	7.0
Bradley	1	0.7	582	1.1
Campbell	--	--	--	--
Cannon	--	--	--	--
Carroll	2	1.3	325	0.6
Carter	2	1.3	1,035	2.0
Cheatham	--	--	--	--
Chester	--	--	--	--
Claiborne	--	--	--	--
Clay	1	0.7	90	0.2
Cocke	1	0.7	250	0.5
Coffee	1	0.7	550	1.1
Crockett	--	--	--	--
Cumberland	2	1.3	450	0.9
Davidson	2	1.3	360	0.7
Decatur	--	--	--	--
DeKalb	3	2.0	1,255	2.4
Dickson	2	1.3	770	1.5
Dyer	2	1.3	575	1.1
Fayette	--	--	--	--
Fentress	--	--	--	--
Franklin	2	1.3	633	1.2
Gibson	4	2.7	1,350	2.6
Giles	4	2.7	1,208	2.3
Grainger	--	--	--	--
Greene	7	4.7	2,027	3.9
Grundy	--	--	--	--
Hamblen	5	3.4	2,530	4.9
Hamilton	1	0.7	1,600	3.1
Hancock	--	--	--	--
Hardeman	--	--	--	--
Hardin	--	--	--	--
Hawkins	4	2.7	1,850	3.6
Haywood	--	--	--	--
Henderson	2	1.3	1,286	2.5
Henry	3	2.0	385	0.7
Hickman	--	--	--	--
Houston	--	--	--	--
Humphreys	--	--	--	--
Jackson	1	0.7	300	0.6
Jefferson	--	--	--	--
Johnson	--	--	--	--
Knox	1	0.7	200	0.4
Lake	--	--	--	--
Lauderdale	3	2.0	820	1.6
Lawrence	3	2.0	1,561	3.0

Table 19 (Continued)

County	Companies		Employment	
	Number	Percent	Number	Percent
Lewis	--	--	--	--
Lincoln	--	--	--	--
Loudon	--	--	--	--
McMinn	4	2.7	1,463	2.8
McNairy	--	--	--	--
Macon	1	0.7	168	0.3
Madison	3	2.0	868	1.7
Marion	--	--	--	--
Marshall	3	2.0	1,280	2.5
Maury	1	0.7	94	0.2
Meigs	--	--	--	--
Monroe	2	1.3	910	1.8
Montgomery	2	1.3	350	0.7
Moore	--	--	--	--
Morgan	--	--	--	--
Obion	1	0.7	3,000	5.8
Overton	3	2.0	571	1.1
Perry	2	1.3	1,225	2.4
Pickett	--	--	--	--
Polk	--	--	--	--
Putnam	3	2.0	1,037	2.0
Rhea	1	0.7	220	0.4
Roane	--	--	--	--
Robertson	3	2.0	704	1.4
Rutherford	7	4.7	2,871	5.5
Scott	1	0.7	196	0.4
Sequatchie	--	--	--	--
Sevier	3	2.0	630	1.2
Shelby	3	2.0	442	0.9
Smith	5	3.4	944	1.8
Stewart	--	--	--	--
Sullivan	1	0.7	500	1.0
Sumner	11	7.4	1,693	3.3
Tipton	--	--	--	--
Trousdale	--	--	--	--
Unicoi	--	--	--	--
Union	--	--	--	--
Van Buren	1	0.7	450	0.9
Warren	2	1.3	1,150	2.2
Washington	--	--	--	--
Wayne	--	--	--	--
Weakley	--	--	--	--
White	3	2.0	1,342	2.6
Williamson	1	0.7	100	0.2
Wilson	6	4.0	2,084	4.0
TENNESSEE	149	100.0	51,808	100.0

Note: Percent is percent of Tennessee total.

Source: ELM International, Inc., 1998.

Table 20: Number of Suppliers by County

County	Number of Suppliers	County	Number of Suppliers
Anderson	14	Lewis	1
Bedford	5	Lincoln	3
Benton	2	Loudon	6
Bledsoe	4	McMinn	6
Blount	9	McNairy	3
Bradley	7	Macon	2
Campbell	3	Madison	13
Cannon	2	Marion	
Carroll	5	Marshall	9
Carter	14	Maury	9
Cheatham		Meigs	1
Chester	1	Monroe	7
Claiborne		Montgomery	6
Clay	1	Moore	
Cocke	4	Morgan	1
Coffee	12	Obion	3
Crockett		Overton	5
Cumberland	5	Perry	2
Davidson	44	Pickett	3
Decatur	3	Polk	1
DeKalb	4	Putnam	17
Dickson	9	Rhea	2
Dyer	9	Roane	2
Fayette	2	Robertson	13
Fentress	1	Rutherford	41
Franklin	6	Scott	3
Gibson	10	Sequatchie	
Giles	10	Sevier	4
Grainger		Shelby	56
Greene	22	Smith	6
Grundy	1	Stewart	2
Hamblen	12	Sullivan	6
Hamilton	18	Sumner	26
Hancock		Tipton	3
Hardeman	1	Trousdale	1
Hardin	1	Unicoi	3
Hawkins	14	Union	
Haywood	2	Van Buren	1
Henderson	6	Warren	8
Henry	8	Washington	1
Hickman	1	Wayne	1
Hickman	1	Weakley	2
Houston		White	8
Humphreys	1	Williamson	5
Jackson	1	Wilson	11
Jefferson	5	Total	622
Johnson	1		
Knox	34		
Lake			
Lauderdale	4		
Lawrence	9		

Source: Tennessee Department of Economic & Community Development, *1998 Automotive Suppliers Directory*, August 1998.

extensive production of other modes of transportation equipment. And then there is the dramatic contribution of supplier firms who support the production of transportation equipment. All of this economic activity ripples through state and local economies, expanding job opportunities, increasing personal income and expanding tax bases. Clearly the automotive sector's migration is one of the major economic events to take place in the southeast in the 20th century.

ENDNOTES

* We would like to thank Joe Imorde of BellSouth for his long-standing interest in the automotive sector's development in the Southeast region. BellSouth provided initial funding that enabled CBER to begin its examination of the automotive industry in the region.

1. See James M. Rubenstein, *The Changing U.S. Auto Industry: A Geographical Analysis*. New York, Routledge, 1992.

2. United States Bureau of Labor Statistics, *Employment and Earnings*, March 1999.

3. This estimate assumes that the percentage of employment dedicated toward automotive input production is the same as the percentage of supplier industry output purchased by auto manufacturers as calculated in Table 3.

4. See Sean P. McAlinden and Brett C. Smith. *The Changing Structure of the U.S. Automotive Parts Industry*. Office for the Study of Automotive Transportation, University of Michigan Transportation Research Institute, 1993.

5. Calculated from data given in *Survey of Current Business*, U.S. Department of Commerce, Bureau of Economic Analysis, October 1998.

6. For a detailed discussion of this issue, see *The Contribution of the International Auto Sector to the U.S. Economy*, Transportation Research Institute, the Office for the Study of Automotive Transportation and The Institute of Labor and Industrial Relations, University of Michigan, March 1998.

7. Note that these data do not represent a comprehensive count of motor vehicle and parts manufacturing facilities in the U. S. since they only include Motor Vehicle Manufacturers' Association member and large non-member establishments. Thus, the magnitude of the facility and employment counts is likely to be understated. Still, the calculated shares of facilities and jobs and the changes in these shares should be a fair reflection of the actual shift in automotive manufacturing activity among the states.

8. This dataset was provided by the Tennessee Valley Authority so its geographic coverage is limited to states having territory in the TVA region.

9. To limit this risk automotive supplier firms were selected from the DBR listing using a two-part screening procedure. First, the establishment records were screened by SIC code to select out plants in certain industries likely to sell a considerable portion of their output to auto manufacturers or other auto suppliers. The SIC codes used for this first screen were selected by utilizing information contained in input-output tables for the United States, which allows rough calculation of the percentage of output sold to the automobile industry from a given supplier industry. A partial listing of the supplier industries is given above in Table 1. In addition, although the input-output tables include purchases by the auto industry from non-manufacturing firms (e. g. wholesalers, business service providers, etc.) the identification procedure was limited to firms within manufacturing in order to more precisely focus on industries likely to produce a substantial amount of their output for the auto industry. Wholesaling and service activities are less apt to be dependent on auto plants for their profitability. After this initial industry level screen, the product information for each record was reviewed to eliminate obvious cases where a non-automotive supplier firm remained in the database. For example, several manufacturers of office, church and institutional furniture were eliminated from SIC 2531 (Public Building and Related Furniture) which also includes firms that manufacture automobile seats. Some aircraft seat manufacturers were also eliminated from this industry category. Combined, these two screens eliminated 2,696 records from the original TVA database leaving behind a fairly concisely defined group of automobile supplier firms.

10. This percentage excludes firms in SIC 3542 since data on the percent of their output to the auto industry were not given in the JASID.

11. Appalachian Council of Governments, *Spartanburg County Economic Activity Report* and *Greenville County Economic Activity Report*.

APPENDIX

Appendix Table 1: Car Assembly Plants in the U.S., Canada and Mexico, Models, Production, Capacity, and Utilization, 1997 Model Year

Company	City	State	Models	Production	Capacity	%Utilized
Chrysler	Belvidere	IL	Dodge Neon Chrysler Neon Plymouth Neon	211,487	266,560	79.3
	Bramalea	**Ontario**	**Chrysler Concorde Chrysler LHS* Chrysler 300M* Dodge Intrepid**	**204,131**	**216,320**	**94.4**
	Detroit	MI	Dodge Viper Plymouth Prowler	2,253	7,616	29.6
	Sterling Hts	MI	Chrysler Cirrus Dodge Stratus Plymouth Breeze	226,977	258,944	87.7
	Toluca	**Mexico**	**Chrysler Stratus Chrysler Sebring convertible Dodge/Plymouth Neon**	**133,292**	**167,552**	**79.6**
Total Chrysler				**778,140**	**916,992**	**84. 9**
Ford	**Atlanta**	**GA**	**Ford Taurus Mercury Sable**	**248,124**	**247,520**	**100.2**
	Chicago	**IL**	**Ford Taurus Mercury Sable**	**247,610**	**247,520**	**100.0**
	Cuautitlan	Mexico	Ford Contour Mercury Mystique	44,444	114,240	38.9
	Dearborn	**MI**	**Ford Mustang**	**119,196**	**186,592**	**63.9**
	Hermosillo	**Mexico**	**Escort Tracer**	**126,941**	**152,320**	**83.3**
	Kansas City	**MO**	**Ford Contour Mercury Mystique**	**179,830**	**239,904**	**75.0**
	Lorain	**OH**	**Ford Thunderbird Mercury Cougar**	**71,092**	**141,440**	**50.3**
	St. Thomas	**Ontario**	**Ford Crown Victoria Mercury Grand Marquis**	**228,616**	**227,520**	**100.5**
	Wayne	**MI**	**Ford Escort**	**277,454**	**285,600**	**97.1**
	Wixom	**MI**	**Lincoln Continental Lincoln Mark VIII Lincoln Town Car Lincoln LS6 (winter 98)* Lincoln LS8 (winter 98)***	**146,482**	**198,016**	**74.0**
Total Ford				**1,689,789**	**2,040,672**	**82.8**
GM	**Bowling Green**	**KY**	**Chevrolet Corvette**	**24,673**	**24,752**	**99.7**
	Flint (Buick City)	**MI**	**Buick LeSabre Pontiac Bonneville**	**205,924**	**227,792**	**90.4**
	Detroit-Hamtramck	**MI**	**Cadillac DeVille/Concours Cadillac Eldorado Cadillac Seville**	**170,998**	**228,480**	**74.8**

Appendix Table 1 (Continued)

Company	City	State	Models	Production	Capacity	% Utilized
	Fairfax	KS	Pontiac Grand Prix Oldsmobile Intrigue	239,030	208,800	114.5
	Lansing (M plant)	MI	Oldsmobile Alero* Pontiac Grand Am*	185,001	228,480	81.0
	Lansing (C plant)	MI	Pontiac Grand Am*	228,387	228,480	100.0
	Lansing (Genassy)	MI	Chevrolet Cavalier convertible Pontiac Sunfire convertible	16,001	19,040	84.0
	Lansing (Lansing Craft Center)	MI	EV1	374	3,760	9.9
	Lordstown	OH	Chevrolet Cavalier Toyota Cavalier** Pontiac Sunfire	371,577	388,960	95.5
	Oklahoma City	OK	Chevrolet Malibu Oldsmobile Cutlass	174,632	247,520	70.6
	Orion Township	MI	Buick Park Avenue Buick Riviera Oldsmobile Aurora Oldsmobile Eighty Eight Pontiac Bonneville	207,321	228,480	90.7
	Oshawa (No. 1)	Ontario	Chevrolet Lumina Chevrolet Monte Carlo	257,085	242,688	105.9
	Oshawa (No. 2)	Ontario	Buick Regal Buick Century Chevrolet Lumina	243,331	246,480	98.7
	Ramos Arizpe	Mexico	Chevrolet Cavalier Chevrolet Joy/Swing Pontiac Sunfire	158,110	152,320	103.8
	Ste. Therese	Quebec	Chevrolet Camaro Pontiac Firebird	90,397	190,548	47.4
	Spring Hill	TN	Saturn coupe, sedan & wagon	271,471	288,200	94.2
	Wilmington	DE	Chevrolet Malibu	98,817	206,964	47.7
Total GM				2,943,129	3,361,744	87.5
Auto Alliance	Flat Rock	MI	Mazda 626 Mercury Cougar	100,648	189,652	53.1
BMW	Spartanburg	SC	BMW Z3 BMW M5 coupe	62,943	72,352	87.0
CAMI	Ingersoll	Ontario	Chevrolet Metro Suzuki Swift	71,744	116,560	61.6
Honda	Alliston	Ontario	Acura EL Honda Civic	165,040	152,320	108.4

Appendix Table 1 (Continued)

Company	City	State	Models	Production	Capacity	% Utilized
	East Liberty	OH	Acura CL Honda Civic	232,680	220,864	105.3
	Marysville	OH	Acura TL (fall 98)* Honda Accord	415,588	383,040	108.5
Total Honda				813,308	756,224	107.5
Mitsubishi Motor Manufacturing	Normal	IL	Chrysler Sebring coupe Dodge Avenger Mitsubishi Eclipse coupe & convertible Mitsubishi Galant	189,086	239,904	78.8
Nissan	Smyrna (Line1)	TN	Nissan 200SX Nissan Altima Nissan Sentra	115,576	129,472	89.3
	Smyrna (Line 2)	TN		163,934	201,824	81.2
	Aguascalientes and Cuernavaca	Mexico	Nissan Tsuru (Sentra) Nissan Tsubame wagon Nissan Lucino (200SX)	129,686	247,520	52.4
Total Nissan				409,196	578,816	70.7
NUMMI	Fremont	CA	Chevrolet Prizm Toyota Corolla	209,829	219,360	95.7
Subaru-Isuzu	Lafayette	IN	Subaru Legacy	102,180	99,008	103.2
Toyota	Cambridge	Ontario	Toyota Corolla Toyota Solara (fall 98)*	108,952	108,439	100.5
	Georgetown (Line 1)	KY	Toyota Camry	258,713	198,016	130.7
	Georgetown (Line 2)	KY	Toyota Avalon	146,260	209,440	69.8
Total Toyota				513,925	515,895	99.6
Volkswagen	Puebla	Mexico	Volkswagen Beetle Volkswagen New Beetle Volkswagen Golf Volkswagen Jetta Volkswagen Cabrio	257,366	289,408	88. 9
Volvo	Halifax	Nova Scotia	Volvo 70 Series	6,524	9,480	68.8
Total Big Three				5,411,058	6,319,408	87.6
Total Transplant				2,736,749	3,086,659	88.7
Total Car				8,147,807	9,406,067	86.6

Source: Crain Communications, *Automotive News 1998 Market Data Book*, May 27, 1998.

*1999 model
**For export only

Appendix Table 2: Truck Assembly Plants in the U.S. Canada and Mexico, Models, Production, Capacity, and Utilization, 1997 Model Year

Company	City	State	Models	Production	Capacity	% Utilized
Chrysler	**Warren (Dodge City)**	**MI**	**Dodge Dakota Dodge Ram pickup**	**254,506**	**236,096**	**107.8**
	Detroit	**MI**	**Jeep Grand Cherokee**	**278,453**	**285,600**	**97.5**
	Lago Alberto	**Mexico**	**Dodge Ram**	**84,601**	**80,640**	**104.9**
	Newark	**DE**	**Dodge Durango**	**33,175**	**64,481**	**51.4**
	Windsor (Pillet Rd)	**Ontario**	**Dodge Ram Van Dodge Ram Wagon**	**76,800**	**84,320**	**91.1**
	Saltillo	**Mexico**	**Dodge Ram**	**138,021**	**119,040**	**115.9**
	St. Louis (North)	**MO**	**Dodge Ram Quad cab pickup**	**125,448**	**129,472**	**96.9**
	St. Louis (South)	**MO**	**Chrysler Town & Country Dodge Caravan, Grand Caravan Plymouth Voyager, Grand Voyager**	**280,743**	**285,600**	**98.3**
	Toledo	**OH**	**Jeep Cherokee Jeep Wrangler**	**291,941**	**266,560**	**109.5**
	Windsor	**Ontario**	**Dodge Caravan, Grand Caravan Plymouth Voyager, Grand Voyager**	**346,369**	**348,390**	**99.4**
Total Chrylser				**1,655,551**	**1,664,103**	**99.5**
Ford	**Avon Lake**	**OH**	**Mercury Villager Nissan Quest**	**106,783**	**133,280**	**80.1**
	Cuautitlan	**Mexico**	**Ford F Series Ford P350/M450 Ford BF700/800**	**58,019**	**64,136**	**89.6**
	Edison	NJ	Ford Ranger Mazda B Series	127,254	152,320	83.5
	Kansas City	**MO**	**Ford F Series**	**239,232**	**205,632**	**116.3**
	Louisville (Kentucky Truck)	**KY**	**Ford F Series (+8,500 lbs.)**	**226,778**	**205,632**	**110.3**
	Wayne (Michigan Truck)	**MI**	**Ford Expedition Lincoln Navigator**	**279,093**	**262,000**	**106.5**

Appendix Table 2 (Continued)

Company	City	State	Models	Production	Capacity	% Utilized
	Norfolk	VA	Ford F Series	233,600	205,632	113.6
	Oakville	Ontario	Ford Windstar Ford F Series	292,687	276,816	105.7
	Oakville (Ontario Truck)	Ontario	Ford F Series	109,526	142,200	77.0
	St. Louis	MO	Ford Explorer	228,501	190,400	120.0
	St Paul (Twin Cities)	MN	Ford Ranger	164,826	171,360	96.2
Total Ford				2,642,749	2,574,544	102.6
GM	Arlington	TX	Cadillac Escalade ('99 model) Chevrolet Silverado* Chevrolet C/K heavy duty* Chevrolet Tahoe* GMC Sierra* GMC Sierra heavy duty* GMC Yukon*	43,362	55,200	78.6
	Baltimore	MD	Chevrolet Astro GMC Safari	170,804	190,400	89.7
	Detroit	MI	Chevrolet P model GMC P model	22,904	34,272	66.8
	Doraville	GA	Chevrolet Venture Oldsmobile Silhouette Opel/Vauxhall Sintra Pontiac Trans Sport	252,673	239,904	105.3
	Flint	MI	Chevrolet Silverado crew cab* GMC Sierra crew cab*	71,093	66,640	106.7
	Janesville (lines 1 & 2)	WI	Line 1: Chevrolet Tahoe* Chevrolet Suburban* GMC Yukon* GMC Suburban* Line 2: Chevrolet Kodiak GMC Topkick	241,393	201,824	119.6
	Linden	NJ	Chevrolet Blazer Chevrolet S10 pickup GMC Jimmy GMC Sonoma	178,530	190,400	93.8
	Moraine	OH	Chevrolet Blazer GMC Jimmy Oldsmobile Bravada	294,214	257,040	114.5
	Oshawa	Ontario	Chevrolet Silverado* GMC Sierra*	304,161	265,440	114.6
	Pontiac (East)	MI	Chevrolet Silverado* GMC Sierra*	215,212	285,600	75.4
	Shreveport	LA	Chevrolet S10 pickup GMC Sonoma Isuzu Hombre	149,324	199,692	74.8

Appendix Table 2 (Continued)

Company	City	State	Models	Production	Capacity	% Utilized
	Silao	Mexico	Chevrolet Silverado* Chevrolet Tahoe* Chevrolet Suburban* GMC Yukon* GMC Suburban*	142,790	152,320	93.7
	Wentzville	MO	Chevrolet Express GMC Savana	128,285	152,320	84.2
Total GM				2,455,279	2,519,532	97.4
CAMI	Ingersoll	Ontario	Chevrolet Tracker Pontiac Sunrunner Suzuki Sidekick	40,005	79,968	50.0
Mercedes-Benz	Vance	AL	ML 320 ML 430 ('99 model)	19,462	40,432	48.1
Nissan	Smyrna	TN	Frontier pickup	118,798	125,664	94.5
	Aguascalientes and Cuernavaca	Mexico	Tsubame (wagon/van) pickups	43,097	49,504	87.1
Total Nissan				161,895	175,168	92.4
NUMMI	Fremont	CA	Toyota Tacoma	147,930	152,320	97.1
Subaru-Isuzu	Lafayette	IN	Honda Passport Isuzu Amigo Isuzu Rodeo	84,712	91,392	92.7
Toyota	Georgetown	KY	Sienna	26,838	31,280	85.8
Total Big Three				6,753,579	6,758,179	99. 9
Total Transplant				480,842	570,560	84.3
Total Truck				7,234,421	7,328,739	98.7

Source: Crain Communications, *Automotive News 1998 Market Data Book*, May 27,1998.
* 1998 and 1999 models produced at both plants

Appendix Table 3: Number of Suppliers in Tennessee by SIC

SIC		Number of Suppliers
2211	Broadwoven Fabric Mills, Cotton	2
2241	Narrow Fabric and Other Smallwares Mills: Cotton, Wool, Silk, and Manmade Fiber	2
2258	Lace and Wrap Knit Fabric Mills	1
2269	Finishers of Textiles, nec	1
2273	Carpets and Rugs	2
2296	Tire Cord and Fabrics	3
2297	Nonwoven Fabrics	1
2299	Textile Goods, nec	1
2393	Textile Bags	1
2394	Canvas and Related Products	3
2396	Automotive Trimmings, Apparel Findings, and Related Products	1
2399	Fabricated Textile Products, nec	5
2441	Nailed and Lock Corner Wood Boxes and Shook	2
2448	Wood Pallets and Skids	3
2449	Wood Containers, nec	1
2542	Office and Store Fixtures, Shelving, Lockers	2
2621	Paper Mills	1
2631	Paperboard Mills	1
2653	Corrugated and Solid Fiber Boxes	11
2657	Folding Paperboard Boxes including Sanitary	1
2672	Coated and Laminated Paper, nec	2
2674	Uncoated Paper and Multiwall Bags	1
2675	Die-Cut Paper and Paperboard and Cardboard	2
2721	Periodicals: Publishing or Publishing and Printing	1
2731	Books: Publishing or Publishing and Printing	1
2752	Commercial Printing, Lithographic	4
2759	Commercial Printing, nec	3
2761	Manifold Business Forms	1
2812	Alkalies and Chlorine	1
2819	Industrial Inorganic Chemicals, nec	3
2821	Plastic Materials, Synthetic Resins, and Nonvulcanized Elastomers	7
2822	Synthetic Rubber (Vulcanized Elastomers)	8
2841	Soap and Other Detergents, Except Specialty Cleaners	2
2842	Specialty Cleaning, Polishing, and Sanitation Prepartations	4
2843	Surface Active Agents, Finishing Agents, Sulfonated Oils and Assistants	1
2851	Paints, Varnishes, Lacquers, Enamels, and Allied Products	5
2869	Industrial Organic Chemicals, nec	7

Appendix Table 3 (Continued)

SIC		Number of Suppliers
2891	Adhesives and Sealants	3
2899	Chemical and Chemical Preparations, nec	1
2911	Petroleum Refining	1
2992	Lubricating Oils and Greases	4
3011	Tires and Inner Tubes	9
3052	Rubber and Plastics Hose and Belting	6
3053	Gaskets, Packing, and Sealing Devices	9
3061	Molded, Extruded, and Lathe-Cut Mechanical Rubber Goods	2
3069	Fabricated Rubber Products, nec	24
3081	Unsupported Plastics Film and Sheet	1
3082	Unsupported Plastics Profile Shapes	1
3086	Plastics Foam Products	9
3087	Custom Compounding of Purchased Plastic Resins	1
3089	Plastics Products, nec	56
3211	Flat Glass	2
3229	Pressed and Brown Glass and Glassware, nec	2
3231	Glass Products, Made of Purchased Glass	4
3264	Porcelain Electrical Supplies	1
3291	Abrasive Products	2
3292	Asbestos Products	1
3295	Minerals and Earths, Ground or Otherwise Treated	1
3296	Mineral Wool	1
3312	Steel Works, Blast Furnaces (including Coke Ovens), and Rolling Mills	9
3315	Steel Wiredrawing, Steel Nails, and Spikes	6
3316	Cold-Rolled Steel Sheet, Strip, and Bars	9
3317	Steel Pipe and Tubes	4
3321	Gray and Ductile Iron Foundries	3
3325	Steel Foundries, nec	1
3334	Primary Production of Aluminum	1
3341	Secondary Smelting and Refining of Nonferrous Metals	2
3353	Aluminum Sheet, Plated, and Foil	3
3356	Rolling, Drawing and Extruding of Nonferrous Metals, Except Copper and Aluminum	2
3357	Drawing and Insulating of Nonferrous Wire	2
3363	Aluminum Die-Castings	5
3364	Nonferrous Die-Castings, Except Aluminum	3
3365	Aluminum Foundries	4
3366	Copper Foundries	1

Appendix Table 3 (Continued)

SIC		Number of Suppliers
3398	Metal Heat Treating	2
3399	Primary Metal Products, nec	2
3421	Cutlery	1
3423	Hand and Edge Tool	1
3429	Hardware	11
3432	Plumbing Fixture, Fittings and Trim	1
3433	Heating Equipment	1
3442	Metal Doors, Sash, Frames, Molding, and Trim	1
3443	Fabricated Plate Work	4
3444	Sheet Metal Work	5
3448	Prefabricated Metal Buildings and Components	1
3449	Miscellaneous Structural Metal Work	1
3451	Screw Machine Products	12
3452	Bolts, Nuts, Screws, Rivets, and Washers	5
3462	Iron and Steel Forging	4
3465	Automotive Stampings	12
3469	Metal Stampings	35
3471	Electroplating, Plating, Polishing, Anodizing	14
3479	Coating, Engraving, and Allied Services	14
3492	Fluid Power Valves and Hose Fittings	2
3493	Steel Springs, Except Wire	2
3495	Wire Springs	2
3496	Miscellaneous Fabricated Wire Products	4
3498	Fabricated Pipe and Pipe Fittings	2
3499	Fabricated Metal Products	16
3519	Internal Combustion Engines	3
3523	Farm Machinery and Equipment	2
3531	Construction Machinery and Equipment	2
3534	Elevators and Moving Stairwells	1
3535	Conveyors and Conveying Equipment	3
3537	Industrial Trucks, Tractors, and Trailers	4
3541	Machine Tools, Metal Cutting Types	9
3542	Machine Tools, Metal Forming Types	7
3544	Special Dies and Tools	66
3545	Cutting Tools, Machine Tool Accessories and Machinists' Precision Measuring Devices	21

Appendix Table 3 (Continued)

SIC		Number of Suppliers
3547	Rolling Mill Machinery and Equipment	1
3549	Metalworking Machinery	1
3559	Special Industry Machinery	25
3561	Pumps and Pumping Equipment	1
3562	Ball and Roller Bearings	6
3563	Air and Gas Compressors	2
3564	Industrial and Commercial Fans and Blowers	5
3565	Packaging Machinery	1
3566	Speed Changers, Industrial High-Speed Drives	2
3567	Industrial Process Furnaces and Ovens	1
3568	Mechanical Power Transmission Equipment	1
3569	General Industrial Machinery and Equipment	8
3571	Electronic Computers	1
3585	Air-Conditioning and Warm Air Heating Equipment	5
3592	Carburetors, Pistons, Piston Rings, and Valves	5
3593	Fluid Power Cylinders and Actuators	1
3594	Fluid Power Pumps and Motors	1
3599	Industrial and Commercial Machinery and Equipment	58
3612	Power, Distribution and Specialty Transformers	1
3621	Motors and Generators	3
3624	Carbon and Graphite Products	1
3625	Relays and Industrial Controls	7
3631	Household Cooking Equipment	1
3639	Household Appliances, nec	1
3641	Electric Lamp Bulbs and Tubes	1
3643	Current-Carrying Wiring Devices	3
3644	Noncurrent-Carrying Wiring Devices	1
3647	Vehicular Lighting Equipment	5
3651	Household Audio and Video Equipment	1
3674	Semiconductors and Related Devices	1
3675	Electronic Capacitors	1
3679	Electronic Components, nec	7
3692	Primary Batteries, Dry and Wet	1
3694	Electrical Equipment for Internal Combustion Engines	11
3699	Electrical Machinery, Equipment and Supplies, nec	3
3711	Motor Vehicles and Passenger Car Bodies	13
3713	Truck and Bus Bodies	13

Appendix Table 3 (Continued)

SIC		Number of Suppliers
3714	Motor Vehicle Parts and Accessories	130
3715	Truck Trailers	14
3792	Travel Trailers and Campers	3
3799	Transportation Equipment, nec	4
3821	Laboratory Apparatus and Furniture	1
3823	Industrial Instruments for Measurement, Display, and Control of Process Variables	2
3825	Instruments for Measuring and Testing of Electricity and Electrical Signals	1
3829	Measuring and Controlling Devices, nec	1
3873	Watches, Clocks, Clockwork Operated Devices, and Parts	1
4783	Packing and Crating	1
5012	Automobiles and Other Motor Vehicles	3
5013	Motor Vehicle Supplies and New Parts	23
5014	Tires and Tubes	5
5063	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Materials	3
5072	Hardware	3
5084	Industrial Machinery and Equipment	1
5085	Industrial Supplies	3
5088	Transportation Equipment and Supplies, Except Motor Vehicles	1
5093	Scrap and Waste Materials	3
5112	Stationery and Office Supplies	1
5113	Industrial and Personal Service Paper	1
5162	Plastics Materials and Basic Forms and Shapes	2
5169	Chemicals and Allied Products, nec	2
5199	Nondurable Goods, nec	2
5251	Hardware Stores	1
5531	Auto and Home Supply Stores	1

Source: Tennessee Department of Economic & Community Development, *1998 Automotive Suppliers Directory*, August 1998.