ACKNOWLEDGEMENTS

This report is the product of a true partnership. It represents the combination of the efforts made over the period of 12 months of over 20 Michigan Automotive Partnership (MAP) members and companies. Many of these MAP members gave willingly of their valuable time to guide, review, and edit this complicated study. These members set aside their natural competitive activities to focus on what is best for the automotive industry and the State of Michigan.

We must acknowledge the efforts and contributions of several OSAT staff. Bernard Swiecki generated the bulk of the policy survey results and produced the health care analysis contained in this study. Paul DiLaura developed the weighting scheme that he used to produce the forecast results. Both Bernard and Paul also contributed heavily to almost every other facet of the study. Esther Ullman, OSAT's survey manager, led the survey coordination and collection team. Diana Douglass, performed magnificently in pulling together this difficult document. Finally, our director, David Cole, not only helped to lead the MAP in their efforts, but also contributed to the interpretation and discussion of the results on global warming policy. We would also like to thank the Michigan Jobs Commission for the opportunity to carry out this project and wish them the best in their future efforts to improve the economic fortunes of the State of Michigan.

Sean P. McAlinden and Brett C. Smith

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EXECUTIVE SUMMARY

The Michigan Jobs Commission sponsored this study in September 1997. It is part of an overall contract granted to the Office for the Study of Automotive Transportation (OSAT) to assist the Jobs Commission in maintaining a special industry roundtable, the Michigan Automotive Partnership (MAP). Two sets of Michigan automotive firms currently participate as members of the MAP: the state's largest vehicle-producing firms (General Motors, Ford, and DaimlerChrysler), and a representative group of 25 automotive component, engineering service, and capital equipment firms. The constant purpose of the MAP is to provide a forum for the Jobs Commission to communicate with the state's major industry, especially with regard to the state's economic policy.

In the fall of 1997, the MAP and OSAT agreed to perform this policy study. This study seeks to obtain information and develop industry consensus on a range of state-level policy issues through a representative, multiround survey of other Michigan automotive firms, as well as a comparison group of parts-making firms from outside of Michigan. The policy domains for this study were suggested in site visit interviews and through the use of a short policy-rating poll of the MAP membership in the winter of 1997-1998. The policy domains include an automotive human resources forecast; issues in education and training for the auto industry; factors in the expansion and location of automotive facilities; the impact of global climate change policy on the automotive industry; and a measurement of health care programs in the auto industry.

The survey sample for this study was designed in response to the special needs of the MAP and to match the overall structure of the state's automotive industry. It was decided, therefore, to include not only firms that manufacture motor vehicles and automotive parts and components, but also to include companies that supply the auto industry with special tooling, capital equipment, and engineering services. For comparative purposes, a sample of non-Michigan automotive parts and component firms were taken from one of the most comprehensive listings of such companies. The study's final response sample was comprised of 141 companies. The 141 responding firms include 4 vehicle manufacturers (original equipment manufacturers, or OEMs), 47 *preproduction* companies, and 90 automotive component suppliers. The preproduction company category includes respondents from the special tooling, capital equipment, and engineering service industries.

This report contains two sets of overall results. First, a human resources forecast is presented. Most of the results contained in this section either describe Michigan's automotive labor economy or forecast expected changes in Michigan's automotive labor market during 1998-1999. Expectations regarding changes in capital spending and capacity also are included in this section of the report. These various forecasts and estimates set the stage for the second section, which presents survey results on the other four policy areas described above as well as measurements of labor scarcity. This second section of the report includes a review of 33 policy questions from two survey questionnaires. These results are presented in a format similar to the Delphi Forecast series, a survey conducted by the OSAT since 1979.

Human Resources Forecast

The survey questionnaire contained questions that asked companies to describe and forecast change in their company's human resources. The forecast includes expectations of changes in employment, hiring, employee attrition, and wage and salaries in Michigan's automotive industry. The forecast interval was for only 1 year. Typically, the forecast results are produced through the use of employment weights that allow the study to estimate change for all of Michigan's automotive industry. This section describes the basic occupational structure of the state's auto industry, wage levels for hourly workers, unionization rates, and starting salaries for engineers. Some highlights of the forecast section follow.

Employment Change: The 141 responding firms were asked to forecast their percent change in U.S. and Michigan employment during 1998-1999. The companies were asked to not only project change in total employment, but also employment in four occupation categories. The OEM respondents expect to reduce both U.S. and Michigan total employment by a weighted average of 2.9 percent. Our study projects a *fall* in 1999 OEM employment by *6,821*. Michigan preproduction companies are expected to *increase* their U.S. employment in 1999 by 4.3 percent, and their Michigan employment by 5.3 percent, from reported levels in 1998. This automotive sector in Michigan will *increase* employment by *4,682* during 1999. In contrast to preproduction firms, Michigan component firms expect to increase their U.S. employment by more than their Michigan employment in 1999; a 6.0 percent increase in U.S. employment versus a 4.1 percent increase in Michigan employment. It is expected that these parts suppliers, then, will *increase* their Michigan employment by *4,905*. In contrast to the Michigan sample of parts-producing companies, non-Michigan parts suppliers only expect to increase U.S. employment, on average, by 2.7 percent.

The projected total 1998-1999 increase in preproduction and Michigan component firm employment of 9,587 is combined with the reduction of 6,821 OEM jobs to give a net employment increase of 2,766 for the entire Michigan automotive sector. This represents an increase of 0.6 percent over 1998 employment.

Expected Attrition of Employees: Respondents were asked to forecast their companies' expected 1999 U.S. and Michigan rates of employee attrition from all causes. The OEMs expect that 6.1 percent of both their U.S. and Michigan hourly workers will leave in 1999 (presumably due to retirement). The same companies expect about 3.1 percent of their current U.S. and Michigan salaried employees to leave next year. Michigan preproduction companies, on the other hand, expect about 4.0 percent of their Michigan hourly and salaried workers to leave in 1999. The same firms expect a smaller percentage, 3.1 percent, of their overall salaried and hourly U.S. labor forces to exit in 1999.

Michigan component firms expect almost 13 percent of their Michigan hourly workers, and 6 percent of their Michigan salaried workers, to leave during 1998-1999. Non-Michigan component suppliers expect about 7 percent of their hourly and a modest 3 percent of their salaried workers to leave during the same period. The size of the company appears to be an important factor in expectations regarding attrition. Companies with 250-499 employees (U.S.) expect almost 19 percent of their hourly employees, and over 7 percent of their salaried employees, to leave during 1998-1999.

Expected Percentage Change in Monetary Compensation: Respondents were asked to estimate their company's change in U.S. monetary compensation in the next 12 months. This question covers roughly the summer of 1998 through the summer of 1999. The expected percentage change in OEM compensation is only 0.4 percent because the third year of the union contract contains no increase in the basic wage. However, the OEMs also expect to increase compensation for salaried employees in the next 12 months by only a marginal amount (1.4 percent). The non-OEM groups, however, report expected increases in overall compensation that range from 4.0 percent (Michigan preproduction firms) to 3.4 percent (Michigan components). Generally, engineers and skilled trade workers appear to be slated for the largest increases in wages and salaries in the next year.

Change in Capital Spending and Facilities/Capacity: Respondents also were asked for their expectations regarding change in their U.S. and Michigan facilities/capacity during 1998-1999**.** Michigan component companies expected to increase their U.S. capacity by an impressive 16 percent and their Michigan capacity by almost 15 percent. Non-Michigan suppliers, however, expect to increase their capacity by less than 6 percent. The OEMs expect no increase in their U.S. or Michigan capacity. Small non-OEM Michigan firms, with employment between 1 and 249, report

the largest percent increases in capacity for 1999 of any size group—a 9 percent increase for both U.S. and Michigan capacity.

Education and Training for the Automotive Industry

The OEMs report a relative labor shortage in information technology (IT) systems support technicians, computer programmers/software specialists, and product engineers. Conversely, they report an ample supply of general production labor, general production supervisors, other specific technician labor, and clerical/office employees.

Michigan-based suppliers reported a moderate scarcity within Michigan for 8 of 10 labor categories. Skilled trades workers are the most scarce. Firms from the Michigan sample with facilities outside of Michigan reported a moderate scarcity in 7 of the 10 labor categories for their non-Michigan facilities, with general production supervisors being the scarcest.

In general, the OEMs forecast increased scarcity for both the U.S. and Michigan labor markets in the coming 2 years. Both Michigan and non-Michigan suppliers do not anticipate any significant change in the market for labor in the next 2 years.

The suppliers (Michigan and non-Michigan) forecast a tighter labor market for production labor and supervisors than do the OEMs. Conversely, the OEMs expect a tighter labor market for IT systems support technicians, computer programmers/software specialists, and product engineers in the coming 2 years. Importantly, the OEMs forecast a severe shortage of product engineers both in Michigan and the rest of the United States. The Michigan suppliers expect a severe shortage of skilled trades in Michigan.

Almost 36 percent of Michigan suppliers indicate that they have been severely affected by recent labor shortages. This is substantially higher than reported by the non-Michigan suppliers (16.7 percent). Overall, a nearly equal number of Michigan (84.3 percent) and non-Michigan (89.9 percent) suppliers report that they have been adversely—either severely or moderately—affected by the tight labor market.

Michigan suppliers (67.3 percent) report a significantly higher incidence of losing employees to companies located in higher tiers than do the non-Michigan suppliers (38.5 percent). However, a higher percent of the non-Michigan suppliers (36.1 percent) reported losing an employee to a competitor than did the Michigan suppliers (20.4 percent). Overall, 86 percent of Michigan suppliers, and 75 percent of non-Michigan suppliers reported losing individuals to other companies either in their own tier or in a higher tier.

Respondents reported that in the first year of employment, new hire production workers receive 32 hours of training. Newly hired skilled trades, supervisors, and engineers receive 40 hours of training. For experienced employees, the amount of time spent in training per year is roughly half of that of a new hire. The forecast indicates that respondents expect the amount of time spent in training will increase by at least 10 to 20 percent by 2003.

The expansion of co-op programs and higher standards of conduct were rated as potentially very effective policy actions to improve general and technical education for manufacturing industries. There is some disagreement between the OEMs and Michigan suppliers in several of the policy actions. However, it is important to note that they generally agree that the changes could be effective in improving general and technical education, but disagree on the degree of effectiveness of the actions.

The respondents rated increased efforts to improve and reform public K-12 education as potentially the most effective policy action to improve labor market conditions for the auto industry. The manufacturers also rated highly the creation and subsidy of distance learning technologies for in-plant training. Michigan suppliers rated the subsidy of apprenticeship training for small-to-

medium-sized automotive firms as potentially effective. All three groups rated state programs stressing health and safety as the least potentially effective.

Expansion and Location

The site selection decision process is very complex and dynamic. While it is true that many factors are at least somewhat critical for site location decisions, a few factors appear to be more critical. OEM respondents rate land cost/availability, state and local business taxes, and quality of transportation as the most critically important factors. Michigan supplier respondents rated local labor quality, proximity to a specific customer, and state and local business taxes as the most critical. Non-Michigan suppliers rated local labor quality, local labor cost, and unionization rates as the most critical location factors.

Impact of Global Climate Change

The impact of global climate change has become an issue of significant concern for all automotive participants. The major manufacturers have indicated that, while still unsure of the severity of any such change, they are implementing strategies to address possible causes. It is noteworthy that the OEMs are especially optimistic regarding the potential for opportunities for advanced technologies arising from the increased emphasis placed on environmental concerns.

The OEMs indicate that they believe the use of extensive cost-benefit analysis to establish parameters for action is the most effective of the listed actions. They report that an increase in the number of joint government/industry programs to develop advanced technologies and an increase in the incentives to manufacturers for the use of energy-efficient technologies are potentially effective. The suppliers also report that incentives to manufacturers for the use of energy-efficient technologies would be effective. None of the three groups appears to believe that ratification of the Kyoto agreement by the U.S. Senate is an effective way to address global climate change concerns.

Health Care

All respondents report providing health care insurance for their employees, which indicates that health care is a standard benefit for automotive firms. A majority of the responding OEMs (75 percent) self-insure a portion of their health care plans. Although the responding non-Michigan suppliers initially appear more likely to self-fund their health care plans than their Michigan counterparts, further analysis shows that the real determinant appears to be company size. Respondents from larger firms indicate higher levels of self-funding than do those from smaller firms.

Among both Michigan and non-Michigan suppliers, preferred provider organization (PPO) plans are most popular, with 84 percent of Michigan and 83 percent of non-Michigan suppliers reporting participation. Cost appears to be the deciding factor in the respondents' choice of health care plans. PPOs, which tend to be less expensive than other health care plans, are provided by the most respondents while traditional indemnity plans, which tend to be the most expensive health care plans, are provided by fewer respondents.

Cost is an issue which permeates the respondents' comments throughout the health care section of the study. The respondents' concern with cost is apparent in their agreement that their health care costs will rise in 1999. Eighty-one percent of Michigan and 77 percent of non-Michigan suppliers expect their costs to rise. All four responding OEMs expect their health care costs to be higher in 1999. OEMs expect their health care costs to increase by 5 percent. Michigan suppliers who expect an increase in health care costs for 1999 expect that increase to be 7 percent while non-Michigan suppliers expect an increase of 6 percent.

While all four responding OEMs report providing retirement health care benefits to their employees, only 17 percent of Michigan suppliers and 23 percent of non-Michigan suppliers do. A majority of the responding firms providing retiree health care benefits require employees to pay a premium. Two of the four responding OEMs, 53 percent of Michigan suppliers and 75 percent of non-Michigan suppliers require a premium.

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SECTION 1

1.1 Introduction

The year 1998 has so far produced a watershed in the U.S. automotive labor market. In the second quarter of 1998, the U.S. Department of Labor, Bureau of Labor Statistics, (BLS) reported that 1,005,000 Americans were employed in its major industrial classification for the auto industry: Motor Vehicle and Motor Vehicle Equipment Manufacturing (SIC 371, figure 1.1). [1] If this employment total holds for the year, the industry would match its U.S. historical peak employment level, which was set in 1978. The BLS also reported an industry unemployment rate for SIC 371 of 2.3 percent for the second quarter, a record low not seen since 1973. Michigan's overall unemployment rate plunged to 3.4 percent in April 1998. The rate rose during the following summer labor strike, but then fell again to an astounding 3.2 percent in August 1998. Michigan has not experienced such rates of unemployment since the mid-1960s.[2]

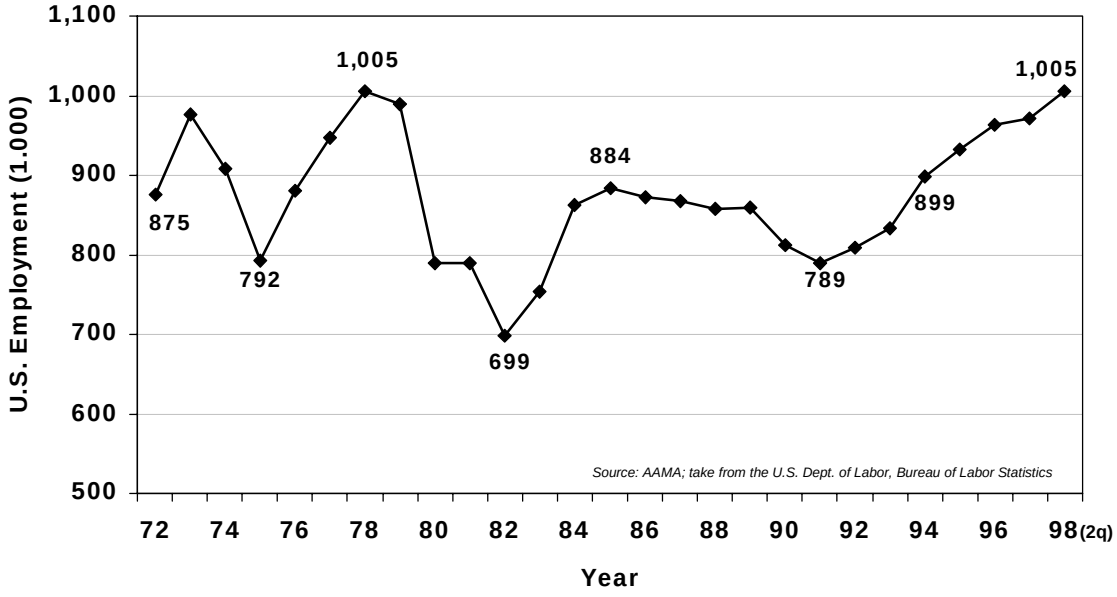


Figure 1.1
U.S. Motor Vehicle and Equipment Manufacturing Employment
1972 – 1998 (2nd quarter)

[1] *Economic Indicators: the Motor Vehicle's Role in the U.S. Economy.* 2nd quarter, 1998. Washington, D.C.: American Automobile Manufacturers Association.
[2] Michigan Employment Security Commission, *Michigan Statistical Abstract – 1996 Edition* (Detroit, Michigan: 1996). Published by the University of Michigan Press (Ann Arbor, Michigan)

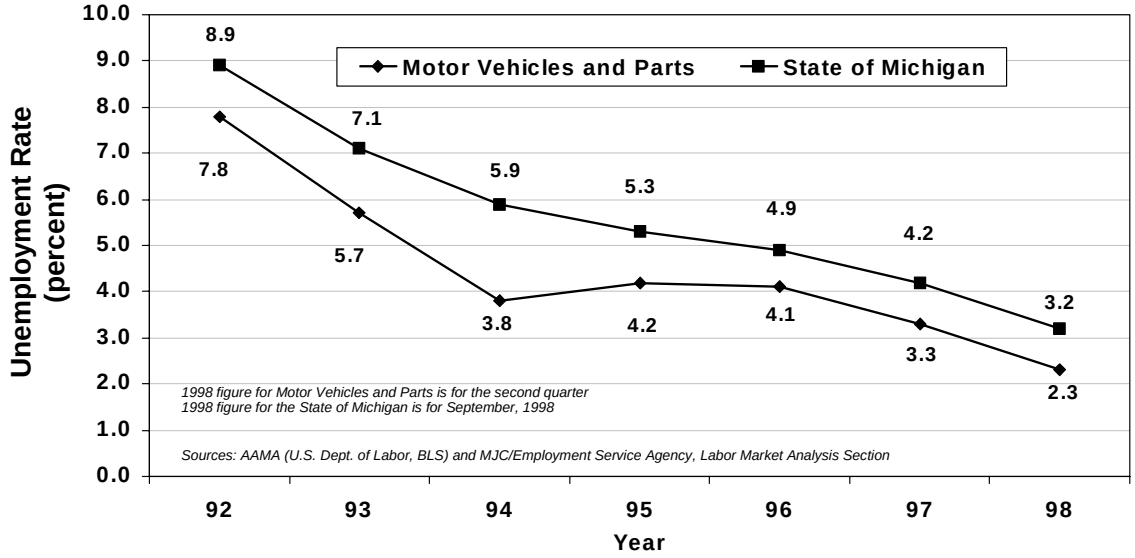


Figure 1.2
Unemployment Rates
1992 – 1998

This report was sponsored by the Michigan Jobs Commission in September 1997. It is part of an overall contract granted to the Office for the Study of Automotive Transportation (OSAT) to assist the Jobs Commission in maintaining a special industry roundtable, the Michigan Automotive Partnership (MAP). Two sets of Michigan automotive firms currently participate as members of the MAP: the state's largest vehicle-producing firms (General Motors, Ford, and DaimlerChrysler), and a representative group of 25 automotive component, engineering service, and capital equipment firms. The purpose of the MAP is to provide a forum for the Jobs Commission to communicate with the state's major industry, especially with regard to the state's economic policy. The MAP also is dedicated to bringing about close cooperation between the industry and the state in the area of human resource planning. This report is a second effort made by the MAP in the area of human resource challenges. The first report*, Driving America's Renaissance*,[3] was released in 1995.

Complaints of automotive labor shortages and tight labor markets were rife in Michigan's auto industry during the first six months of 1998—a situation that was characteristic of labor markets throughout the midwest in recent years. A major motivation for this study was to determine whether any new public policies might alleviate the extent and consequences of such severe labor shortages in automotive manufacturing and related industries. In order to carry out such a study, OSAT and the MAP designed an investigation of a selected group of state automotive firms that represent Michigan's vast and interconnected automotive industry.

Study Initiation

In the fall of 1997, the MAP and OSAT agreed jointly to perform this policy study. This study differs from the 1995 MAP study in two major ways. First, unlike the first study, human resource issues are only one of a number of major policy areas investigated. Second, instead of collecting information and interviews only from participating MAP members, this study seeks to obtain

[3] McAlinden, Sean P. and Smith, Brett C.*, Driving America's Renaissance: Human Resource Issues in Michigan's Automotive Industry*. UMTRI-95-37. Ann Arbor: University of Michigan Transportation Research Institute, Office for the Study of Automotive Transportation, 1995.

information and develop consensus through a representative survey of other Michigan automotive firms, as well as a comparison group of parts-making firms from outside of Michigan. The policy domains for this study were suggested in site visit interviews and through the use of a short policy-rating poll of the MAP membership in the winter of 1997-1998.

Table 1.1 shows the results of the MAP's rating of 12 state policy areas in terms of their importance to the industry and effectiveness of their inclusion in this study. The ratings were made on the basis of a five-point scale, where five was "most critical," and one, "least critical." In the end, the six highest scoring issues were investigated in this study, plus one special environmental concern: the effects of possible global warming policies on the automotive industry.

Table 1.1
Priority Ratings of State Economic Policy Issues

MAP Member Survey Results	
4.4	Labor Quality and Availability
4.2	Business and Property Taxes
4.2	Performance of Public Education
4.1	Business Environment Factors
3.8	Health Care
3.8	Subsidies and Incentives for Training and Retraining
3.7	Transportation Systems
3.5	Utility Regulation and Rates
3.3	Economic Policy
3.0	Environmental Issues
2.9	Effects of Globalization
2.7	Industry Communication

The MAP assigned the study methodology and sampling design to OSAT's research study team; these methods are described below. A number of MAP members helped construct the first round policy questionnaire and almost all of the members performed a final review of the draft questionnaire. Discussions of the questionnaire domains and items and a review of the sample design were major subjects at two MAP meetings in the winter of 1997 and spring of 1998. At these meetings, it was decided that the questionnaire would contain five major topic areas.

1. *A Human Resources Forecast*: It was agreed to preface the study with a section that forecasts changes in employment, hiring, and wage and salary issues in Michigan's automotive industry. The forecast interval is usually brief, only one year through 1999. This section also describes the basic occupational structure of the state's auto industry, wage levels for hourly workers, unionization rates, and starting salaries for engineers. Finally, the human resources forecast attempts to measure the extent of labor scarcity in a variety of automotive occupational markets, to determine the perceived source of these shortages, and to forecast their prevalence through the year 2000.
2. *Education and Training for the Auto Industry*: The first policy section of the study measures the current extent of training within the industry, describes the sources and types of training, and rates the effectiveness of the public education system in terms of providing skills to future and current employees. Respondents also were asked to rate and rank the potential effectiveness of a number of public policy options in the education and training arena.

3. *Expansion and Location*: This section of the study first forecasts near-term change in capital spending (through 1999) and facilities/capacity by automotive firms in Michigan and in the U.S. This section also asks Michigan automotive firms to rate the relative importance of various factors in their company's decision to site a new facility or expand a current facility. This list of factors includes a number of state policy parameters such as business taxes or regulatory climate.

4. *Impact of Global Climate Change*: The sole environmental policy topic area is concerned with the likely mandates arising from U.S. government commitments made at the recent Kyoto Conference on Global Climate Change and their likely impact on the U.S. automotive industry and the Michigan economy. Special concerns raised in this section include the likely effects of higher corporate average fuel economy standards for light trucks and possible government policies that might help the industry meet this environmental challenge.

5. *Health Care*: The last section of the study is concerned primarily with an accurate measurement of health care benefits offered by automotive firms and their expectations on future increases in health care costs.

This report contains two sets of overall results preceded by a description of the study sample. First, the human resources forecast is presented. Most of the results contained in this section either describe Michigan's automotive labor economy or forecast expected changes in Michigan's automotive labor market during 1998-1999. Expectations regarding changes in capital spending and capacity also are included in this section of the report. These various forecasts and estimates set the stage for the second section, which presents survey results on the four policy areas described above. Both parts of this study contain the results of the second round survey. Responses to a series of focused questions suggested by first round results are obtained in a survey of responding firms. The second round survey is meant to provide additional consensus and better measurement on a number of first round survey policy issues, particularly the definition and effects of labor scarcity in Michigan's automotive market.

1.2 A Representative Sample

The Survey Sample or Who We Spoke To

The survey sample for this study was designed in response to the special needs of the MAP and to match the overall structure of the state's automotive industry. It was decided, therefore, to include not only firms that manufacture motor vehicles and automotive parts and components, but also to include companies that supply the auto industry with special tooling, capital equipment, and engineering services. For comparative purposes, a sample of non-Michigan automotive parts and component firms were taken from one of the most comprehensive listings of such companies. The steps that were taken to produce the final sample were not simple. A full description of the sampling process is provided in Appendix A; a relatively short description of the five major sources of the survey sample follows.

1. *ES202 Record Population*: In January 1998, OSAT received a facility population tape from the Michigan Employment Security Administration's (MESA) Division of Research and Statistics. The tape record was in response to an OSAT request for a listing of all Michigan facilities in 11 automotive supplier, 2 machine tooling, and 3 engineering service industries. The records were drawn from the MESA employment security insurance records (ES202) for all Michigan employers and included information for each facility on employment and industry coding. Over 7,000 records or facilities were listed on the tape. OSAT analysts reduced this facility count to approximately 3,700 companies. This population of companies was then divided into three basic employment-size strata (excluding engineering service companies with employment less than 10) and an initial random sampling of the companies by industry-size strata was made.

   The selected companies were then screened by telephone to determine their automotive status. If the firms reported current major automotive business they were retained in the sample. The telephone screening process to determine automotive status also produced estimates needed to correct population parameters for future survey weights needed for the study results. The final survey sampling frequencies were determined on the basis of anticipated automotive status, probable response, and relative share of the substrata in overall Michigan automotive employment. In the sample process, 329 companies were selected and 72 (22 percent) of these companies responded to the first round survey.

2. *Machine Tool and Metalworking Roundtable*: The MAP membership reviewed the initial MESA-based sample at their meeting in April 1998 and decided that Michigan capital equipment firms supplying the auto industry should be added to the overall sample. Such firms produce cutting, forming, and shaping machinery, as well as other automotive manufacturing equipment such as transfer lines and robotics. According to the MESA, Michigan contained 448 capital equipment-manufacturing facilities that employed 18,818 in January 1998. Since the major MESA sampling process had already been completed, it was decided to supplement the MESA ES202 sample with the membership list of the Michigan Jobs Commission Business Roundtable for machine tool and metalworking firms—a companion roundtable to the MAP. This roundtable was made up of 60 Michigan companies who were surveyed at the same time as the MESA sample. Sixteen, or 27 percent, of these companies responded to the first round survey.

3. *The Michigan Automotive Partnership*: The membership of the MAP naturally wished to be included in the sample. The MAP includes as members the three largest vehicle producing firms in the state. The other 25 members were originally selected on the basis of their representative status in terms of location, size, and type of component system manufactured. It was thought that the inclusion of the membership would not significantly

alter the representative status of the overall sample. Sixteen MAP members, including the three vehicle producers, responded to the first round.

4. *AIAM Respondent*: The Association of International Automotive Manufacturers (AIAM) agreed to ask their member firms with significant Michigan employment to participate in the study. One such firm did so and is included in the vehicle manufacturer portion of the final sample.
5. *ELM Guide Sample*:[4] contains an annually updated listing of 2,107 major U.S. component suppliers. OSAT purchased the 1997 electronic version of this database. An analysis was made of these listings to determine the number of companies not reporting a significant Michigan manufacturing or R&D facility. According to the OSAT analysis of the *ELM Guide*, this category of non-Michigan suppliers numbered 1,528 in 1997. OSAT randomly selected 175 of these companies as a sample of non-Michigan automotive parts suppliers. Twenty-one percent, or 36, of these sampled firms responded to the first round survey.

The five sources for the sample survey yielded 592 companies for the final sample tally. Of these,145 companies responded to the first round questionnaire during the summer of 1998, but only 141 of these responses were complete or usable. Table 1.2 contains a summary of the number of questionnaires mailed, the number of responses to the first round questionnaire, and the final response rates by sample source. Tables 1.3 and 1.4 provide two additional breakouts of the study's final response sample of 141 companies. In table 1.3, the 141 responding firms are broken out by industry sector or group and by U.S. employment strata. In all, the final response sample includes 4 vehicle manufacturers (OEMs), 47 preproduction companies, and 90 automotive component suppliers. The preproduction company category includes respondents from the special tooling, capital equipment and engineering service industries. It is necessary to combine these respondents into the preproduction category because of the relatively low number of responses for each of the three individual industries.

Table 1.2
Summary of First Round Returns

	Mailed	Returned	Percent
In-State Companies			
Randomly selected	329	72	22%
Machine Tool and Metal Working Roundtable	60	16	27%
Michigan Automotive Partnership	28	16	57%
Total	417	104	25%
Out-of-State Companies			
Randomly selected	175	36	21%
AIAM*	—	1	—
Total	592	141	24%
*Used in results as an in-state company.			

[4] ELM Guide: *A Database For the Automotive Industry*, Version 2.9.2 [electronic database]. Available: ELM International, Inc., East Lansing, Michigan, 1997.

Table 1.3
Employment and Size Breakdowns of Round 1 Respondents (United States Employment)

	1-249	250-499	500+	Total
OEMs	0	0	4	4
Preproduction Companies				
Special Tooling	18	3	3	24
Capital Equipment Manufacturers	3	1	1	5
Engineering and/or Design Services	10	5	3	18
Total Preproduction Companies	*31*	*9*	*7*	*47*
Components Manufacturers				
In-state	24	12	18	54
Out-of-state (ELM Guide sample)	11	11	14	36
Total Components	*35*	*23*	*32*	*90*
Total	***66***	***32***	***43***	***141***

Table 1.4
Employment and Size Breakdowns of Round 1 Respondents (Michigan Employment)

	1-249	250-499	500+	Total
OEMs	0	1	3	4
Preproduction Companies				
Special Tooling	18	4	2	24
Capital Equipment Manufacturers	3	1	1	5
Engineering and/or Design Services	10	5	3	18
Total Preproduction Companies	*31*	*10*	*6*	*47*
Components Manufacturers				
In-state	27	12	14	54*
Total	***58***	***23***	***23***	***105****
* One Michigan component manufacturer did not provide Michigan employment figures.				

Table 1.4 provides additional detail regarding the Michigan companies' portion of the sample. In all, 105 Michigan companies are included in the total sample. Of these firms, 4 are OEMs, 47 are preproduction companies, and 54 are component makers. How representative of Michigan's auto industry is this sample of 105 companies? Table 1.5 shows company counts and employment totals for both the Michigan samples by industry and size substrata and for the population as reported in the ES202 records from MESA. For example, 33 respondent preproduction firms in the Michigan employment size strata of 1-249 report total employment of 2,519. The MESA records show that the state of Michigan as a whole contains 2,793 such firms employing 68,410.

Table 1.5
Michigan Sample and Population

	OEMs	Preproduction Companies	MI Component Firms	Total MI Companies
1-249 MI Employees				
Sample				
N	—	33**	27	60
Employment	—	2,519	2,307	4,826
Population				
N	—	2,793	648	3,441
Employment	—	68,410	26,295	94,705
250-499 MI Employees				
Sample				
N	1	9	12	22
Employment	*400*	*3,098*	*3,918*	*7,416*
Population				
N	1	27	87	115
Employment	400	9,041	29,922	39,363
Over 500 MI Employees				
Sample				
N	3	5	14	22
Employment	234,820	6,571	14,027	255,418
Population				
N	3	12	50	65
Employment	234,820	10,881	63,426	309,127
Total				
Sample				
N	4	47	53*	104*
Employment	235,220	12,188	20,252	267,660
Population				
N	4	2,832	785	3,621
Employment	235,220	88,332	119,643	443,195

* One component manufacturer reported no Michigan employees. The total number of component manufacturers that responded is 54 (bringing the total for the state to 105).

** For weighting purposes, all capital equipment manufacturers are included in the smallest size category.

The OEMs reported total employment of 235,220 in the summer of 1998. This figure is substituted for the original MESA total for these firms. Total employment for the 104 responding Michigan companies, then, is 267,660 or 60.3 percent of the population's total employment of 443,195. This percentage is high because of the OEMs' dominant share of Michigan automotive employment (53.1 percent). However, the 100 non-OEM respondent firms still report total Michigan employment of over 32,000 in their survey questionnaires. Our estimate of total non-OEM Michigan employment in early 1998 is about 240,400. Thus, the 100 responding Michigan firms are responsible for about 13.5 percent of non-OEM automotive employment in Michigan, even though our sample constitutes less than 3 percent of total non-OEM automotive companies. It is also interesting to note that, in 1995, MESA estimates (using a somewhat different methodology) that total employment in Michigan automotive manufacturing was 475,000, a figure remarkably close to this study's population employment estimate of 443,000 for early 1998.

Tables 1.6 and 1.7 contain a breakdown of the second round survey sample by industry and employment size groups. The 141 first round respondents were sent a follow-up questionnaire in September 1998. About 64 percent of these companies had responded as of December 1998. Table 1.6 shows a breakout of the entire second round sample by U.S. employment size strata, and table 1.7 for Michigan company respondents by Michigan employment strata. No apparent pattern in response by the various size or industry groups seems to appear, except for a somewhat lower than average rate of response for non-Michigan suppliers.

Table 1.6

Employment and Size Breakdowns of Round 2 Respondents (U.S. Employment)

	1-249	**250-499**	**500+**	**Total**
OEMs	0	0	3	3
Preproduction Companies	22	4	4	30
Components Manufacturers				
In-State	14	7	16	37
Out-of-State	4	6	10	20
Total Components	18	13	26	57
Total	**40**	**17**	**33**	**90**

Table 1.7

Employment and Size Breakdowns of Round 2 Respondents (Michigan Employment)

	1-249	**250-499**	**500+**	**Total**
OEMs	0	1	2	3
Preproduction Companies	23	5	2	30
Components Manufacturers				
In-State	15	8	14	37
Total	**38**	**14**	**18**	**70**

1.3 Human Resources Forecast

Reported U.S. and Michigan Employment

The first round survey questionnaire contained 14 questions that asked companies to describe and forecast change in their companies' human resources. These questions are shown in Appendix B. Respondents were first asked to provide their company's U.S. and Michigan levels of employment (at the time of the survey: summer 1998), and to break out their total employment into four occupational categories. Results for mean U.S. employment are shown in table 1.8. Mean total employment for the OEM companies is 134,856, an average dominated by the responses of the three headquartered Michigan firms. About 15 percent of OEM employment is located in the skilled trades category and over 56 percent in other hourly production classifications, for a combined hourly U.S. employment share of 72 percent. Almost 13 percent of OEM employment is made up of engineers and technicians. In contrast, preproduction companies report almost 28 percent of their average employment of 291 as located in skilled trades, and about 30 percent in engineering and other technical occupations. Hourly production workers comprise only 32 percent of employment for preproduction companies.

The occupational distribution of Michigan component supplier respondents is similar to that of the OEMs. The only major difference is the relative share of engineering employment. Just less than 8 percent of the average employment total of 611 for Michigan suppliers is reported in engineering and technical work. The average ELM sample of non-Michigan suppliers reports over 76 percent higher total U.S. employment than the average Michigan parts-maker. This group of component firms, however, employs significantly lower shares for skilled trades and engineering employees compared to the other three groups of firms. A surprisingly large share of non-Michigan supplier employment is located in other-salaried and other-hourly classifications.

Table 1.8
Average Size and Composition of U.S. Employment in Responding Firms

	Trades	Other Production	Engineers/ Technicians	Other Salaried and Other Hourly	Total
OEMs n=4					
Employment	20,892	76,200	17,200	20,564	134,856
Percentage	15.5	56.5	12.7	15.3	100.0
Preproduction n=47					
Employment	81	42	87	81	291
Percentage	27.8	4.4	29.9	27.8	100.0
Michigan Components n = 54					
Employment	103	365	48	198	611
Percentage	16.9	59.7	7.9	28.6	100.0
ELM Sample n=36					
Employment	62	472	51	494	1,079
Percentage	5.8	43.7	4.7	45.8	100.0

On average, OEMs reported almost 44 percent of their U.S. employment in Michigan. As shown in table 1.9 the Michigan occupational employment distribution for these firms is very similar to their U.S. distribution, except for a higher percentage for Michigan of other-salaried and other-hourly employment, and a somewhat surprising lower percentage for engineers and technicians in

Michigan. Michigan preproduction firms report 89 percent of their total U.S. employment in Michigan. This contrasts greatly with the 63 percent figure for Michigan component makers. Many of these firms possess facilities outside of Michigan, which is apparently not the case for preproduction firms.

Table 1.9
Average Size and Composition of Michigan Employment in Responding Firms

	Trades	Other Production	Engineers/ Technicians	Other Salaried and Other Hourly	Total
OEMs n=4					
Employment	8,918	32,390	6,395	11,027	58,730
Percentage	15.2	55.2	10.9	18.8	100.0
Preproduction n=47					
Employment	78	34	83	64	259
Percentage	30.0	13.1	32.2	24.7	100.0
Michigan Components n = 54					
Employment	47	223	37	75	382
Percentage	12.3	58.4	9.7	19.6	100.0

Change in Sales

Responding firms were asked for the actual percentage change in their U.S. dollar sales in 1996-1997 and expectations regarding sales change between 1997 and 1998. Some general results for this question are given in figures 1.3 and 1.4. These sales change results also reflect the first use of survey weights in this study. Sales change results for the Michigan respondent categories use company weights. In other words, each answer by a Michigan respondent is weighted by the number of companies they represent in their particular stratum of employment size and industry. This technique is used in order to reflect more accurately the likely experience of all Michigan automotive firms. The technical description of this process is given in Appendix A. The ELM sample results, on the other hand, are simple averages for the 36 non-Michigan supplier respondents.

The OEMs report a 13.6 percent increase in U.S. dollar sales for 1996-1997. The same vehicle companies, however, expect a smaller 5.2 percent increase in 1997-1998. The other two Michigan groups, preproduction firms and parts suppliers, also expect a smaller percentage increase in U.S. dollar sales for 1997-1998 compared to 1996-1997. Michigan component firms, however, still expect a significant increase of 11.1 percent in U.S. dollar sale in 1998 compared to 1997. Non-Michigan parts firms expect a larger percentage increase in 1998 than they experienced during 1996-1997. However, their 1998 increase of 8.7 percent is still lower than Michigan supplier expectations for the same period.

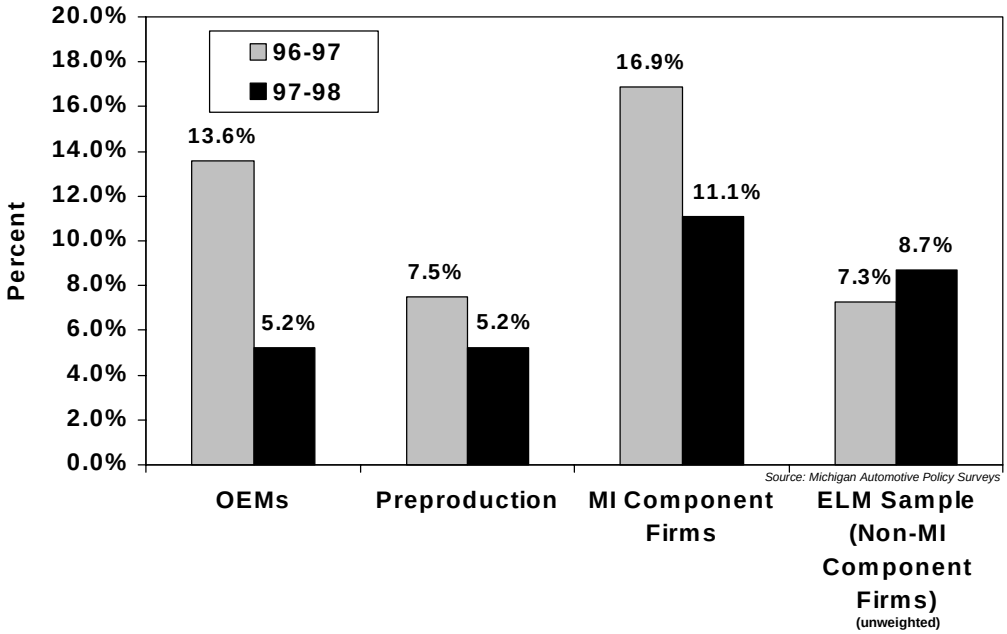


Figure 1.3
1996 – 1998
Change in U.S. Dollar Sales by Industry Group
(company-weighted)

Figure 1.4 shows percentage sales change for Michigan non-OEM respondent firms by employment size. In this figure, preproduction and component firms are combined and then separated by size strata. All three size groups in Michigan expect a smaller percent increase in dollar sales in 1998 than that experienced in 1997. Although the drop in the percentage increase is large for Michigan suppliers with over 500 in employment, their expectation of a 7.8 percent increase still demonstrates a healthy increase in business.

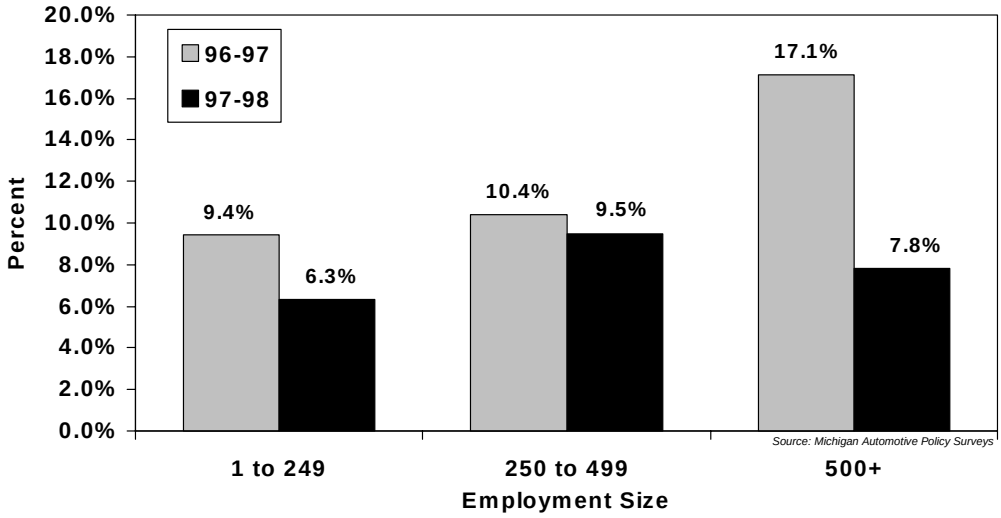


Figure 1.4
1996 – 1998
Change in U.S. Dollar Sales for Michigan Non-OEM Companies by Employment Size
(MI company-weighted)

Change in Employment and Hiring

Perhaps the most important forecast attempted by this study is the expected change in Michigan automotive employment. The 141 responding firms were asked to forecast their percent change in U.S. and Michigan employment from 1998 to 1999. The companies were asked to project change in (not only) total employment, but also employment in four occupation categories.

Results on directional change (increase, decrease, no change) are shown first in figures 1.5 through 1.8. The Michigan results are company-weighted so that the percentages shown represent the expected behavior of Michigan companies in the three Michigan automotive sectors. For example, results shown in figure 1.5 indicate that 40 percent of Michigan preproduction companies expect to increase U.S. employment in 1999. About 35 percent of these firms expect to increase their Michigan employment totals (figure 1.7). On the other hand, almost 55 percent of Michigan component companies are expected to increase their U.S. employment. This compares favorably to 32 percent of non-Michigan suppliers with similar intentions. A somewhat larger percentage of Michigan parts suppliers, 63 percent, are expected to increase Michigan employment than is the case for U.S. employment. In contrast, only one OEM firm is expected to increase its U.S. and Michigan employment totals. Two OEM firms expect to reduce their employment in Michigan and the U.S. Finally, as shown in figure 1.6, 46 percent of medium-size (employment of 250-499) non-OEM Michigan companies expect to increase their U.S. employment. Fifty-eight percent of these firms expect to increase their employment in Michigan in 1999 (figure 1.8).

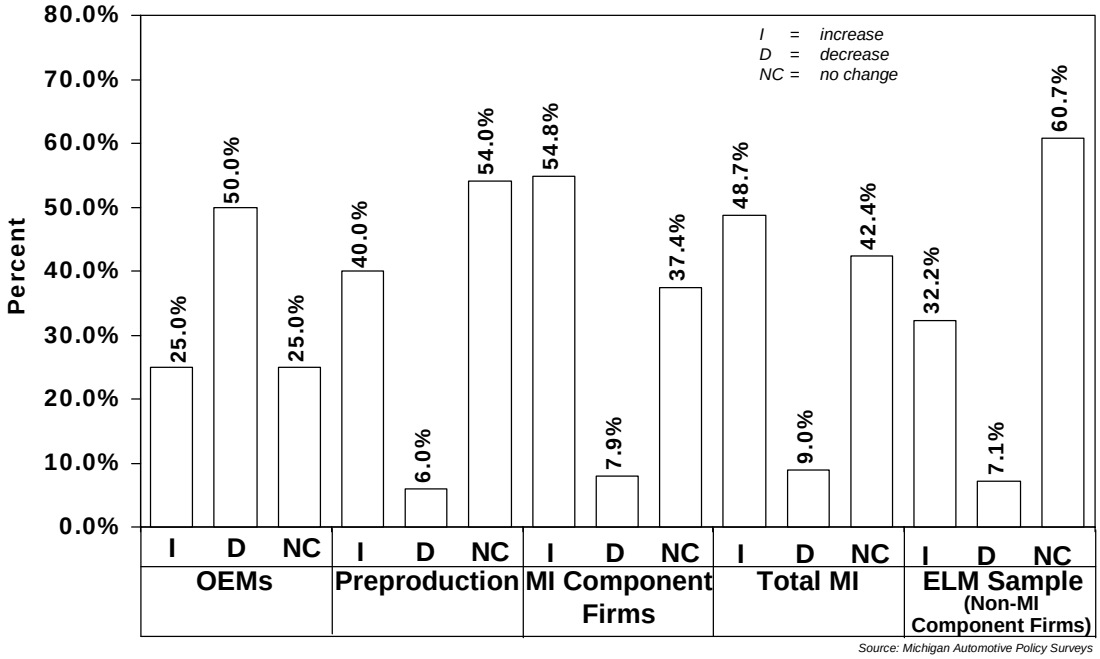


Figure 1.5
1998 – 1999
Change in U.S. Employment by Industry Group
(unweighted averages)

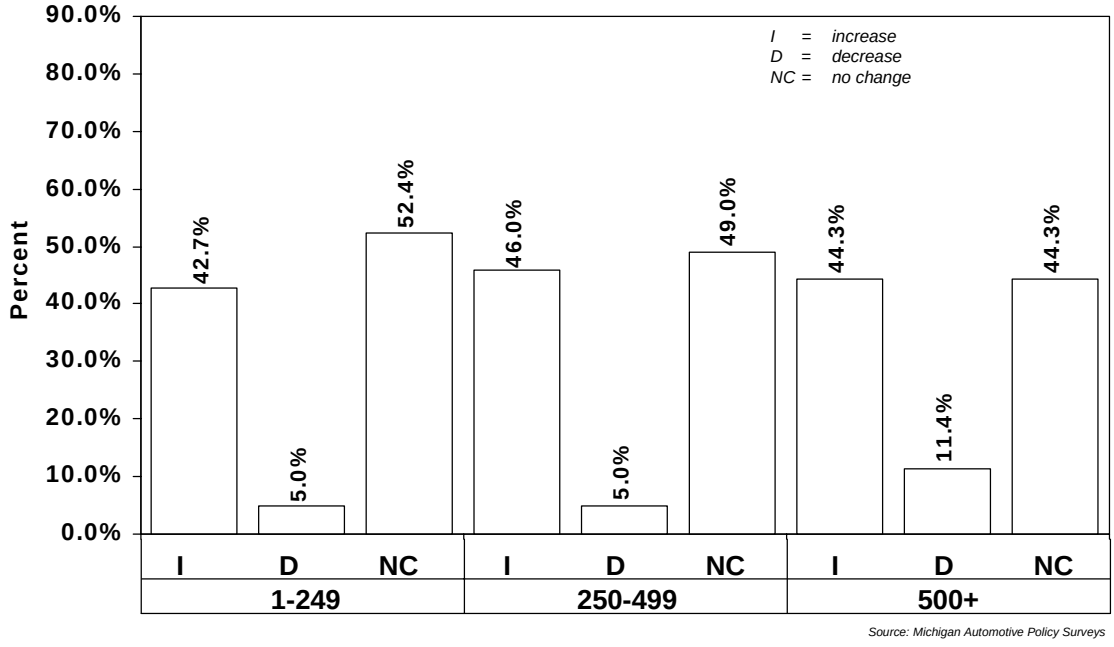


Figure 1.6
1998 - 1999
Change in U.S. Employment, Non-OEM Michigan Companies by Employment Size Group
(unweighted averages)

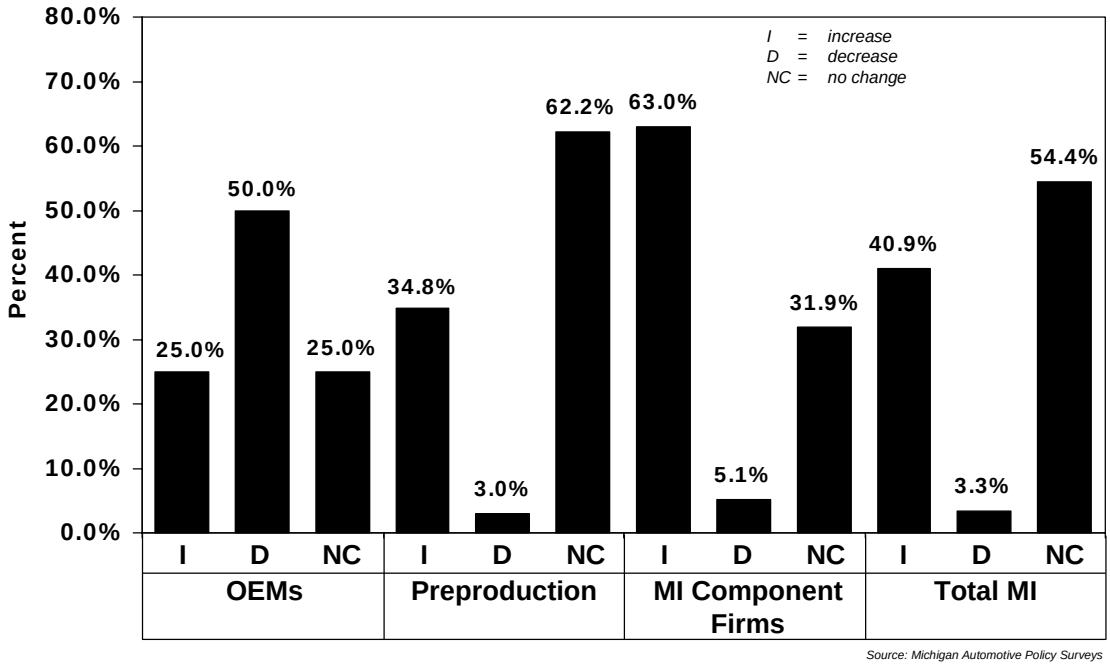


Figure 1.7
1998 - 1999
Change in Michigan Employment by Industry Group
(MI company-weighted)

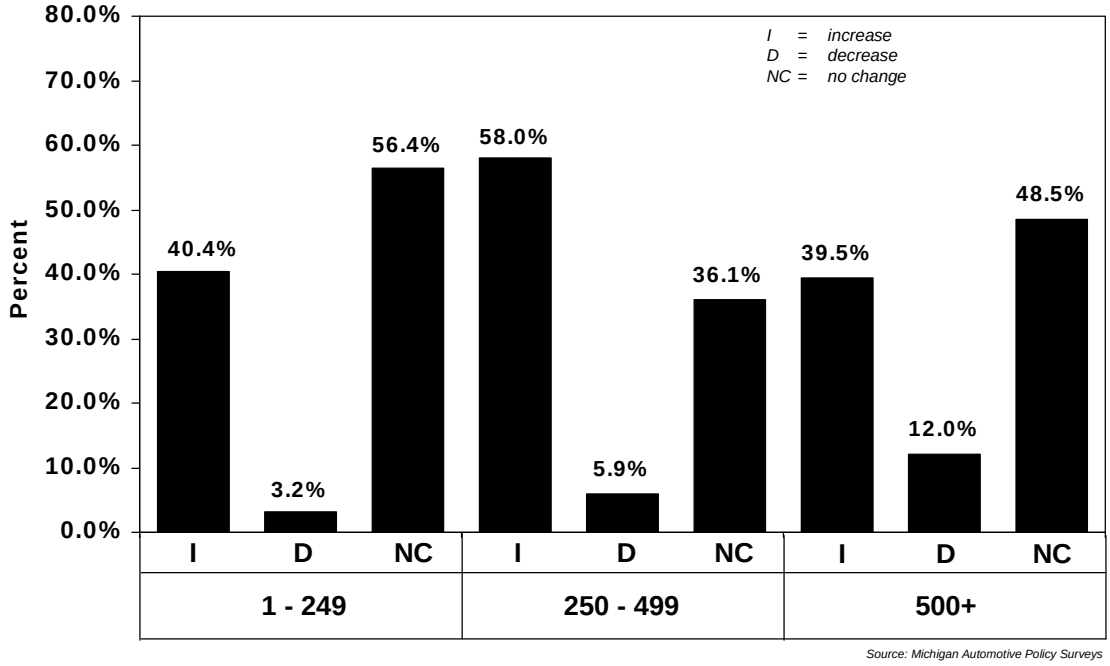


Figure 1.8
1998 – 1999
Change in Michigan Employment, Non-OEM Companies by Employment Size Group
(MI company-weighted)

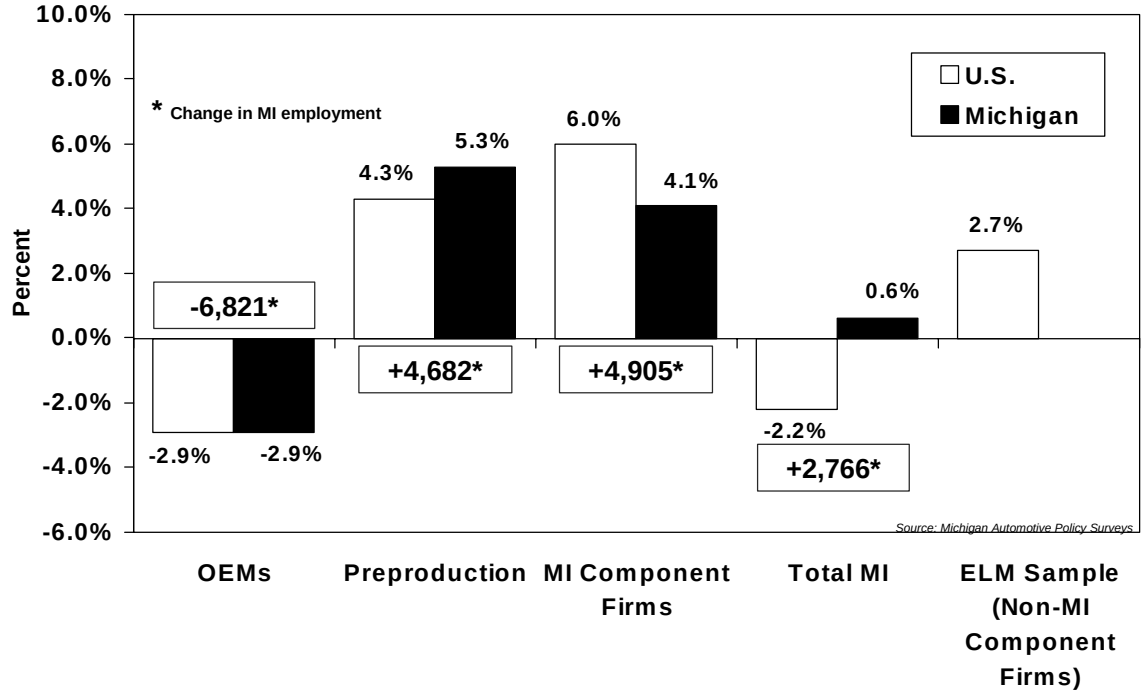
Percentage change in employment results are shown in figures 1.9 and 1.10. Results contained in these two figures for the 105 Michigan respondents are estimated with the use of population employment weights. Responses are weighted according to the industry and employment size stratum's share of overall Michigan automotive employment. Results by occupation for each group are made on the basis of sample occupation shares of overall total sample employment. This was done to allow a reasonable forecast of change in the overall number of jobs in Michigan's auto industry. A different set of employment weights, based on self-reported employment, is used to estimate the probable percent increase in U.S. employment for this sample. The technical process is described in Appendix A. Once again, ELM sample results for change in U.S. employment merely reflect the sample average for this group of 36 non-Michigan respondent companies.

Figure 1.9 shows the percent change in total employment by industry group and the change for occupations within each group. The OEM respondents expect to reduce both U.S. and Michigan total employment by a weighted average of 2.9 percent. Since the OEMs report Michigan total employment of 235,220 in 1998, the study results project a *fall* in 1999 OEM employment of *6,821*. OEM employment in Michigan and nationwide is projected to fall in all four occupation categories. In particular, other-salaried employment is expected to fall both in the U.S. and Michigan, by 4.0 percent in 1999.

Michigan preproduction companies are expected to *increase* their U.S. employment in 1999 by 4.3 percent and their Michigan employment by 5.3 percent. Since the 1998 population employment is 88,332 for Michigan preproduction firms, this automotive sector in Michigan will *increase* employment by *4,682* during 1999. Significant increases in the Michigan employment of hourly workers (5.0 percent) and engineers and technicians (5.4 percent) are projected for this industry group. In contrast to preproduction firms, Michigan component firms expect to increase their U.S. employment by more than their Michigan employment; a 6.0 percent increase in U.S. employment versus a 4.1 percent increase in Michigan employment. It is expected that these parts suppliers, will *increase* their Michigan employment by *4,905*. Michigan component makers also expect to increase their employment of engineers and technicians by an impressive 7.6 percent. In contrast to the Michigan sample of parts-producing companies, the ELM sample only expects to increase U.S. employment, by 2.7 percent. This group of non-Michigan firms, however, expects to increase their U.S. employment of engineers and technicians by an impressive 4.7 percent in 1999.

Change in total Michigan automotive employment is summarized in figure 1.9. The projected total 1998-1999 increase in preproduction and Michigan component firm employment of 9,587 is combined with the reduction of 6,821 OEM jobs to give a net employment increase of 2,766 for the entire Michigan automotive sector. This represents an increase of 0.6 percent over 1998, although occupations such as engineering should increase by a larger percentage of 1.8 percent. Our sample of Michigan automotive firms expects to decrease their 1999 employment by 2.2 percent. This increase is still lower than that reported by the suppliers in the ELM sample, but Michigan suppliers expect to grow their U.S. employment in 1999, as noted above, by twice the percentage of Michigan parts companies.

The total employment forecast for Michigan supports the continued movement of OEM jobs to the supplier sector. All types of jobs appear to be moving from the OEMs to the supplier sector, especially those in engineering and technical fields. This hypothesis is refuted if the major source of decreasing OEM employment is improving OEM productivity. If this is the case, increasing supplier employment could indicate higher sales by supplier firms to customers other than the OEMs included in this study (very likely), declining supplier productivity (very unlikely), or suppliers commanding a greater share of vehicle content production (probable).



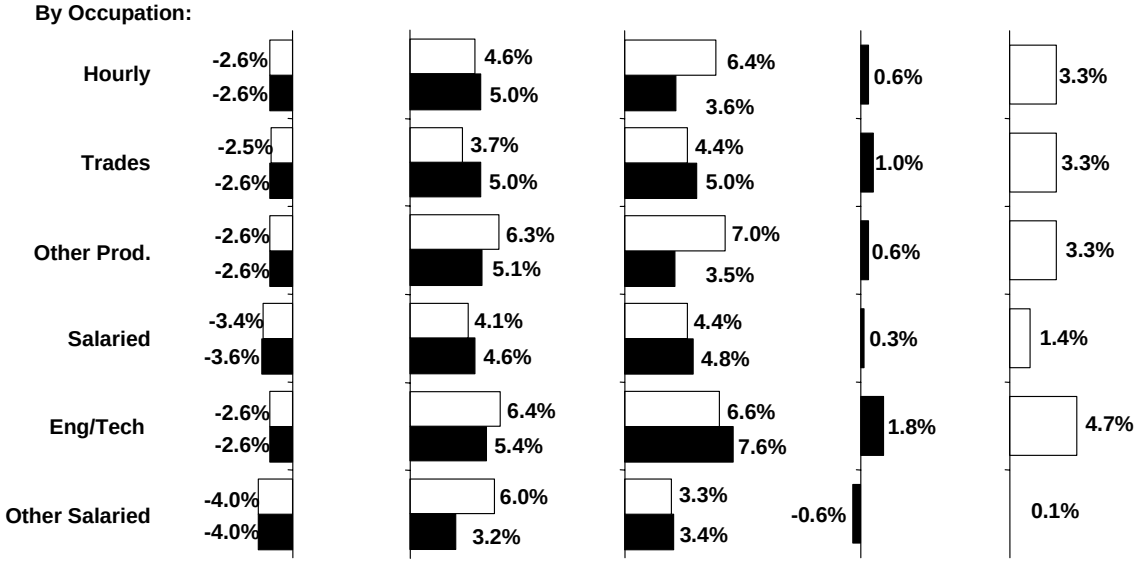


Figure 1.9
1998 – 1999
Percent Change in U.S. and Michigan Employment by Industry Group, and Occupation Group within Industry Group
(employment-weighted)

Figure 1.10 shows additional employment projections for non-OEM Michigan firms. All three employment-size categories report increases in employment. (However, all three size categories show larger increases in U.S. employment in 1999 than in Michigan). The smallest non-OEM firms, in the 1-249 employment category, appear to be growing fastest in employment. Engineering and technical employment will increase the most, except in smaller firms where larger increases in trades and other production employment outpace growth in engineering. This pattern supports the hypothesis that pure manufacturing activity is moving further down the supply chain, with large suppliers assuming largely technical roles in product development.

Change in Rate of Hiring

This study's first round questionnaire does not attempt to measure absolute changes in the number of hires by automotive firms in the U.S. or in Michigan. Instead, respondent companies are asked to estimate percent changes in their 1999 hiring rates compared to hiring rates in 1998. Results for percent changes in hiring are shown for the different industry groups and occupations in figure 1.11. Generally, the results in figure 1.11 match employment change results shown in figure 1.7 fairly well. The percentage changes for hiring, however, are slightly higher.

Figure 1.12 and 1.13 provides a breakout of responding firms, using company weights, in terms of direction of change in hiring. Results in this figure may be a better indicator of change in hiring activity than the rate change percentage in the previous figure. For example, 33.5 percent of Michigan preproduction firms are projected to increase their Michigan hiring in 1999 over 1998. About 45 percent of these firms are expected to increase their rate of U.S. hiring. Very few firms in this group are expected to decrease their hiring rate in 1999. Sixty-three percent of Michigan component firms are expected to increase their rate of Michigan hiring in 1999 over 1998, the largest increase measured for any industry or size group. A larger percentage of Michigan component firms are increasing Michigan hiring rates than are increasing U.S. hiring.

Expected Attrition of Employees

Respondents were asked to forecast their companies' expected U.S. and Michigan 1999 rates of employee attrition (from all causes) in the second round survey questionnaire. Employment weighted results for two occupation categories, hourly and salaried employees, are shown for industry groups in figure 1.14. Three of the four OEM study companies responded to this question. Generally, the OEMs expect that 6.1 percent of their U.S. and Michigan hourly workers will leave in 1999 (presumably due to retirement). The same companies expect about 3 percent of their current U.S. and Michigan salaried employees to leave next year. Michigan preproduction companies, on the other hand, expect about 4.0 percent of their Michigan hourly and salaried workers to leave in 1999. The same firms expect a smaller percentage, 3.1 percent, of their overall salaried and hourly U.S. labor forces to exit in 1999.

In strong contrast, responding component firms expect a far higher percentage of their current employees to leave in 1999 than the OEMs or preproduction firms. In particular, as shown in figure 1.14, Michigan component firms expect almost 13 percent of their Michigan hourly workers, and over 6 percent of their Michigan salaried workers, to leave during 1998-1999. Non-Michigan component suppliers expect about 7 percent of their hourly and a modest 3 percent of their salaried workers to leave during the same period. The size of the company appears to be an important factor in expectations regarding attrition. Figure 1.15 shows results on expected employee attrition for non-OEM Michigan companies. Companies with 250-499 employees (U.S.) expect almost 19 percent of their hourly employees, and over 7 percent of their salaried employees, to leave during 1998-1999. It should be remembered that this group of companies reported their intentions to increase hourly employment by over 4 percent in 1999 (figure 1.9). An increase of 4 percent in employment combined with a 19 percent attrition rate would imply a 1999 hiring rate, as a percentage of current 1998 employment, of almost 23 percent for medium-sized non-OEM automotive firms in Michigan. Since Table 1.5 shows these firms employing almost 39,000 in 1998, a hire rate of 23 percent would translate to a total number of 8,970 new hires for this group of firms during 1998-1999. This may prove to be an ambitious figure in the midst of Michigan's generally tight labor markets.

Compensation of Hourly Employees

Respondent firms are asked to supply their current hourly compensation (not including benefit costs) for two types of production workers: hourly trades workers and other hourly production workers. Results shown in table 1.10 are derived through the use of employment weights for the Michigan industry groups. Non-OEM skilled trades wages in table 1.10 range from $16.42 for Michigan component firms to $13.35 for non-Michigan suppliers. Non-OEM Michigan skilled trade wages range from $16.99 for firms with greater than 499 employees to $15.70 for medium sized firms with employment between 250-499. Generally, reported skilled trade wages for non-OEM firms remain in a tight range of $16-17. A similar narrow range appears to hold for other production worker wages for non-OEM firms located in or out of Michigan. Non-Michigan suppliers report an average other-production worker wage of $10.44, not far below the Michigan parts-maker wage of $10.93. The highest other-production worker wage, $11.73, is reported by preproduction firms.

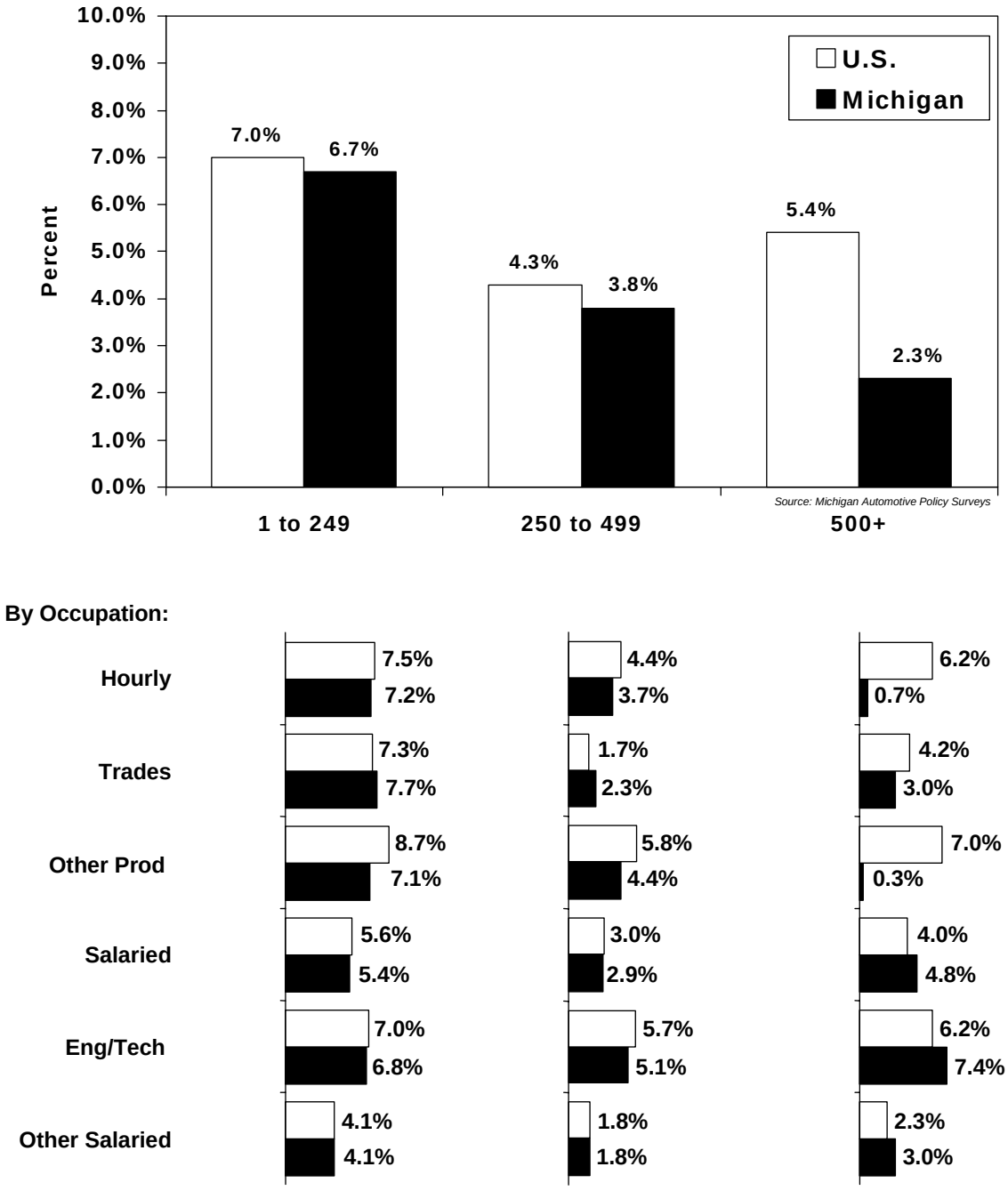
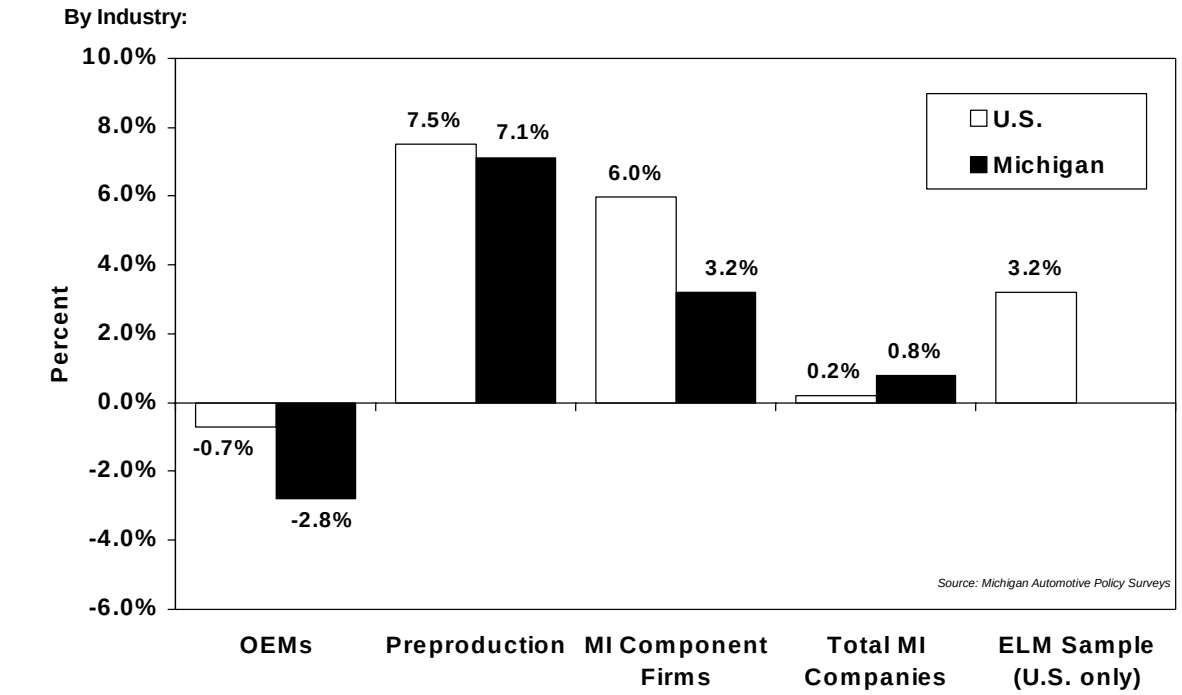


Figure 1.10
1998 – 1999
Percent Change in U.S. and Michigan Employment for Non-OEM Michigan Companies, by Employment Size Group, and by Occupation Group within Employment Size Group (employment-weighted)



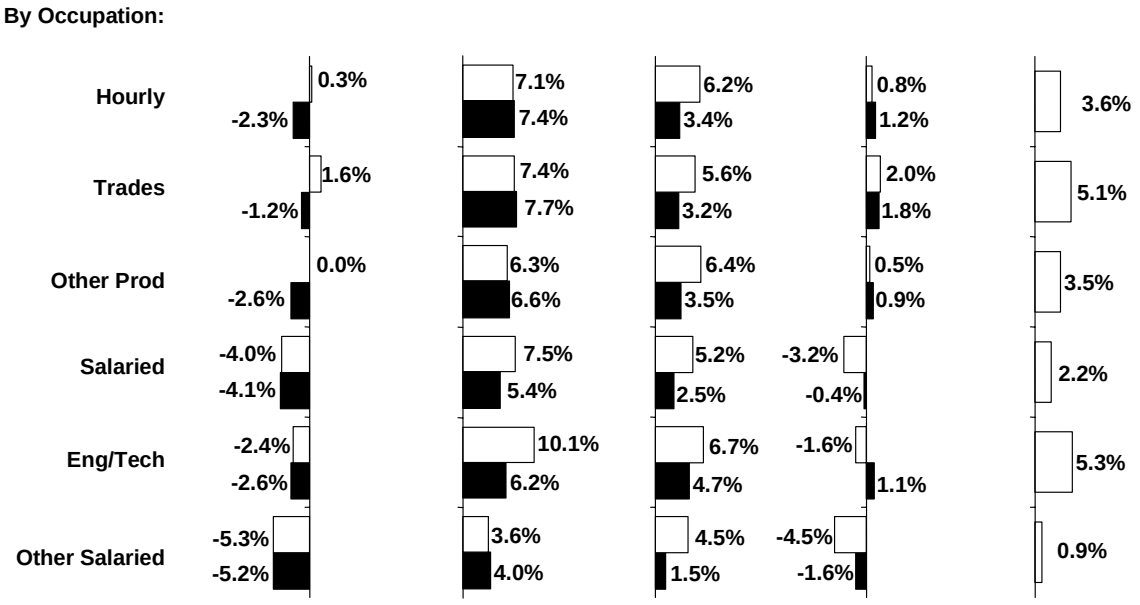
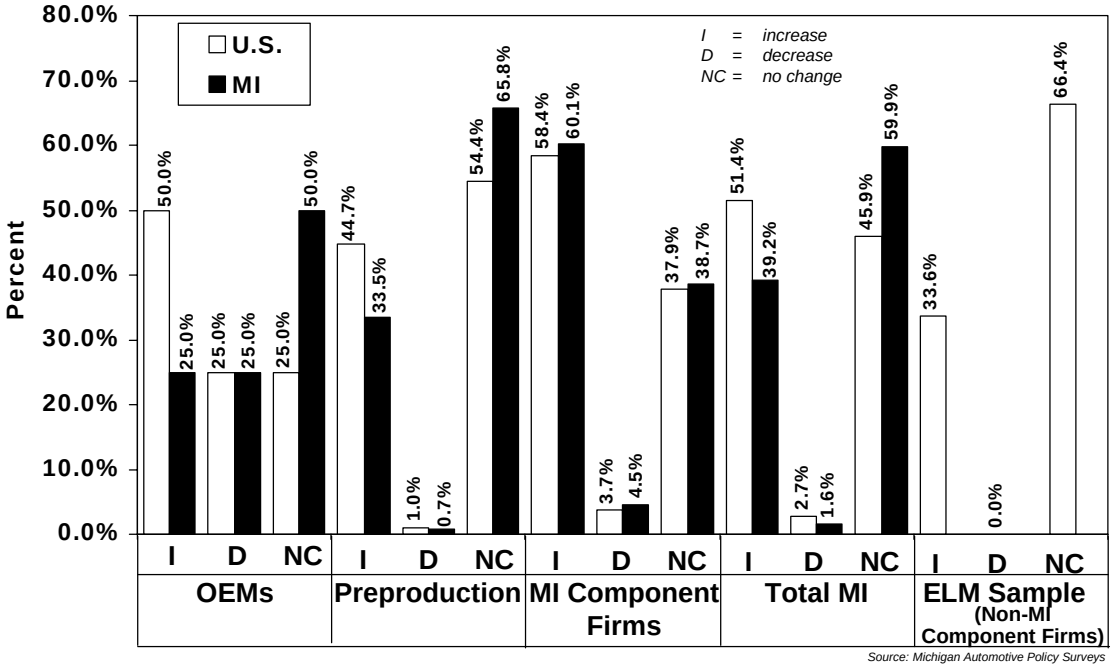
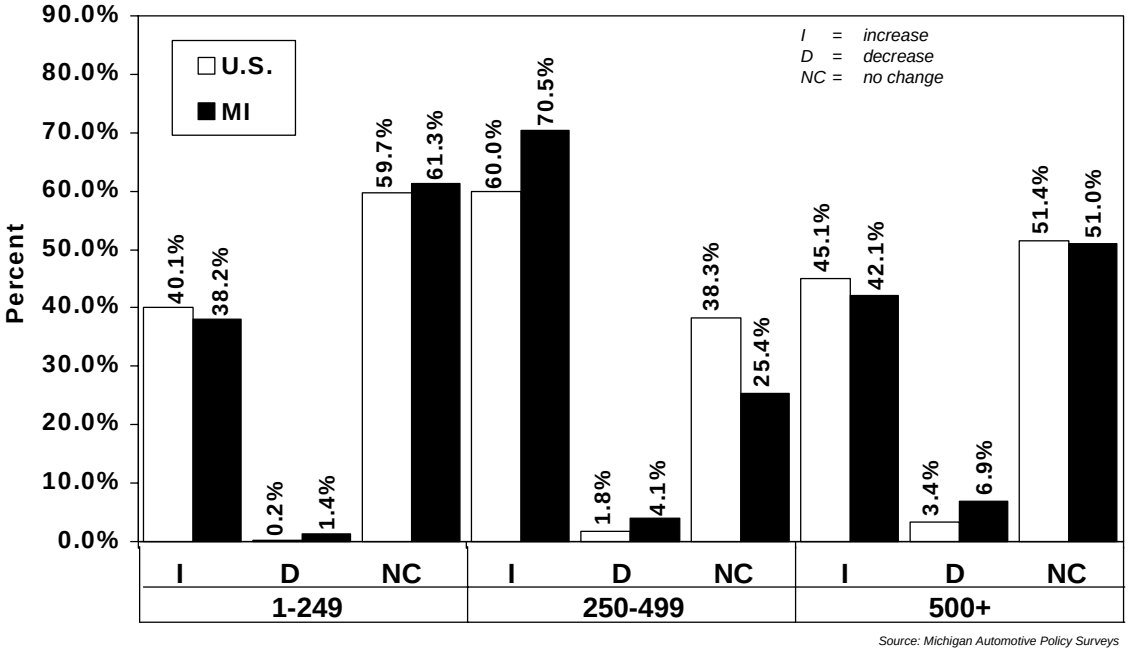


Figure 1.11
1998 – 1999
Percent Change in U.S. and Michigan Hiring Rates by Industry Group and by Occupation Group within Industry Group
(employment-weighted)



Source: Michigan Automotive Policy Surveys

Figure 1.12
1999
U.S. and Michigan Attrition Rates
(MI results by company weights, U.S. results unweighted)



Source: Michigan Automotive Policy Surveys

Figure 1.13
1998 – 1999
Expected Change in U.S. and Michigan Hiring Rates for
Non-OEM Firms (U.S.) and MI Non-OEM Firms (MI) by Employment Size Group
(MI results by company weights, U.S. results unweighted)

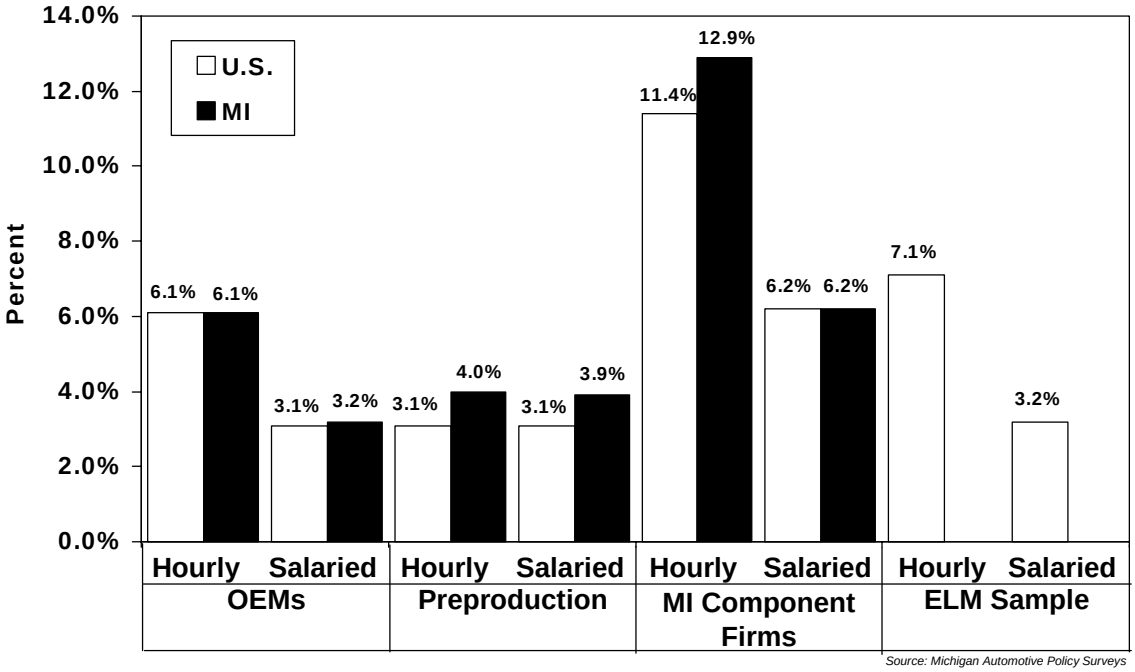


Figure 1.14
Expected 1999 U.S. and Michigan Attrition Rates by Industry Group (employment-weighted)

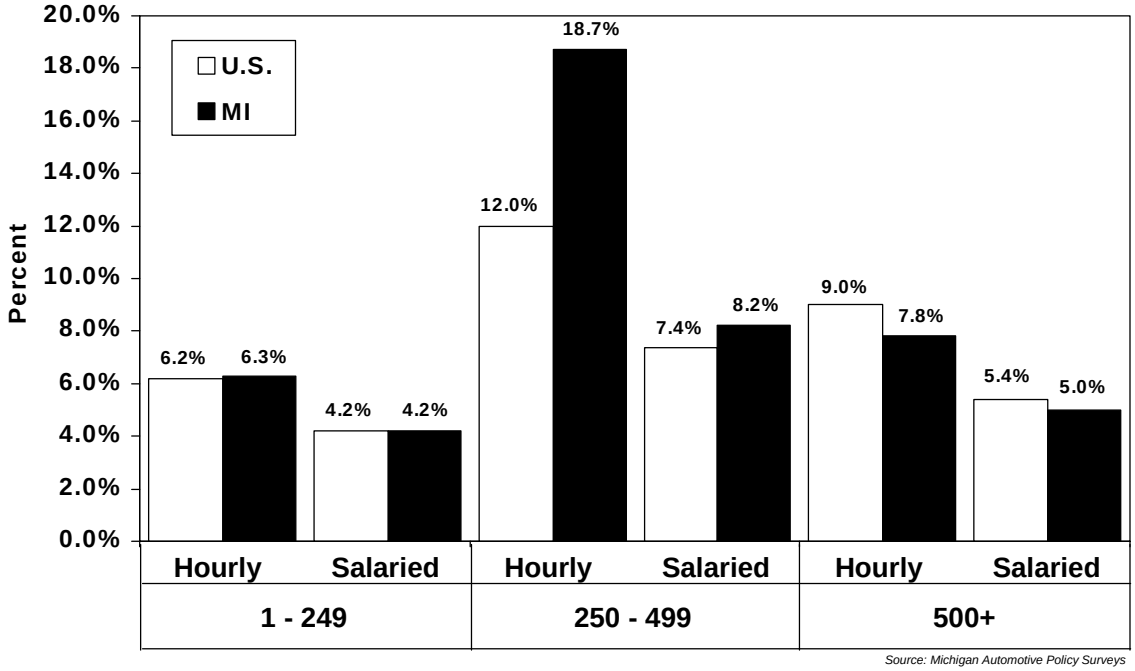


Figure 1.15
Expected 1999 Attrition for Non-OEM Michigan Companies by Employment Size
(MI results are employment-weighted, U.S. results are unweighted)

Table 1.10
Hourly Compensation for Production Employees
(MI employment-weighted)

	Trades	Other Production
OEMs	$23.50	$19.55
Preproduction	$16.19	$11.73
MI Component Firms	$16.42	$10.93
Non-OEM MI	$16.32	$11.27
ELM Sample (unweighted) (Non-MI Components)	$13.35	$10.44
Non-OEM MI Sample		
1 – 249	$16.05	$11.30
250 – 499	$15.70	$11.75
500+	$16.99	$10.99

Average Current Annual Starting Salary for Engineers

Respondents were asked to provide the average, current annual starting salary (not including benefits) paid by their companies to three types of newly hired engineers: manufacturing, design, and product. Employment weights are used to derive the results for study averages in this case. Results for four industry groups and three employment size categories are shown in table 1.11. Salary results range from a mean of $41,807 for manufacturing engineers hired by non-OEM Michigan companies with employment between 250-499, and a mean of $52,865 for product engineers hired by firms also in this industry group with employment of 500 or higher. Several concerns regarding the results of this table exist. First, several MAP members pointed out that the distinction between design and product engineers is problematic. Second, it is apparent that many respondents mean their response to reference new entrant (recent college graduate) engineers, not all new hires, experienced or inexperienced. This question was rewritten for the second round follow-up survey that measures starting salaries for several types of newly hired engineers.

Table 1.11
First Round Results: Starting Salaries for Engineers
(MI employment-weighted)

	Manufacturing	Design	Product
OEMs	$49,105	$49,105	$49,105
Preproduction	$42,433	$43,843	$49,021
MI Component Firms	$45,400	$45,210	$48,254
ELM Sample (unweighted) (Non-MI Component Firms)	$42,861	$45,528	$44,145
ELM Sample Non-MI Component Firms			
1 – 249	$42,994	$43,261	$47,937
250 – 499	$41,807	$45,086	$41,974
500+	$46,826	$46,136	$52,865

Second round survey estimates of engineering salaries by industry group are given in table 1.12. This second round question (shown in Appendix B) asked respondents to estimate starting salaries for newly hired "entry-level" engineers with no experience by type of engineering, and also to provide starting salaries for engineers with five years of experience. The employment-weighted results shown in table 1.12 indicate that the original salaries reported in table 1.11 were actually averages of starting salaries for both experienced and inexperienced engineers. A significant gap exists between starting salaries paid by OEM companies and the various types of supplier firms. The gap is largest in the field of manufacturing engineers, a key occupation for many small-to-medium sized supplier firms. This pattern is especially worrisome for supplier firms that must compete with the OEM companies for both new and experienced engineers. Finally, the bottom section of table 1.12 shows another gap in entry-level salaries between Michigan suppliers based on size of employment. Larger firms (250-500+ in employment) tend to offer higher starting engineer salaries than the smallest suppliers (1-249). However, the gap is not present in the case of experienced (with 5 years of experience) engineers. Smaller suppliers, on average, offer the same or even higher level of salaries for engineers with experience.

Table 1.12
Second Round Results: Starting Salaries for Engineers
(MI employment-weighted)

	Entry Level			5 Years Experience		
	Mfrg	**Design**	**Prod**	**Mfrg**	**Design**	**Prod**
OEMs	$42,352	$42,352	$42,352	$59,757	$59,757	$59,757
Preproduction	$34,387	$33,749	$34,672	$53,618	$52,709	$62,921
MI Component Firms	$38,268	$36,625	$38,488	$51,262	$52,540	$51,178
ELM Sample (unweighted) (Non-MI Component Firms)	$37,461	$38,518	$38,977	$51,411	$53,667	$52,917
	Non-OEM Michigan Companies by Employment Size					
	Entry Level			**5 Years Experience**		
1 – 249	$34,492	$34,146	$34,581	$53,820	$54,214	$61,217
250 – 499	$39,164	$34,952	$39,980	$52,314	$57,092	$52,574
500+	$38,000	$37,244	$38,675	$50,252	$48,222	$51,612

Expected Percentage Change in Monetary Compensation

Respondents are asked to estimate their company's change in U.S. monetary compensation in the next 12 months. This question covers roughly the summer of 1998 through the summer of 1999 and is meant to provide human resource managers with valuable benchmarks for salary and wage increases by occupation. Figure 1.16 shows the employment-weighted results for expected change in compensation by industry group and by occupation in each industry group. The OEMs expect to increase compensation for salaried employees in the next 12 months by only a marginal amount (1.4 percent). The non-OEM groups report expected increases in overall compensation that range from 4.0 percent (Michigan preproduction firms) to 3.4 percent (Michigan components). Generally, engineers and skilled trade workers should receive the largest increases in the next year.

Use of Contingent Employment

Several members of the MAP showed a strong interest in the current and expected use of contingent employees in the automotive industry. Respondents were asked to provide the percent of "managerial" and production employees who are contingent workers. Figure 1.17 shows results for this question for major industry groups and figure 1.18 shows results for three size strata for Michigan non-OEM companies. The OEMs are the largest percentage employer of contingent managerial employees. Almost 10 percent of current OEM managerial employees are contingent workers. The OEMs do not expect this percentage to fall by 2003. Michigan component firms are the largest employers of contingent production employees with 7.9 percent of total production employees. This percentage is expected to fall somewhat to 5.9 percent for these parts-makers by 2003. Michigan non-OEM firms with over 500 employees are relatively heavy users of contingent production workers (8.2 percent), but this rate is expected to fall by 2003 to 5.5 percent.

Unionization Percentages

Respondents are also asked if any of their skilled trades or other production employees are organized by a union. Figure 1.19 shows results for these two hourly categories and a combined hourly unionization rate, weighted by employment, for the major industry groups. As expected, OEM hourly employment is almost completely organized. It should be remembered that a number of international OEMs that manufacture in the U.S. did not respond to this survey.

Non-OEM firms, however, show some variation in reported unionization. Preproduction firms report 23.6 percent of their hourly workforce as belonging to unions and only 13.8 percent of workers in the other-production category. This estimate may not be reliable, however, since very few firms in the preproduction group reported the presence of unions. Low unionization in this sector may be a fact, but a larger sample of such firms is required for a confident estimate. Finally, it is not surprising that Michigan component firms report a higher unionization percentage than non-Michigan firms. What is surprising, however, is the small difference in the rates for the two groups of component suppliers. Many industry observers have speculated that non-Michigan parts suppliers experience far lower unionization rates than companies in Michigan. This may still be the case since the ELM sample count may be inadequate for estimating this critical labor parameter. Also, the questionnaire does not ask for the actual unionization percentage for each company's labor force. Many large supplier companies now maintain both union and nonunion facilities in different areas of the country.

Change in Capital Spending and Facilities/Capacity

This section of the questionnaire on expansion and location includes several questions that ask firms to forecast future rates of capital spending and expansion of facilities/capacity.

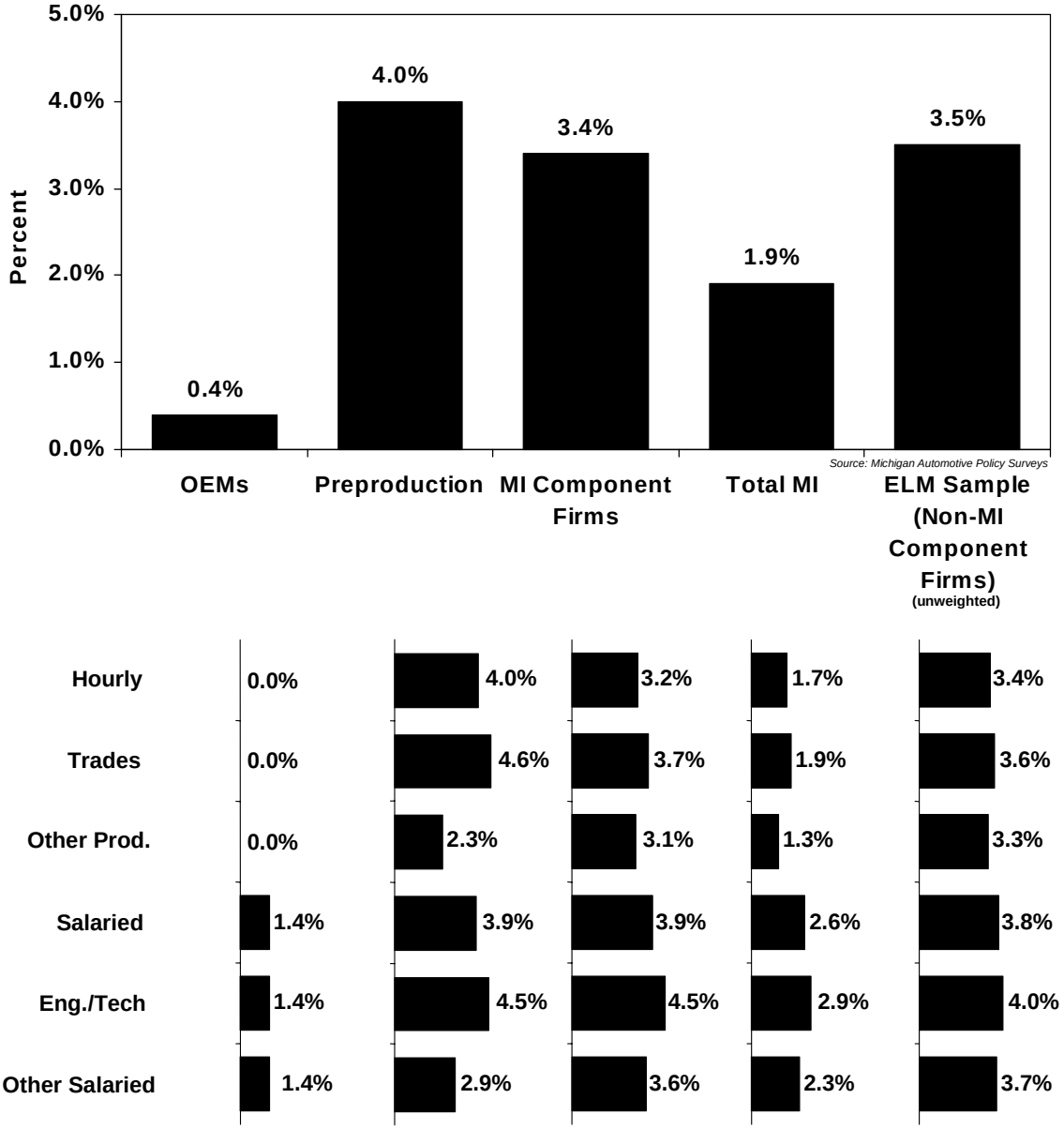


Figure 1.16
Next 12 Months, Expected Percent Change in Monetary Compensation by Industry Group and by Occupation Group within Industry Group
(MI employment-weighted)

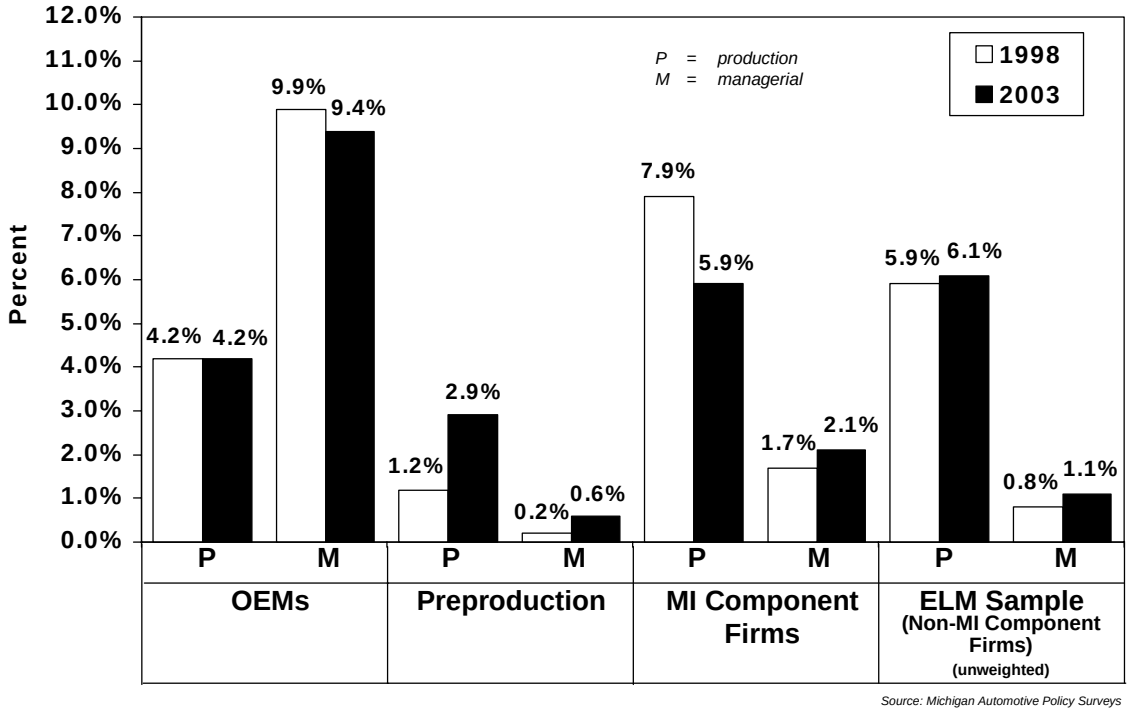


Figure 1.17
1998 – 2003
Use of Production and Managerial Contingent Employment by Industry Group
(MI employment-weighted)

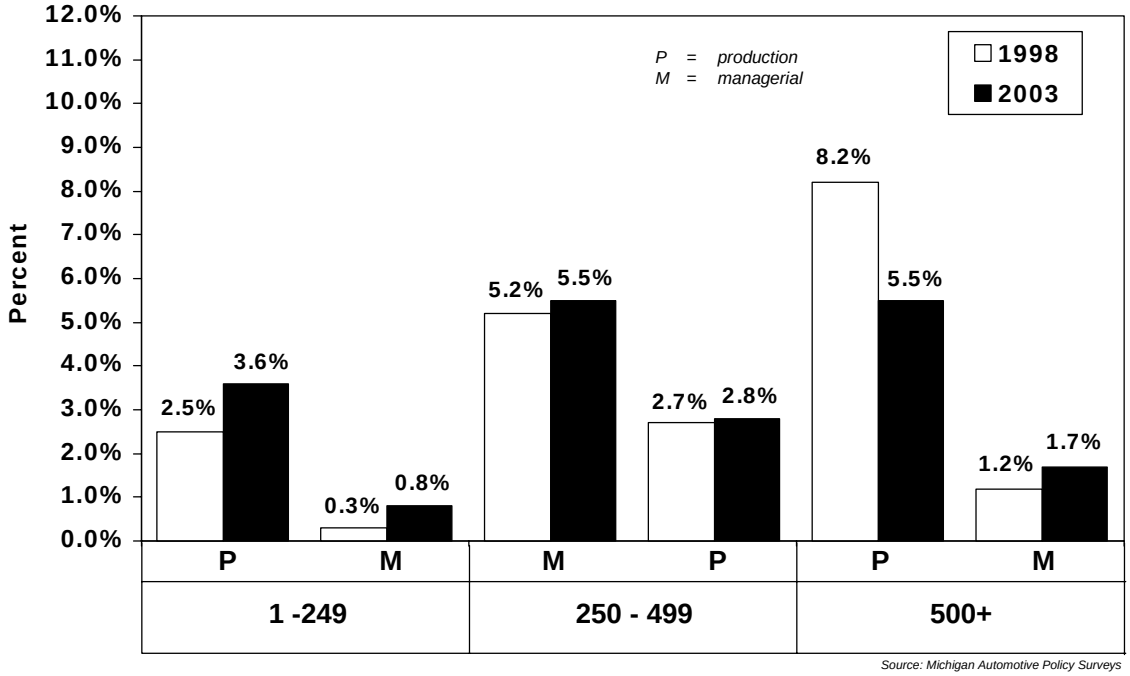


Figure 1.18
1998 – 2003
Use of Production and Managerial Contingent Employment by Non-OEM MI Firms by Employment Size Group
(MI sample only, employment-weighted)

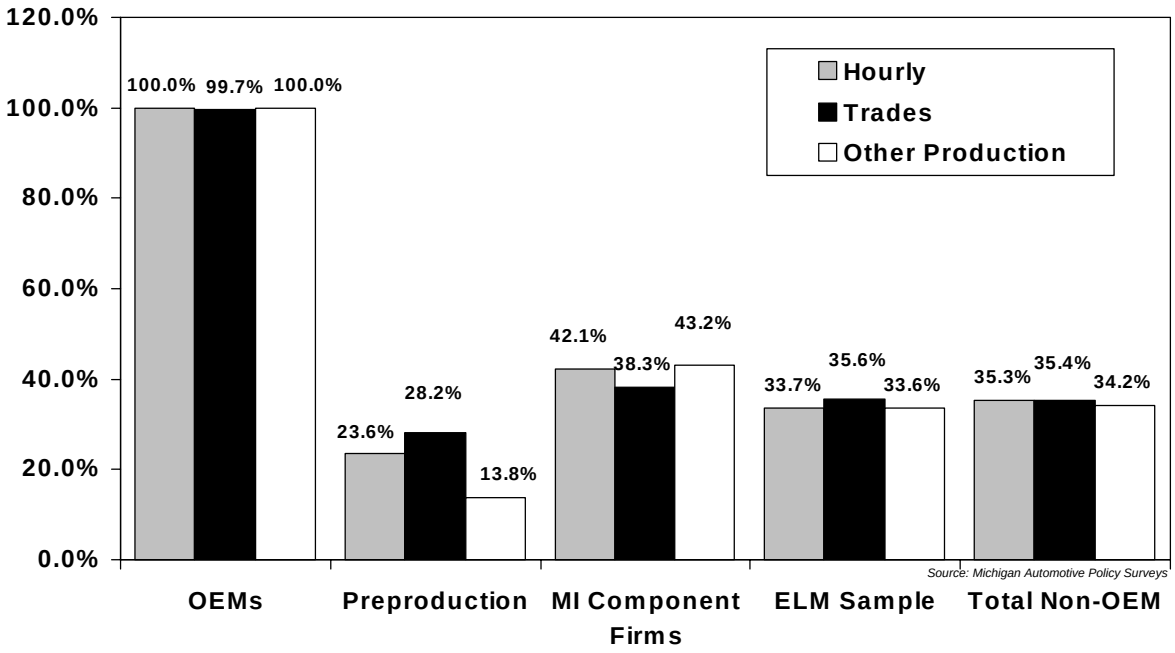


Figure 1.19
Unionization Rates by Industry Group
(U.S. employment-weighted)

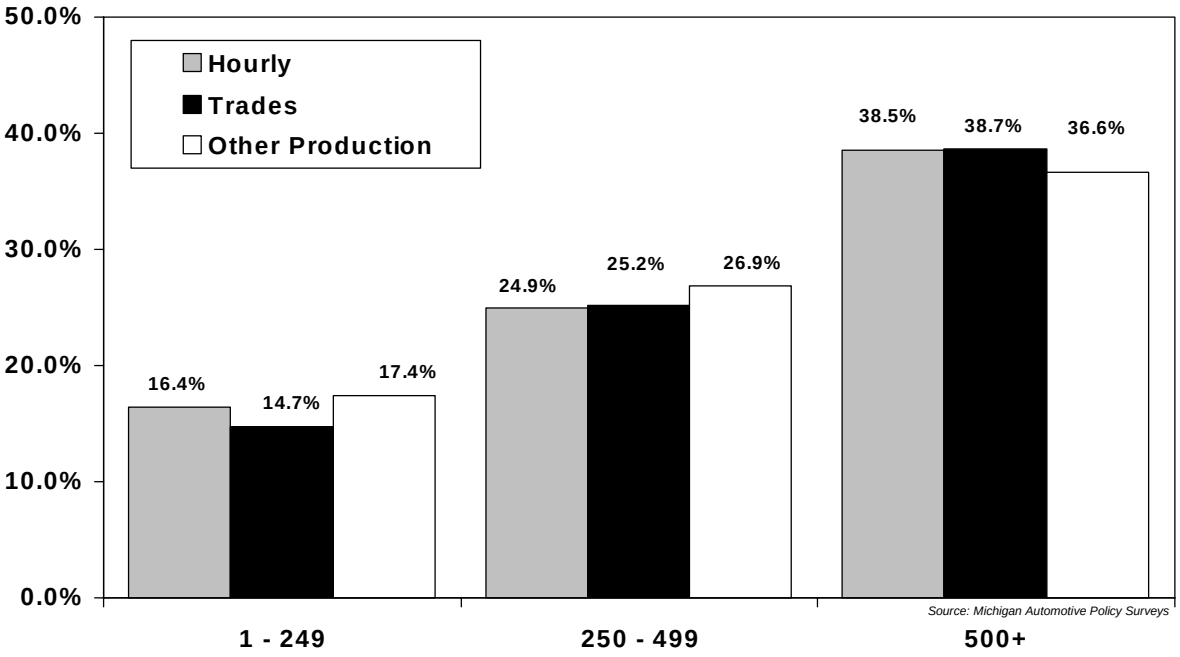


Figure 1.20
Unionization Rates for Non-OEM Companies by Employment Size Groups
(U.S. employment-weighted)

Figures 1.21 and 1.22 show results, company-weighted, for a question that asks for change in capital spending in 1999 compared to levels in 1998. Two of the OEM firms report an expected increase, one firm reports an expected decrease, and one firm expects no change in 1999 capital spending. About 63 percent of Michigan component firms are expected to increase their capital spending in 1999, but only about 35 percent of preproduction companies will. The most optimistic Michigan non-OEM size group in terms of future investment is the groups of companies that employ 250-499 people. Over 53 percent of these firms expect to increase their capital spending.

Further detail on the expected percentage increase in capital spending is given in figures 1.23 and 1.24. The OEMs report an average expected increase of only 2.0 percent in capital spending next year. Michigan component firms, however, expect to increase their capital spending by an impressive 12.1 percent, almost twice the percent increase expected for the non-Michigan group of parts suppliers. The Michigan non-OEM size group with the largest expected increase in capital spending is the group of firms with 250-499 employees.

Respondents were also asked for their expectations on the change in U.S. and Michigan facilities/capacity. The question asks respondents for both the direction of change and the percent change compared to 1998. Simple directional results, once again derived with the use of company weights, are shown in figures 1.25 and 1.26. Three OEM firms responded to this question. One OEM firm expects to increase capacity in the U.S. and Michigan, and the other two firms expect no change. About 32 percent of preproduction firms expect to increase both U.S. and Michigan capacity, and 67 percent of these companies expect no change. About 43 percent of Michigan component firms expect to increase their U.S. capacity and 35 percent of this group expect to increase their Michigan capacity. About 37 percent of non-Michigan suppliers also expect to increase their U.S. capacity, a similar result to that for Michigan suppliers. Finally, over 40 percent of non-OEM Michigan companies with 500 employees or more expect to increase their U.S. capacity in 1999. Only 25 percent of this group, however, expect to increase their capacity in Michigan.

Figures 1.27 and 1.28 show company-weighted results for percentage change in capacity in 1999 for industry groups and for Michigan employment size groups. The impressive 16 percent increase in Michigan component industry U.S. capacity is matched almost by this group's intentions to increase their Michigan capacity by almost 15 percent. Non-Michigan suppliers, however, expect to increase their capacity by less than 6 percent. The OEMs expect no increase in their U.S. or Michigan capacity. Finally, small non-OEM Michigan firms, with employment between 1 and 249, report the largest percent increases in capacity for 1999 of any size group—approximately a 9 percent increase for Michigan and a 10 percent increase for the U.S.

Summary of Human Resources Forecast

A general theme that appears in the human resources forecast is that of general optimism and growth for non-OEM Michigan automotive firms. The expectations of Michigan component firms regarding future capital spending, current dollar sales, and changes in capacity are the highest in the study. Michigan preproduction companies, however, lead the way in terms of expected increases in employment and hiring. It is clear that Michigan's overall supplier industry has arrived as a major economic sector in this state. About 47 percent of Michigan automotive employment is now located in preproduction and component-making industries. This may be a historical peak for supplier share of automotive employment in this state. Results from this set of forecasts indicate that this share will increase.

The results also show that the strongest occupations in terms of employment and compensation growth are engineering/technical and skilled trades. It is also true that only a handful of companies that responded to this survey expected any decline in their level of employment, investment, or capacity. Yet the general subject of labor scarcity or inadequate human resources is not measured

in the forecast portion of this study. Human resources and skills remain paramount for many Michigan automotive producers and service firms. An inability to locate, hire, and retain such resources could jeopardize the generally positive forecasts discussed above. A measurement of the issue of labor shortages is contained in the next section of this study.

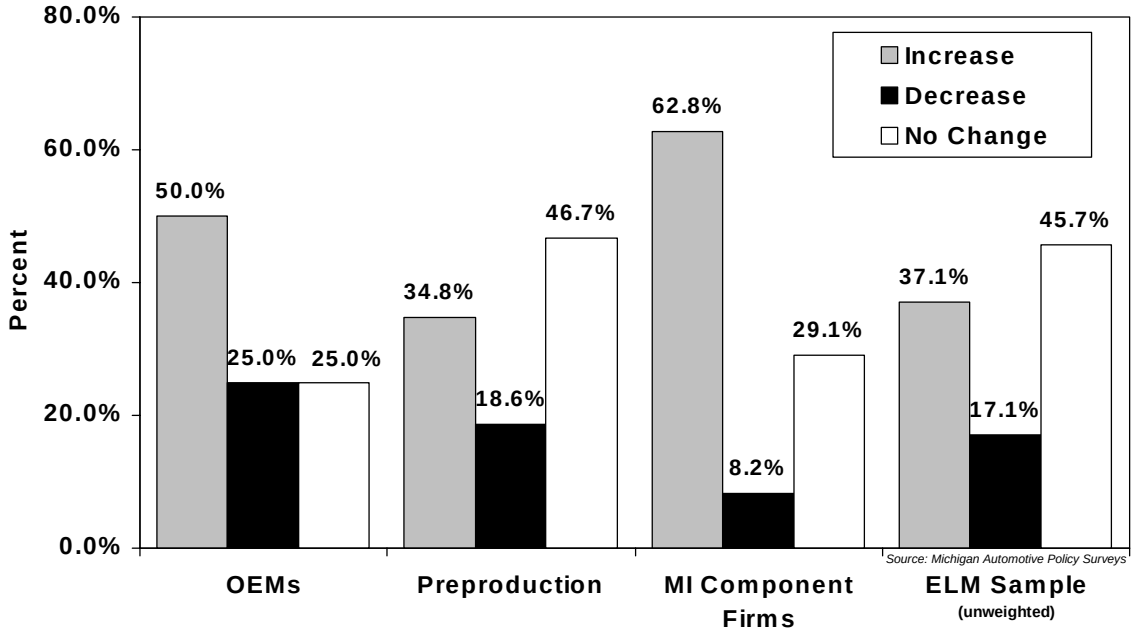


Figure 1.21
1998 – 1999
Change in Capital Spending by Industry Group
(MI company-weighted)

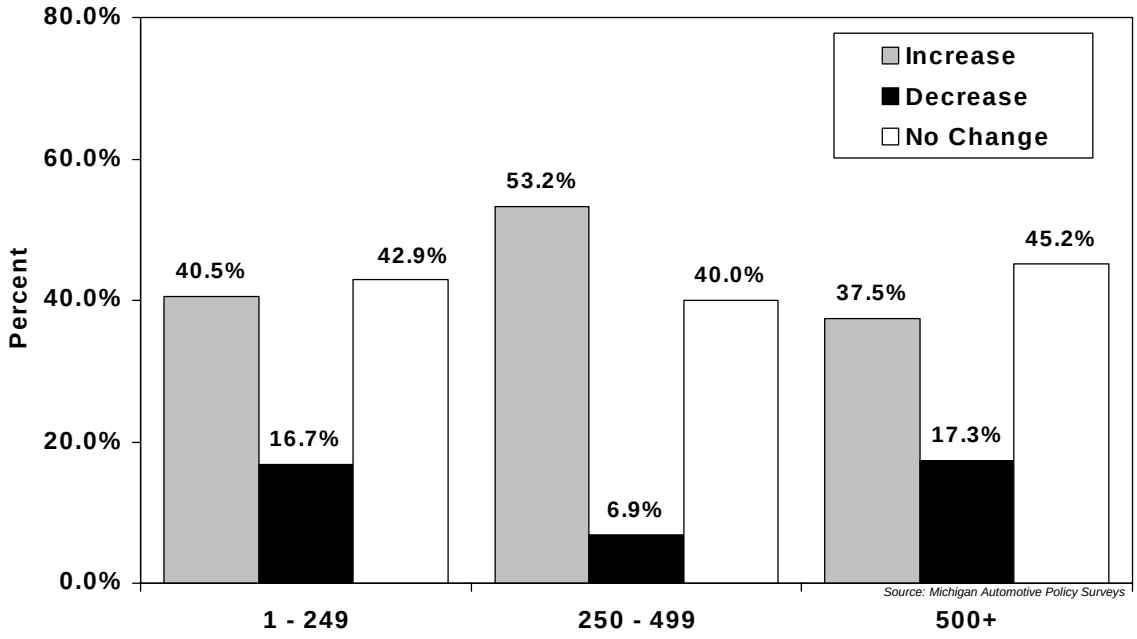


Figure 1.22
1998 – 1999
Change in Capital Spending for Non-OEM Michigan Firms by Employment Size Group
(MI company-weighted)

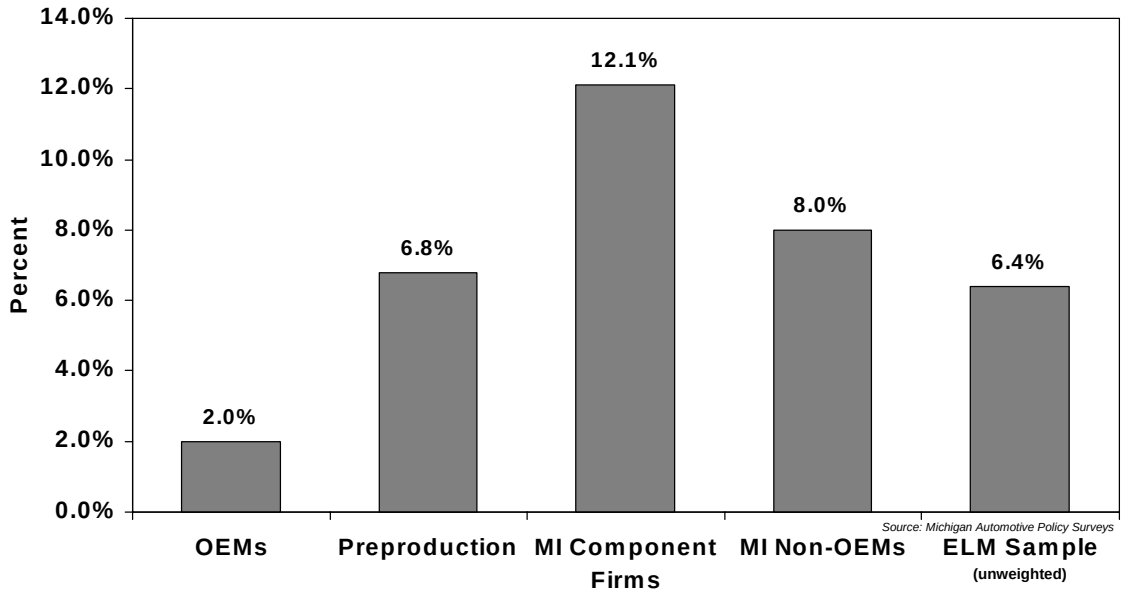


Figure 1.23
1998 – 1999
Percent Change in Capital Spending by Industry Group
(MI company-weighted)

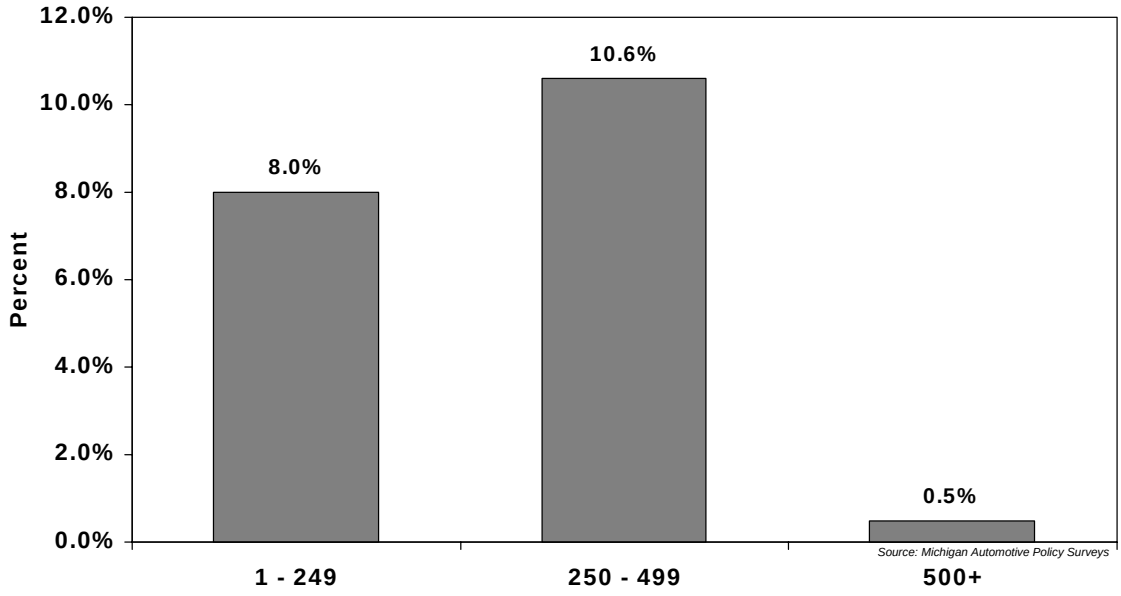
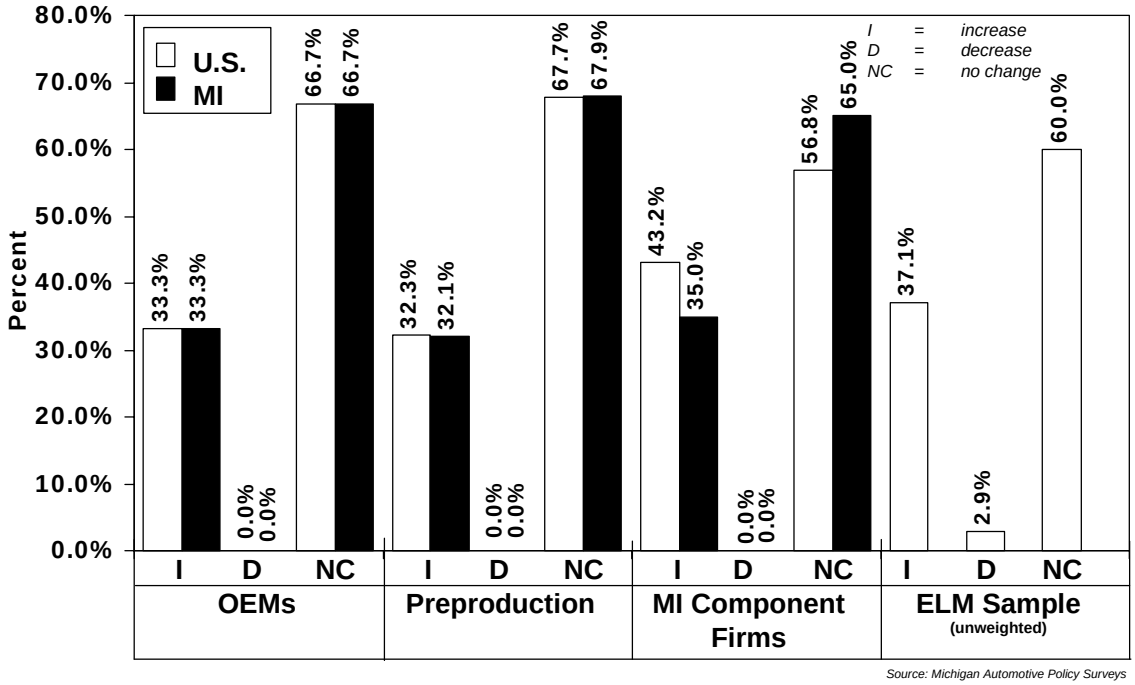
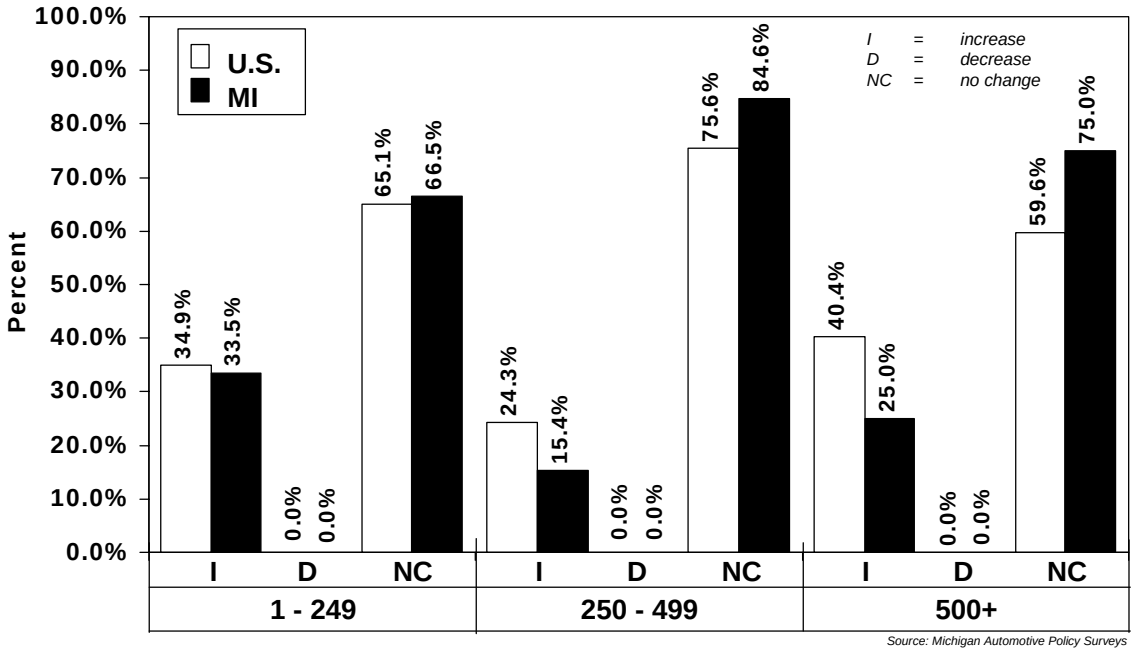


Figure 1.24
1998 – 1999
Percent Change in Capital Spending for Non-OEM Michigan Firms
by Employment Size Group
(MI company-weighted)



Source: Michigan Automotive Policy Surveys

Figure 1.25
1998 – 1999
U.S. and Michigan Change in Facilities/Capacity by Industry Group
(MI company-weighted)



Source: Michigan Automotive Policy Surveys

Figure 1.26
1998 – 1999
U.S. and Michigan Change in Facilities/Capacity for Michigan Non-OEMs
by Employment Size Group
(MI company-weighted)

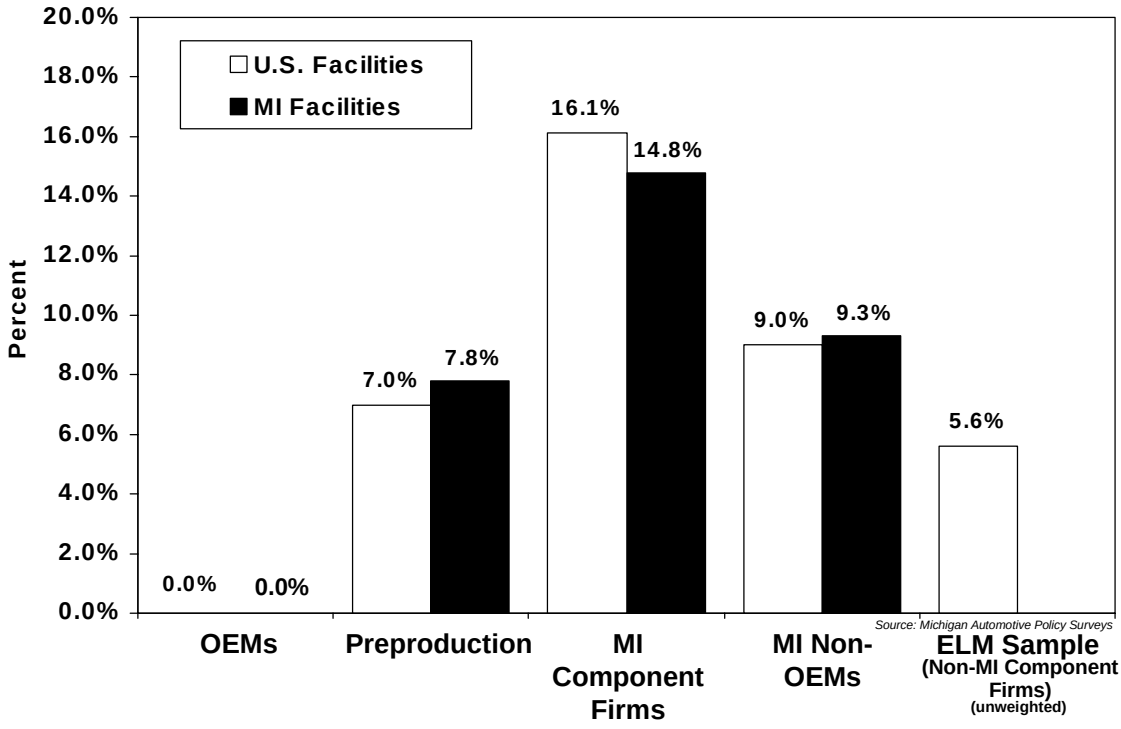


Figure 1.27
1998 – 1999
Percent Change in Facilities/Capacity by Industry Group
(MI company-weighted)

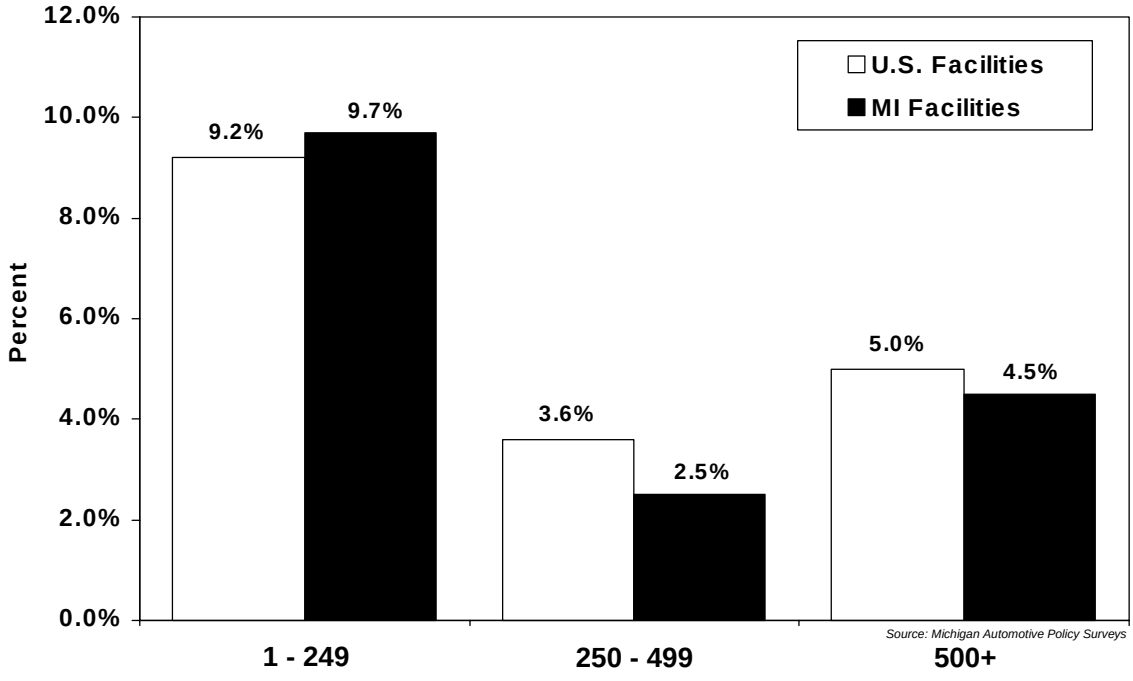


Figure 1.28
1998 – 1999
Percent Change in Facilities/Capacity for Michigan Non-OEMs by Employment Size Group
(MI company-weighted)

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SECTION 2

2.1 Introduction

Survey results

The following section includes a review of 33 questions from the first and second round of the survey. These results are presented in a format similar to the Delphi forecast series, surveys and forecasts conducted by the OSAT since 1979. Although the format of this report is similar to the Delphi series, the survey technique used for this project is not the standard Delphi methodology. Whereas, the Delphi survey method relies on a small panel of experts to identify current conditions and forecast future trends, this policy survey uses a random sample as described below. Although the survey techniques are different, the authors felt it useful to present the data in a format that has been well received by OSAT report readers for nearly 2 decades.

Section 2 has five sections: introduction, education and training for the automotive industry, expansion and location, impact of global climate change, and health care.

Presentation and analyses of survey results.

The policy survey presents responses from three separate groups: the North American automotive manufacturers; Michigan component firms and preproduction suppliers, and non-Michigan suppliers. Where it is considered relevant to a better understanding of or perspective on the forecast, our analyses includes a comparison of the forecast from the three groups in an attempt to illustrate where significant agreements or differences exist.

Data tables. When a question calls for a response in the form of a number, responses are reported as the median value and the interquartile range (IQR). The median is a measure of central tendency that mathematically summarizes an array of judgmental opinions while discounting extremely high or low estimates; it is simply the middle response. The IQR is the range bounded at the low end by the 25th-percentile value and at the high end by the 75th-percentile value. For example, in a question calling for a percentage forecast, the median answer might be 40 percent and the IQR 35-45 percent. This means that one-quarter of the respondents answered 35 percent or less, another one-quarter chose 45 percent or more, and the middle half of all responses ranged between 36 percent and 44 percent, with 40 percent as the middle response. That narrow interquartile range would indicate a fairly close consensus among the respondents.

In contrast, the percentage forecast for a different question might show a similar median forecast of 40 percent, but with an interquartile range of 20-70 percent, indicating less consensus or a considerable degree of uncertainty about the issue in question.

For several questions, the respondents are asked to respond to a list of topics and are asked to rate them using a 1-5 scale. The results for such questions are presented using mean response. Comparisons between supplier groups are made using standard statistical tests. However, due to the low number of responses by OEMs, comparisons using standard statistical measures would not be useful. Therefore, any OEM response that differs from either supplier group by greater than 0.5 is noted. It is important to note that this arbitrary measure does not necessarily indicate a significant difference, but instead merely suggests that the responses for the groups may differ.

Selected edited comments. Selected, edited comments from the policy survey respondents are shown following each data table in order to provide some insight into the deliberative process by which respondents arrived at their forecast.

The presentation of comments, which is a traditional element of the Delphi method, also lends itself well to the random sample survey. Respondents are encouraged to contribute comments to explain their responses. These replies may provide important information, which is not evident in the numerical data. An individual respondent may have unique knowledge that readers should carefully consider. However, readers should be careful not to overemphasize a particular comment. It is possible for a well-stated contrary opinion to mislead the reader into ignoring an important majority opinion, which is accurately reflected in numerical data.

Discussion. Narrative discussions are presented to highlight and explain a particular set of data.

Strategic considerations. Based on the replies to a particular question, other MAP research and studies, and OSAT's extensive interaction with the automotive industry, this report makes inferences and interpretations as to the core issues in questions and their potential impact on the industry. By no means are they exhaustive statements of critical issues. Rather, they are points that the reader might consider useful.

2.2 Education and Training for the Automotive Industry

LABOR SCARCITY

1. Many automotive firms have experienced difficulty in acquiring or retaining adequate human resources in recent years. Please rate your firm's current experience in the following U.S. and Michigan (if applicable) labor markets.

Where: 1 = ample supply/no scarcity, 3 = moderate scarcity, and 5 = severe shortage/scarcity

Labor market – United States	Mean Rating		
	OEM	MI	Non-MI
General production labor	1.8	2.8	3.0
Skilled trades labor	3.0	3.7	3.7
General production supervisor	1.7	3.1	2.9
IT systems support technicians	3.8	3.4	3.5
Computer programmers/Software specialists	3.5	3.3	3.6
CAD technicians	3.0	3.2	3.0
Other specific technician labor	1.7	3.4	2.9
Product engineers	3.7	3.5	3.4
Business management	2.3	2.7	2.5
Clerical/Office	1.8	1.9	2.2

Number of responses = 79

Labor market – Michigan	Mean Rating	
	OEM	MI
General production labor	2.3	3.0
Skilled trades labor	3.0	3.8
General production supervisor	1.7	3.1
IT systems support technicians	3.7	3.3
Computer programmers/Software specialists	4.0	3.2
CAD technicians	2.7	3.2
Other specific technician labor	2.5	3.3
Product engineers	3.7	3.5
Business management	2.7	2.6
Clerical/Office	1.8	2.1

Number of responses = 93

Other responses:

Calibration/Metrology technicians: Michigan - 5; U.S. - 5
CMM operator: Michigan - 5; U.S. - 5
Electrical engineering: Michigan - 3
Maintenance: Michigan - 5
Quality assurance engineer: Michigan - 4
Sales: Michigan - 2
Tooling engineer: Michigan - 4
Employees who are willing to work and have good attitude - 5

Selected edited comments

- Approximately 33 percent of all new hires prove to be unreliable, unskilled (lacking basic educational skills), and inexperienced.
- Finding production workers with needed skills is a major problem.
- The poor knowledge and attitude coming out of K-12 is a problem. Also, manufacturing is not appealing because schools and parents want their kids to go to college.
- The short supply of computer programmers in the U.S. is the critical factor in technology growth.

Discussion

The OEMs report a relative labor shortage in IT systems support technicians (3.8 for the U.S. and 3.7 for the State of Michigan), computer programmers/software specialists (3.5 and 4.0), and product engineers (3.7 and 3.7). Conversely, they report an ample supply of general production labor, general production supervisors, other specific technician labor, and clerical/office employees. The OEMs report markedly lower scarcity than either the Michigan or non-Michigan suppliers in 4 of the 10 categories.

Michigan-based suppliers reported a moderate scarcity (3.0 or greater) within Michigan for 8 of the 10 labor categories, with skilled trades rated as the most scarce (3.8). Firms from the Michigan sample with facilities outside of Michigan reported a moderate scarcity in 7 of the 10 labor categories for their non-Michigan facilities, with general production supervisors being the most scarce.

Non-Michigan suppliers rated 6 of the 10 job categories as at least moderately scarce. Skilled trades were rated as the most scarce (3.7). With regard to the U.S labor market, the Michigan and non-Michigan suppliers are in general agreement except for other specific technical labor (3.4 for Michigan suppliers and 2.9 for non-Michigan suppliers). Finally, it is important to note that the Michigan component firms and preproduction suppliers differ in their rating of the scarcity of CAD technicians for the U.S. The preproduction firms (3.6) report a significantly greater amount of scarcity for CAD technicians than do the component firms (2.8)

Strategic Considerations

The responses highlight several human resource challenges faced by the automotive industry. Interestingly, these challenges are in some ways very different for the OEMs, Michigan suppliers, and non-Michigan suppliers. It is apparent that the OEMs are experiencing little difficulty in acquiring general production labor or supervisors, other specific technicians, business managers, and clerical/office workers. The OEMs' rate the Michigan labor market for general production labor and other specific technicians as more scarce than the rest of the U.S. Nonetheless, they reported a far more ample supply of general production for both regions than did the suppliers.

The OEMs did report relative labor scarcity for many of the more technical-type labor markets. For these technical labor markets, the OEMs reported that scarcity was similar to that reported by the Michigan and non-Michigan suppliers.

There are at least three possible factors contributing to the OEMs experiencing an ample supply of the production skills—both labor and supervisor. Several OEMs are attempting to become more competitive through productivity gains. Through efficiency gains, they are reducing the number of employees necessary, and thus may not be experiencing the need for hiring that others may face. Second, the OEMs offer the highest wage rates in the industry, and thus for purely economic reasons, are probably able to draw from a large labor pool. Finally, the labor market for a production job is likely more local than a market for some of the other labor categories. The higher wages and benefits offered by the OEMs likely increases the geographical area from which they can draw compared to companies that pay lower wages. In a sense, the OEMs are positioned at

the top of the human resource food chain for the production labor market, and thus are able to hire labor as needed.

The same may not be true for IT systems support technicians and computer programmers and software specialists—both labor markets for which the OEMs report labor scarcity. The labor market for these jobs is much more national in scope. Not only do OEMs face competition from beyond the local labor market, they also face severe competition from other industries. The labor market for IT technicians, computer programmers, and software specialists is truly national in scope. It is also currently ultracompetitive. The rapid rise of technology has forced industry—all industry—to become acutely aware of their information systems infrastructure and the general scarcity of qualified labor. In many ways, the automotive industry suffers from an image problem with respect to IT workers. Many IT and software specialists, due in part to their scarcity, are highly mobile, and manufacturing is viewed by many in this group as an unattractive industry. According to at least some respondents, this impression of the industry is compounded by its location in America's rust belt.

Suppliers face pressure from the OEMs and suppliers in higher tiers for production workers, and the OEMs and other industries for IT and software specialists. Therefore, it is not surprising that they report relative labor scarcity for many of the job categories listed. It is interesting to note that the suppliers report a slightly lower scarcity than OEMs for IT technicians and software specialists in Michigan, and for IT technicians for the rest of the U.S. It is possible that the suppliers have more pressing needs, such as meeting current production goals. The concern is that these suppliers may be focusing on current manufacturing issues at the expense of future technology challenges.

2a. If you rated any of the labor markets listed in the previous question with a 4 or 5, please rate the following possible causes of labor scarcity.

Where: 1 = not a factor, 3 = moderate factor, and 5 = a major factor

Causes of labor scarcity	Mean Rating		
	OEM	MI	Non-MI
Inadequate supply due to lack of recent graduates	4.3	3.0	3.0
Inadequate supply due to poor quality of recent graduates	2.3	2.5	2.4
Labor scarcity due to strong competition from other automotive employers	4.7	4.2	3.6
Labor scarcity due to strong growth in industry sales	3.0	3.7	3.4
Labor scarcity due to inadequate industry wages and salaries	3.5	2.5	2.5
Labor scarcity due to high industry retirement attrition	2.0	2.3	2.1
Labor scarcity due to unpopularity of manufacturing employment	2.5	2.9	2.7
Labor scarcity due to unpopularity of technical employment	1.0	2.6	2.6

Number of responses = 109

Other responses:

Foundry-specific skills - 4
Geographic area - 4
Inadequate training for journeymen - 5
Increase in alternative employment - 5
Increase in demand due to economy - 5
Labor scarcity due to competition from other industries - 4
Lack of awareness by graduates of skilled trades - 5
Lack of training available for skilled trades - 5
Location - 4
Long term effects of Big Three cost cuts - 5
Rural area - 5
Scarcity due to lack of experience - 5
Shrinking labor force - 5
Unemployment less than 3 percent - 5

Selected edited comments

Lack of talent/interest (5):

- Most skilled trades programs in the high schools have been cancelled; therefore, many young adults are not familiar with our industry as a career opportunity.
- Schools want to teach business. It is cheaper and easier than teaching technical skills. Many students also view business programs as an easier route than technical programs.
- We need to generate interest in the manufacturing industry.

Other:

- Government regulations must be developed to lower transportation cost so we can locate to northern Michigan communities like Gladwin, etc.
- We have found that due to our firm's location in rural northwestern Pennsylvania, it is challenging to attract and retain professionals who are not from this area.

2b. Round 1 results identified relative scarcity in the following labor markets: product engineers, information technology (IT) systems support technicians, and computer programmers/software specialists. If your company has experienced difficulty in acquiring or retaining adequate human resources in recent years for any of these labor markets, please rate the following possible causes of the labor scarcity. (Note: this question was asked in round 2.)

Where: 1 = not a factor, 3 = moderate factor, and 5 = a major factor

	Product engineers			IT systems support technicians			Computer programmers/software specialists		
	OEM	MI	Non-MI	OEM	MI	Non-MI	OEM	MI	Non-MI
Inadequate supply due to lack of recent graduates	3.0	2.7	3.0	4.0	2.6	2.9	4.0	2.7	3.0
Inadequate supply due to poor quality of recent graduates	1.0	2.3	2.1	2.5	2.0	2.1	2.5	1.9	2.1
Labor scarcity due to strong competition from other automotive employers	3.0	4.0	3.6	3.5	3.6	3.6	3.5	3.6	3.4
Labor scarcity due to strong growth in industry sales	1.0	3.7	3.4	1.0	3.4	3.2	1.0	3.3	3.2
Labor scarcity due to inadequate industry wages and salaries	1.0	2.1	2.5	1.5	1.7	2.9	1.5	1.9	2.7
Labor scarcity due to high industry retirement attrition	1.0	2.0	1.9	1.0	1.6	1.7	1.0	1.5	2.0
Labor scarcity due to unpopularity of manufacturing employment	1.0	2.7	3.0	1.0	2.1	2.9	1.0	2.1	3.1
Labor scarcity due to unpopularity of technical employment	1.0	2.5	2.5	1.0	2.0	2.0	1.0	1.9	2.4

Discussion

For the first round, respondents were asked to rate the several possible causes of their reported labor shortage. In round 2, they were asked to rate the possible causes of labor scarcity for product engineers, IT systems support technicians and computer programmers/software specialists.

The strong competition from other automotive firms was the highest rated of the eight possible causes listed in round 1. Interestingly, the manufacturers rated the inadequate industry wages as slightly more than a moderate factor (3.5), while the suppliers rated wages as somewhat less than a moderate factor (2.5). Inadequate supply due to the lack of recent graduates and the strong growth in industry sales were also rated as at least moderate factors in any reported labor scarcity. The manufacturers rated the lack of recent graduates as a much higher factor than did the suppliers. Statistically, the Michigan suppliers (3.7) rated labor scarcity due to strong growth higher than did the non-Michigan suppliers (3.4).

The intent of the round 2 questions was to gain further insight into three technical areas that round 1 results indicated as scarce. The suppliers rated strong competition from other automotive employers, strong growth in industry sales, the unpopularity of manufacturing employment, and the lack of recent graduates as at least moderate factors for the reported labor scarcity. Of special note is the difference between the Michigan (2.7) and non-Michigan (4.0) suppliers on the importance of the unpopularity of manufacturing employment with regard to computer programmers/software specialists.

Strategic considerations

The respondents indicated that a significant portion of the current labor shortage is driven by the economic strength of the economy. Yet, they also indicated that the lack of recent graduates and the unpopularity of manufacturing are contributing to the scarcity.

As noted in the introduction to this report, the BLS reported that in the second quarter of 1998, 1,050,000 Americans were employed in its major classification for the automotive industry. As further noted, if this employment level were to hold for the year, it would match the all-time high set in 1978. Additionally, Michigan's unemployment rate is the lowest since the mid-1960s. These statistics illustrate the severe competition faced by automotive employers in the market for new hires and the respondents' subsequent high rating of competition between automotive firms as a driver of labor scarcity.

Both Michigan and non-Michigan suppliers also note the lack of recent graduates as contributing to the reported scarcity of labor. It is interesting to note that, in the round 1 and round 2 results, suppliers are more inclined to blame the reported shortages on the quantity of recent graduates than they are the quality of those graduates. As noted, this age cohort group of recent graduates from technical programs is one of the smallest cohort groups in decades. This, combined with the reported unpopularity of manufacturing jobs, has made a tight labor market even tighter.

One final comment: round 1 results indicate that the OEMs (3.5) believe wages may be a contributing factor in their reported labor scarcity. However, the suppliers, both Michigan (2.5) and non-Michigan (2.5), indicate that wages are less of a cause of the reported scarcity. Given the wage differential between OEMs and suppliers, especially of production employees, it is interesting that the OEMs, who likely pay more, are more apt to say that the wage rate is more of a factor.

3. Please describe any significant factors (not listed in the previous question) you feel are responsible for current labor shortages. (If applicable, please refer to specific labor markets.)

Selected edited comments

Unpopularity of manufacturing careers (13):

- For the past 20 years opportunities in all types of manufacturing have not been presented to 3rd to 5th grade school kids and their parents.
- Neither schools nor parents are interested in manufacturing, so we have to lower our standards. Government employees could be redeployed. It would save on taxes and help manufacturing.
- Technical employment does not enjoy an adequate level of prestige. Good general office employees are difficult to find. Many applicants in this area do not posses minimum skills to function in a modern office.
- The general lack of knowledge regarding the automotive industry is an important issue (3).
- There is a poor image for manufacturing jobs among the labor pool. There is the perception that manufacturing is a no-prestige, no-career-planning, dead-end job (2).
- There is an attitude in the local community that is unfavorable toward factory employment. Schools emphasize college degrees at the expense of technical education (2).
- There is less emphasis placed by our colleges and universities on computer science and similar technical-related occupations, including CAD designers, and skilled trade/technical positions. In response to industry needs, colleges and universities need to form a stronger partnership with the high schools to educate students, early on, about the availability of employment in these technical types of positions.
- We need to get into middle schools and develop some technical programs to show parents, students, and teachers what high-tech manufacturing is all about. We need a "farm" system (2).

Economic issues (11):

- Although the academic setting needs to improve (increased efficiency, reduction of waste and costs, more customer-oriented), the cycle of economic ups and downs will resolve the scarcity.
- Economic growth of manufacturing in west Michigan has progressed faster than the growth of talent. We are now bringing talent in from throughout the world (2).
- The boom in Michigan's construction industry has affected the labor market.
- The competition for labor in small markets is important to us.
- The economy is strong—we are at full employment levels (5).
- The enormous growth and prosperity in the high technology world of Silicon Valley, where we operate, is a significant factor.
- The number of people willing and able to work in hourly positions is shrinking while the number of positions needing to be filled is increasing.

Lack of quality training (9):

- A concern for us is the continued decline in apprentice programs throughout the industry.
- Graduates at the high school level that apply for technical jobs are not prepared or trained adequately. Training by the employers is expensive because of the mobility of the worker once trained.
- Our society needs to better educate young people and teach them responsibility.
- The lack of specific trades training is a critical factor. (Example: CNC programmers; coordinate measuring machine programmers.) Training and education is much too generic!!!
- There are several significant factors. There is a lack of hands-on apprenticeships for skilled trades. General production supervisors are either technology-oriented or people-oriented. It is

difficult to find a candidate that has both skills, and is experienced. Also, training for specialized technical skills is unavailable.

Small companies cannot compete:

- A major factor is the *greed* of the Big Three and many large Tier 1 suppliers. They have kept the margin of profit all to themselves by expecting 5 percent cash back on all we produce. This makes it difficult to invest in the education and training of our people. They are stockpiling billions of dollars for a rainy day or to help outsource work to other countries, and still qualify for state-funded grants for the development of their employees.
- It is an employee's market today. Companies offering high sign-on bonuses and other perks make it difficult for smaller companies to compete.

Poor quality of remaining labor pool:

- Poor quality of the remaining labor pool is a concern. The people who do not have jobs in this environment are not as capable as those who are already working.
- The lack of a good work ethic and lack of motivation needs to be addressed.

Other (10):

- Global business expansion and additional project responsibility from OEMs also affect the labor market.
- I believe there are three other significant factors: first, welfare reform has led to more people working; second, companies are not willing to locate to former union hot spots where there is a labor market (i.e., Flint, Detroit, Saginaw, Lansing, and Benton Harbor); and third, more companies are going to small towns.
- In part because of the strong national growth of industry, Michigan is not a preferred relocation destination.
- Some government legislation makes people unconcerned about seeking employment.
- The prolabor atmosphere in Michigan is causing people to leave for jobs in probusiness states and communities where companies are establishing new facilities.
- There is a lack of qualified employees who are willing to pay their dues as young engineers. Also, a lack of common sense seems to be a prevailing trait among the young candidates!
- There is high demand for dynamometer technicians, CAD specialists, and manufacturing engineers in Detroit, Flint, and Saginaw; unfortunately, there are not enough experienced employees in these fields.
- There is increased competition from high-tech firms (e.g., Intel, Microsoft, Motorola, and IBM).
- We have been successful in training entry-level employees in the skilled trades area. This is supplemented with apprentice training. Ideally, we would like to not have to train.
- Work visas for foreign professionals are too restrictive or limited in availability.

Discussion

The unpopularity of manufacturing careers (13 comments), economic issues (11 comments), and the lack of quality public training (9 comments) were the factors most frequently mentioned by the respondents as contributors to any current labor scarcity.

Strategic considerations

For the development of a public policy strategy, it is important to distinguish between an economic-cycle-driven labor shortage and a structural scarcity of labor. Several respondents report that the current economic strength of the automotive industry and the communities in which they operate is a significant factor in the reported labor scarcity. It is possible, to some extent, that any

current labor shortages may be resolved by an economic downturn. Yet, the current cohort group entering the workforce is the smallest in decades.

A common theme throughout MAP research of the past four years has been the perception among the general public—and, in particular, educators and their students—that automotive manufacturing takes place in dark, dirty, smoky environments. While in some cases this is still true, many modern manufacturing facilities are vastly different from the factories of the past. Survey respondents indicate that this lack of understanding that people have regarding automotive manufacturing and engineering is one of the biggest challenges the industry faces with respect to attracting young people into manufacturing careers. The education system has emphasized, at the cost of technical training, that a four-year college degree was the only way to achieve a good paying, career-oriented job. The results of the wage estimates in part one of this report indicate that, by learning a skill, many have achieved a good paying job without a four-year degree. The respondents indicated that the general public and, more specifically, K-12 educators have little knowledge of automotive manufacturing and engineering job requirements.

Importantly, the respondents' comments suggest that the lack of quality training by both the vocational education system and company internal training programs have contributed to the current skilled labor shortage. The development of a skilled and trained workforce is a fundamental element of public policy. However, the extent of the training that should be industry-specific is very much debatable. Is it the role of public policy to develop an educational system that provides educated, trainable individuals, or is it to deliver a product (graduate) that is already trained in industry-specific skills? The respondents indicate some disagreement on this subject.

Question 21a asked the respondents to rate the potential effectiveness of nine policy changes to improve labor market conditions for the auto industry. All three groups indicated that increased efforts to reform K-12 public education was potentially the most effective. However, the Michigan suppliers also rated the subsidy of apprenticeship training for small to medium automotive firms as potentially effective. The non-Michigan suppliers were less optimistic about effectiveness of subsidies for apprenticeship training.

4. Please predict the relative labor scarcity your firm expects in the following automotive labor markets in the next two years (1999 - 2000).

Where: 1 = ample supply/no scarcity, 3 = moderate scarcity, and 5 = severe shortage/scarcity

Labor markets – United States	Mean Rating		
	OEM	MI	Non-MI
General production labor	2.0	2.8	2.9
Skilled trades labor	3.5	3.7	3.6
General production supervisor	2.0	2.9	2.7
IT systems support technicians	3.7	3.2	3.4
Computer programmers/Software specialists	4.0	3.1	3.6
CAD technicians	3.3	3.1	3.0
Other specific technician labor	3.0	3.2	2.9
Product engineers	4.3	3.4	3.4
Business management	2.8	2.6	2.5
Clerical/Office	2.0	2.0	2.1

Number of responses = 84

Labor markets - Michigan	Mean Rating	
	OEM	MI
General production labor	1.8	3.1
Skilled trades labor	3.0	4.1
General production supervisor	2.0	3.0
IT systems support technicians	3.7	3.4
Computer programmers/Software specialists	4.0	3.3
CAD technicians	3.3	3.4
Other specific technician labor	3.0	3.3
Product engineers	4.3	3.4
Business management	2.8	2.6
Clerical/Office	2.0	2.2

Number of responses = 82

Other responses:

Architects: Michigan - 4; U.S. - 4
Maintenance: Michigan - 5
Quality assurance engineers: Michigan - 5
Engineers: Michigan - 4; U.S.- 4
Chemists: Michigan - 2
Electrical engineering: Michigan - 3
Sales/Marketing: U.S.- 3
Administrative: U.S.- 2

Selected edited comments

- Another problem is the limited amount of time people spend at one job. Most resumes I receive show many people staying at their jobs less than 3 years—that is not enough time to create a real sense of commitment and ownership to a company.
- Continued low unemployment will cause the current tight labor market to continue.
- Finding employees who are *really* skilled without supervision is increasingly difficult.
- When unemployment is as low as it is, the people changing jobs are often marginal at best. If the economy hits a snag you may not even hire the same personnel that you hire today.

Discussion

In general, the OEMs forecast increased scarcity for both the U.S. and Michigan labor markets in the coming two years. Both Michigan and non-Michigan suppliers do not anticipate any significant change in the market for labor in the next two years.

The suppliers (Michigan and non-Michigan) forecast a tighter labor market for production labor and supervisors than do the OEMs. Conversely, the OEMs expect a tighter labor market for IT systems support technicians, computer programmers/software specialists, and product engineers in the coming two years. Importantly, the OEMs forecast a severe shortage of product engineers both in Michigan and the rest of the U.S. The Michigan suppliers expect a severe shortage of skilled trades in Michigan. The Michigan component firms and Michigan preproduction suppliers are in general agreement with regard to all but one of the listed job categories. Michigan component firms (3.3) expect the scarcity of general production labor to be higher than do the preproduction suppliers (2.6).

Strategic considerations

From the late 1970s through the early 1990s, much of the automotive industry—specifically the Big Three—experienced a period of reduced hiring. During this time, many education systems that had traditionally supplied labor to the industry shifted their focus away from vocational education programs. This extended period of reduced hiring has led to a retirement bubble at the Big Three. As described in the 1995 MAP report *Driving America's Renaissance (DAR):*[5] *Human Resource Issues in Michigan's Automotive Industry*, the average age of the hourly trades at the Big Three in 1995 was 46.8 years with an average of 20.1 years of service. Further, nearly 35 percent of their hourly trades had over 25 years of service and nearly 73 percent had at least 15 years of experience (p.14 DAR). Although essentially all training for Big Three hourly trades is controlled by the individual companies in cooperation with the United Auto Workers (U.A.W.) and is not a responsibility of the local school systems, it is an indication of a larger trend that occurred throughout the industry. In essence, a traditional customer of the education system, the automotive industry appeared to no longer be in need of the skills taught by the traditional vocational education program.

This shift away from vocational education programs, combined with what many respondents suggest is a lack of interest in and respect for manufacturing careers, has led to a current, and forecasted, shortage of capable skilled trades. For the Big Three, this shortage may be more noticeable outside of Michigan. There is currently a high concentration of skilled trades in Michigan, therefore it is possible that OEMs will be able to balance their productivity gains and attrition losses at their Michigan facilities by shifting skilled trades to nearby facilities. Also, for any needs beyond

[5] McAlinden, Sean P. and Smith, Brett C., *Driving America's Renaissance: Human Resource Issues in Michigan's Automotive Industry*. UMTRI-95-37. Ann Arbor: University of Michigan Transportation Research Institute, Office for the Study of Automotive Transportation, 1995.

the current staffing levels, the OEMs may take advantage of a large pool of skilled trades at nearby supplier facilities.

The shortage of skilled labor may be critical for Michigan suppliers. The fact that the Michigan suppliers are forecasting a less ample supply of skilled labor than the OEMs may be largely explained by the very different expectation for future hiring. The OEMs forecast a 2.4 percent decline in skilled trades hiring for 1999, while the Michigan suppliers surveyed forecast a 5.1 percent increase in hiring for the same period. Due to a lack of a vocational education infrastructure, the Michigan suppliers will likely find little help in the form of pretrained skilled trades. They may be forced to either train from within or hire from competing firms. Since the training required to reach the level of a skilled trade is in the order of years, it is possible that those companies that need skilled trades will be forced to meet short-term requirements through hiring from other firms. This, in turn, may create significant wage pressures on the companies operating in the state.

Survey respondents also forecast a scarcity of product engineers. In the case of the OEMs, their forecast indicates a potential critical shortage. Given the recent trend by OEMs toward an increased reliance on suppliers for the product design and development of systems, it is somewhat surprising that OEMs forecast a more severe shortage of product engineers than do either Michigan or non-Michigan suppliers.

The OEMs also expect a severe shortage of computer programmers and software specialists and IT support technicians to continue. It is likely that the interindustry competition for these skills, and a relative shortage of people with the required skills, will lead to increasingly severe shortages within these job categories. The overall poor image of manufacturing and the automotive industry will likely compound this shortage.

5. Overall, has your company been adversely affected by recent labor shortages? Please check one. (Note: this question was asked in round 2.)

	Percent of Responses		
	OEM	MI	Non-MI
Yes, severely	0.0%	35.7%	16.7%
Yes, moderately	0.0	48.6	72.2
No	100.0	15.7	11.1

Selected edited comments

Engineers/Technicians are affected most severely (9):

- It takes us longer now to fill technical jobs than 2 years ago.
- There simply are not enough qualified mechanical, electrical, and computer engineers.
- We are severely affected in certain positions: quality control engineers, manufacturing engineers (both electronics and automotive), top level design.
- We have been most affected in the areas of information systems and engineering
- Yes, particularly in the technical areas. The quality of entry level applicants has declined.

Production/Skilled labor is affected most severely (8):

- It has been impossible to fill skilled labor positions.
- It is difficult to staff/retain entry level employees (especially for the second and third shift).
- Skilled labor – it takes years to grow our own skilled work force.
- There are not enough skilled trades (machinists).

Finding employees with good work habits is difficult:

- It is more difficult finding people with good work habits.
- There is an availability of entry level applicants. However, they do not meet our standards (i.e., attendance, work ethic, proficiency in basic skills above the 8th grade level).
- We are having a difficult time finding employees who pass the drug screen and are motivated enough to work. Many unskilled workers do not have a strong work ethic. They have high absenteeism.

Other (8):

- Increased starting wages have caused compression of rates and overall higher costs.
- Larger, higher paying companies coming into our area have redefined our labor market. The bigger, newer companies are pulling away 20-year veterans.
- This leads to higher costs due to lack of commitment, training, experience, and attitude.
- We are particularly adversely affected in Michigan, where the unemployment rate has been below the national level.
- We have experienced some labor shortages, but we are managing the problem by outsourcing, running overtime, and reducing our volume of business.
- We have noticed that filling jobs takes longer, but we are still able to find qualified candidates for positions.
- We lost key employees to auto companies. We train them, they “steal” them. We sometimes feel as if our employees have been “harvested.”

Discussion

Approximately 36 percent of Michigan suppliers indicate they have been severely affected by recent labor shortages. This is substantially higher than reported by the non-Michigan suppliers (16.7 percent). Overall, a nearly equal number of Michigan (84.3 percent) and non-Michigan (89.9 percent) suppliers report that they have been adversely—either severely or moderately—affected by the tight labor market. Interestingly the comments indicate that companies are experiencing shortages, and subsequent adverse effects with regard to both manufacturing and engineering employment.

Strategic Considerations

The responses suggest that Michigan suppliers have experienced a higher incidence of severe difficulties due to the current labor shortage than have non-Michigan suppliers. However, the fact that 84.3 percent of Michigan suppliers and 88.9 percent of non-Michigan suppliers report being affected by the labor shortage suggests that the lack of available labor is a concern for all industry participants. The pressure that a tight labor market puts on all aspects of business operations can be a significant burden, especially at a time when many companies are experiencing limited resources.

It is also interesting to note that the OEMs report no adverse effects due to any current labor shortage. This response is likely due in part to their limited need for hiring and to their position at the top of the human resource food chain. Interestingly, two comments allude to the recruiting of employees by larger companies.

6. If your company has been recently affected by labor shortage difficulties, please rank the following consequences, where 1 = no consequences, 3 = some consequences, and 5 = severe consequences. (Note: this question was asked in round 2.)

Consequences	Mean Rating		
	OEM	MI	Non-MI
Loss of business or sales	1.0	2.0	1.9
Lower productivity	1.0	3.1	2.9
Increased training costs	2.0	3.4	3.0
Lower morale	2.0	2.6	2.9
Slower launch on new products	1.0	2.5	2.6
Higher labor costs	2.0	3.2	3.3
Increased capital costs	1.0	2.4	2.5
Slower growth in sales and earnings	1.0	2.9	2.3
Increased recruiting costs	3.5	3.6	3.9

Other responses:

Attitude = 5
More overtime = 5
On-time delivery=4
Quality = 4
Quality = 5

Selected edited comments

- Just-in-time delivery is also severely impacted due to labor shortages.
- Lower morale is just management having to turn business away.
- The labor shortage is causing us to hire a lower class of workers who are less apt to do good work. Attendance is a major concern.
- There are increased recruiting costs only for skilled trades and engineers.
- There is more overtime because it takes longer to find candidates.
- There is not a labor shortage if pay is high enough.

Discussion

OEMs, Michigan suppliers, and non-Michigan suppliers all rate increased recruiting costs as the most severe consequence of any reported labor shortage. The OEMs do not rate any of the other listed consequences as affecting operations. Conversely, the suppliers indicate all listed consequences (with the exception of the loss of business or sales) as having some affect on business operations.

Strategic Considerations

This question was asked in round 2 based on information gathered in round 1. The comments from round 1 were used to develop the specific consequences for this question. This was then asked to gain perspective on the breadth and depth of round 1 comments. The results of round 2 enforce the fact that increased recruiting costs are the dominant consequence of any labor shortages.

With the exception of the loss of business of sales, suppliers rated all of the listed consequences as having some affect on business operations. Although increased recruiting costs is the only consequence that appears to be, by itself, somewhat severe, the number of consequences listed as having somewhat of an affect indicates a severe challenge for the industry.

The contrast between the responses of the OEMs and suppliers is important. With the exception of higher recruiting costs, the OEMs appear to be experiencing no consequences from any reported labor shortages. The comment regarding higher wages is of special note. Some suggest that the labor shortage is not a labor issue, but instead a wage shortage. It is possible that higher wages would alleviate many current labor quality and availability concerns. Importantly, the supplier respondents indicate that higher wages have been a consequence of the tight labor market. Yet the current cost constraints faced by automotive suppliers makes a long-term increase in the wage structure highly tenuous. The wage differential between OEMs and suppliers may be, in part, responsible for the lack consequences noted by the OEMs compared to the suppliers.

7. Please describe the strategic consequences of labor shortages for your firm.

Selected edited comments

Impedes growth of business (30):

- A lack of required talent will impede our company's ability to expand. A lack of expansion will result in fewer jobs being created. Also, because of the effects of labor shortages, the company's costs will rise, as we have to expand our geographic search area, contract with third party search firms, etc.
- A tight labor market limits production and stops growth.
- Our customers express reluctance to give us new programs because they believe we may be stretched too thin and do not have the resources to support them.
- Our future is predicated on our ability and performance in attracting and retaining a skilled, competent workforce.
- There are three strategic consequences. First, there is the risk of the loss of new business for growth. Second, it may lead to slower implementation of new technology and products. Finally, it slows our ability to improve processes and therefore overall competitiveness.
- There seems to be an opportunity to grow the business, but lack of qualified specialists may blunt that growth.
- We have been unable to grow as quickly as projected.
- We have lost market share due to the lack of qualified labor.
- We have not been able to develop new products and processes as rapidly as desired.
- We have slowed expansion of production capacity and had project implementation delays due to the shortage of labor.

Higher turnover/Increased training (11):

- Excessive overtime, higher than expected turnover and a less skilled workforce than required are all consequences of the tight labor market.
- The tight labor market for skilled trades/technical positions has caused us to train our own people rather than hire fully qualified people.
- There has been an increased training burden due to turnover as people leave for other opportunities.
- We currently see a high turnover from a work force wanting part-time work. Future orders demand a trained work force, but the high turnover has made training mandatory and ongoing! Ultimately the labor capacity will force us to either pay high wages (becoming uncompetitive) or struggle (losing work due to lack of capacity).
- We must improve processes and reeducate current employees.

Forced to outsource/shift work (10):

- We have dealt with the labor shortage by outsourcing some work to an internal European location.
- We will look for plant locations positioned outside of Michigan.
- We will look to expand with our customer base to Mexico, Asia, South America and Europe. We will also continue to eliminate middle management and strive to have three layers: executive, management, and hourly, with the consequence of all supervision being degreed.
- We will move our factories to markets where labor is not a problem.
- We will transfer production lines to locations where workers are available (Mexico, West Virginia). We also will increase factory and office productivity.

- Will have to add future manufacturing locations outside of the Holland/Zeeland area and possibly outside of Michigan.

Restricts company performance and obligations (6):
- Key initiatives often lag due to constant retraining of new associates.
- Labor shortages would make it difficult for us to achieve production requirements, thus hindering performance by not meeting customer expectations and commitments.
- The shortage will affect our ability to meet business objectives and possibly cause downtime in plants and offices.
- We are unable to react to customer requests and our projects are delayed.

Forced to rely on automation (5):
- Since we have fewer production hours available, it has forced us to use more automation.
- The labor shortage has forced us to rely increasingly on automation.
- We have increased capital to avoid using labor and we have increased automation.

Higher wages/benefits (3):
- Labor shortages will mean either an increased investment in potential employees (through education and training programs) along with more investment in current employees (better benefits, different work environment) or it will force us to seek labor elsewhere (i.e., overseas or in untapped segments of the population).
- Strategic consequences include an increased starting rate when possible, attractive working conditions, incentive programs, and full benefits.

Quality problems (2):
- Lower quality (consistently), difficulty in meeting on time delivery, the cost of the employment process, and heavy training commitment have resulted from the labor shortage.
- We continue to have new products introduced, and without engineering or technical support, this could affect our quality even more and ultimately affect future projects.

Other (26):
- A large proportion of our operation is “cut and sew” production. The shortage of experienced skilled sewers makes it difficult.
- As employees age and retire, there will be less experienced personnel there to replace them.
- Because we are a small company, the consequences are not as great. We are able to utilize overtime with current employees as necessary.
- Finding people who are interested in working for a small company is hard—mainly due to lack of security, promotion, and benefits.
- I feel maintaining the skill level in mold building at this time can only be done by internal training. Without an interest in mold building and the higher wage scale, it would be very difficult to get people.
- If you are unable to hire skilled labor (i.e., machinists) you will be unable to compete in the automotive special tooling market. This will also lead to quality problems.
- It is hard to find a general foreman with the ability to train and run shop.
- Long-term overtime requirements have a negative impact on the overall quality of the parts we produce as well as an increase in minor injuries due to fatigue factors. Our preference is to keep all employees on a 40-hour workweek.
- Manufacturing technology and processes are constantly changing; shortages of technical talent to create complex systems and to design and build products will place even greater stress on the total organization’s capability. There will be cost increases as we lose productivity.

- Our company is losing technical midlevel employees after extensive training to the manufacturers and Tier 1 suppliers. We have great difficulty finding replacements and that causes labor shortage problems on our floor as well as a disruption of service.
- Our company tries to hire knowledge.
- The economy in our area is doing very well, which has caused the current labor shortage.
- The pay rate for experienced technicians is making it impossible to remain competitive in a small business environment.
- The tight labor market has made us unable to provide adequate training and promotion due to turnover. We have researched our wages and find them competitive but find our unskilled work force to lack a full-time work ethic (i.e., we have attendance problems on Monday and Friday.)
- There are four strategic consequences: 1) The lack of an available pool to draw from has increased recruitment and retention costs. As other firms try to hire away skilled trades working for our firm, we must be proactive and provide generous wage increases. 2) The pool of marginally skilled labor is asking for inflated wages due to the scarcity of high talent labor. 3) The current automotive environment is not receptive to increases in our hourly service rates. The current wage inflation causes deteriorated margins. 4) We may have to look at more nonautomotive markets to gain higher margins.
- There are three consequences: high wages for scarce supply, maximum use of paraprofessionals and increased in-house training.
- We are attempting to improve retention through more rewarding jobs and better supervisors. We have implemented a corporate-wide recruiting effort through our HR department. We are also doing more with fewer people by implementing lean manufacturing practices.
- We do not expect labor shortages to negatively impact our forecasted level of business.
- We have increased our wages and benefit packages because of the labor shortage. We have also pursued state funding for education and training. We have promoted or hired people for positions who would not have been considered if there were a more ample supply of labor.
- We have responded to the tight labor market by reassigning employees to cover areas with critical shortages. We have also used part-time independent contractors on off-shifts.
- We have started an apprentice program for both toolmakers and CAD/design engineers.
- We stopped looking for help.

Discussion

Survey respondents indicate that the reported labor scarcity has had a serious impact on business operations. The most frequently mentioned consequence of a tight labor market was the adverse effect on growth (30 comments). Respondents also reported that a higher turnover rate (11 comments), increased cost of training (11 comments), and the need to outsource or shift work have also resulted from the shortage. The challenge of keeping and replace individuals with specific skills is also mentioned frequently by respondents.

Strategic considerations

The last several years have, in many ways, presented outstanding opportunities for suppliers. The combination of a continuing strong market and the shifting of work—both production and engineering—from manufacturers to suppliers, has created the potential for increased value-added by suppliers. Section one results indicate that the component supplier sector is rather bullish toward growth in 1999. However, the comments suggest that the scarcity of labor presents a significant hurdle for supplier expansion plans. Many comments describe lost opportunity for growth due to the lack of available human resources.

The tight labor market has also led to a reported increase in turnover and concomitantly higher training costs. Respondents indicated that they have experienced a high level of competition from other automotive firms for their current employees (questions 2a and 10). Further, Michigan

component firms forecast a surprisingly high attrition rate for hourly employees of 13.7 percent for 1999. According to the respondents, this reported turnover has lead to increased training costs and lost productivity. Training costs appear to be increasing for several reasons. First, with a high turnover rate, there is more frequent training—as trained employees leave, their replacement must be trained—and valuable time is lost. Second, according to some respondents, because of the labor scarcity, it is likely that the new hire replacement is not as competent as the individual replaced. Therefore, the new-hire will require more training to achieve similar productivity levels. Finally, there is a subsequent loss in productivity due to both the time lost to retraining and the lower quality of the new worker.

8. If your company has been recently affected by labor shortage difficulties, which of the following responses has your company used to meet the challenge of labor scarcity, where 1 = not used, 3 = some use, and 5 = heavily used. (Note: this question was asked in round 2.)

Responses	Mean Rating		
	OEM	MI	Non-MI
Increased local recruiting	3.0	3.7	4.4
Higher automation	1.0	2.7	2.9
Increased training	1.5	3.4	3.1
Higher levels of outsourcing	1.0	2.8	2.6
Increased wages, salaries and other monetary incentives	1.5	3.5	3.0
Relocation of current plant within state	1.0	1.5	1.1
Relocation of plant out of state	1.0	1.4	1.3
Increased nonmonentary compensation (education, child care, etc.)	1.0	2.0	2.1
Consideration of plant relocation within the state	1.0	1.6	1.3
Consideration of plant relocation out ofstate	1.0	1.7	1.7
Increased recruiting outside of geographical area	3.5	2.8	3.2
Downsized company operations and sales	1.0	1.8	1.1
Subsidized long-distance transportation	1.0	1.4	1.5

Other responses:

Contract labor - 5
Shift production to other manufacturing location (other states, Mexico, Japan) - 5

Selected edited comments

- Our current recruiting efforts are at a minimum due to the lack of new launches in the near future and little turnover.
- We feel our corporate mission is to recruit the needy people coming off welfare and train them to be productive workers. We use the Genesee County Bus Authority to transport workers from Flint to Rochester and split the cost of the bus pass with our employees.
- Where possible, we have placed new work at out-of-state plants until the Michigan plant's workforce stabilizes.

Discussion

OEMs, Michigan suppliers, and non-Michigan suppliers all rate increased recruiting costs as the most heavily used response to any reported labor shortage. OEMs and non-Michigan suppliers also indicated an increased amount of recruiting outside of the geographical area. Suppliers reported the use of increased training, and increased wages, salaries, and monetary incentives as responses to the labor shortage. Michigan suppliers (1.8) were more likely to report the downsizing of company operations and sales due to the labor shortage than were the non-Michigan suppliers (1.1). Michigan suppliers were also more likely to report increased training (3.4) and relocation of the current plant within the state (1.5) than were the non-Michigan suppliers (3.1 and 1.1 respectively).

Strategic Considerations

Several previous questions identified labor shortages as reported by the respondents. This question was a round 2 question intended to identify actions taken to alleviate these reported shortages. The responses make it apparent that all industry participants have experienced an increase in recruiting efforts due to the reported labor shortage. However, the OEMs' response to question 6 suggests that, with the exception of a need for increased recruiting effort, they have not been negatively affected by any labor shortages.

However, both supplier groups do indicate that several of the listed responses have, to some extent, been used. Increased training, increased wages/salaries, and an increase in recruiting outside of the geographical area are among the responses that have been most highly used. Conversely, suppliers indicated that the labor shortage has not yet lead to the need to relocate facilities either within the state or to other states. Although, Michigan suppliers were statistically more likely to report that they had relocated a plant within the state than were non-Michigan suppliers.

9. Has your firm recently lost employees to other firms located farther up the automotive supply chain?

	Percent of Responses	
	MI	Non-MI
Yes, this has occurred frequently.	20.4	5.6
Yes, this occurs occasionally.	46.9	33.3
No, but we have lost employees to other firms at our tier of production.	20.4	36.1
No	12.2	25.0

Number of responses = 135

Selected edited comments

None

Discussion

The Michigan suppliers (67.3 percent) report a significantly higher incidence of losing employees to companies located in higher tiers than do the non-Michigan suppliers (38.5 percent). However, a higher percent of the non-Michigan suppliers (36.1 percent) reported losing an employee to a competitor than did the Michigan suppliers (20.4 percent). Overall, 86 percent of Michigan suppliers and 75 percent of non-Michigan suppliers reported losing individuals to other companies either in their own tier or in a higher tier.

Strategic considerations

Initial work for the MAP indicated some concern among Michigan suppliers about the loss of key employees to companies located farther up the supply chain. The human resource food chain described the situation where larger companies higher up the supply structure made common practice of preying on their own supply base to get qualified skilled labor. Although in a sense, it is a way of promoting from within—allowing those that were capable a chance to increase their income and benefits—it has the potential to be very costly to the system. The cost to hire and train a new employee, compounded by the lost productivity during the learning period has a negative impact on the competitiveness of suppliers.

The survey responses indicate that its proximity to the customer may be a drawback. 67.3 percent of the Michigan suppliers reported that they had either frequently or occasionally lost employees to companies located further up the supply chain, compared to only 38.5 percent of the non-Michigan suppliers. Further, 20.4 percent of the Michigan suppliers said it occurred frequently, while only 5.6 percent of the non-Michigan suppliers reported this to be a frequent occurrence.

This in effect indicates that, at least in Michigan, the automotive industry operates a sort of minor league farm system. There is a large difference, however, between the way baseball operates its farm system and how it operates in the automotive industry. In baseball, the major league team is affiliated with the farm team, and assists in the development of players and funding of the team. Conversely, in the automotive industry, the higher tier suppliers are more likely to ask for cost reductions than to assist in paying for the training costs and lost productivity caused by the movement of an exemplary employee through the supply chain.

The responses indicate that, especially in a time of labor scarcity, it is not necessarily beneficial to be located within your customer's labor market. This finding has significant implications for the State of Michigan and the suppliers located here. It is possible that Michigan suppliers, in an effort to retain employees, may be forced to offer higher compensation packages than similar companies located further from their customers. The cost of labor is one of 22 site selection criteria factors addressed in question 22. The non-Michigan suppliers rated local labor costs as critically important in the site selection process, higher than proximity to customers. In fact, the cost of labor was rated as the second most critical site selection factor by non-Michigan suppliers. Conversely, the Michigan suppliers rated proximity to customers slightly higher than local costs and rated labor costs as less critical than did the non-Michigan suppliers. Further, 53 percent of non-Michigan suppliers reported that local labor cost was among the top three most important of the factors, while only 16 percent of Michigan suppliers considered labor cost among their top three.

The respondents were also asked if they had experienced losses to other firms in their tier. Thirty-six percent of the non-Michigan suppliers said that this occurred, while only 20 percent of the Michigan suppliers reported losses to others in their tier. The loss of an employee, whether to a company in the same tier, or to one located further up the supply chain can be a costly event. Yet, the movement of an employee to a competitor, can to an extent, be attributable to competitiveness. Conversely, the movement to a higher tier can be viewed as a benefit for the employee, but a detriment to the system.

10. Please describe significant impacts on your firm of the loss of employees to other firms.

Selected edited comments

Higher recruitment and training costs (21):

- Every employee is an asset! Lose an employee and you must start over with all related costs.
- The cost of hiring new employees (search, interviewing, etc.) and then training to perform under our guidelines is a result of the loss of employees.
- The cost of training has gone up and the level of experience has gone down. We are experiencing more frequent errors.
- The increased cost of training new employees and the relative scarcity of technical personnel (i.e., machinists) are concerns.
- The required retraining for replacement personnel, and the loss of productivity and quality during the training period are significant impacts.
- There is a cost to search, screen, hire, and train new employees. We have experienced a setback of our research and development and a deterioration of on-time services to new and existing accounts due to loss of key technical personnel.
- We are unique in that we require our automatic press operators to set their own dies, which requires a lot of training and is difficult to replace. When we lose an automatic press operator (who sets dies) we are significantly impacted.
- We have difficulty finding qualified replacements, so we must spend time training less-than-qualified people for positions.

Not a problem (9):

- Any loss from employees leaving is manageable.
- It is not significant at this time.
- It is presently not a huge occurrence, but it will occur as people feel the need to earn more money.
- The impact has been minimal at our company.
- We have a good corporate culture so our turnover is low.
- We have an extremely low turnover rate, so this is not an issue for us.

Big Three hire the best people (7):

- It is expected in our business. In working with the Big Three, for example, often they will offer a permanent position to one of our employees that they have gotten to know.
- It seems like we are a training department for automotive OEMs.
- It takes 5-10 years to train an employee, and then the Big Three hire them away at significant salary increases. The Big Three are unwilling to pay prices needed to insure a future workforce.
- Our customers (Big Three) hire our best people—or at least try to.
- The Big Three are hiring our best technicians because of their systems know-how and the shortages at the Big Three due to retirement and technology changes for which their people are unprepared.

Confidentiality issues (4):

- "Raiding" by other auto manufacturers in critical skill areas (e.g., paint supervisors and managers) has caused confidentiality issues.
- There is the potential of a transfer of technology to competitors and subsequent application of such technology.

- This company is a technology-driven company. Many of our processes are technologically proprietary. When employees leave us to join other first tier firms, particularly direct competitors, they take that proprietary knowledge with them. If it is applied to our competitors' processes, this company's competitive advantage is eroded.

Increases workload/Damages employee morale (4):
- Engineering positions are difficult and costly to replace. The loss of an individual leads to additional workload and responsibility for current associates.
- Losing employees creates a huge hole in the organization and not only impacts productivity and quality but also employee morale for those who are left behind to pick up the pieces. Loss of employees creates more overtime for those who are still working and can lead to burnout, which can lead to quality and overall performance problems.
- The loss of an employee can cause increased costs based on the need to train the replacement, and general moral destabilization—and frustration.

Lower productivity (4):
- Program delays due to manpower shortages, and a loss of program efficiencies are all results of employees leaving.
- Skilled production workers leaving for 1 to 3 dollar-per-hour raises prevents a smooth production flow.
- The loss of productivity due to training of new replacement salaried employees is a concern.

Distorted wage structure (3):
- An already weak employment pool makes it more difficult to hire. We have to hire away from other firms and offer extreme wage increases to jump ship. This distorts the wage structure of current staff. Also, employees who leave are often asked to convince others to follow, so a snowball effect happens.
- The loss of employees to other firms has forced defensive wage increases for other employees.

Other (30):
- If one employee receives a sweetheart deal, it has a ripple effect on remaining employees (the grass is greener on the other side of the fence, until you get there). People with more seniority know better. Generally, we have a very stable work force.
- In one instance, the drain of skilled trades now and in the future is causing us to evaluate the removal of a highly automated plant to the South.
- Increase in lead times are a result.
- Increased recruiting costs, program delays, and department restructuring have all been a result of losing employees.
- It has caused us to lose our competitive advantage.
- It is primarily a problem in the professional or technical area where recruitment and training expenses are much higher.
- It offers the employee more opportunities to advance—we train them and supply their apprenticeship training, and they take it to a larger corporation.
- Most of the losses are in the skilled trades and unskilled labor positions. After a few weeks, most are trying to get their jobs back because those companies are able to offer more money and better benefits but they also use temporary help, their people are angry, and they are either striking or laying off. It is not a secure environment to work in.
- Reduced program support and an extended learning curve have resulted. A positive consequence has been the increased understanding by customers of our supplier-side issues.
- Some of our employees leave for more money but a small amount (5 percent) do return because they prefer our working conditions.

- The impact is huge in technical companies with fewer than 20 employees.
- The inability to react to customer requests for products, quotes, etc., project delays, and in some cases, the loss of technical knowledge and "horsepower" if a key technical "guru" leaves are important consequences of losing employees to other firms.
- The loss is difficult to quantify, but it is possibly equal to a loss of about 2 percent on yields, and 5 percent on productivity.
- The loss of employees can cause a major hardship until positions are filled, which is very difficult with 1.8 percent unemployment.
- This has not always been a problem; in some cases there is a better understanding of the process.
- Though competition between firms is a given, competition between U.S. firms for employees is not good for individual businesses and the economy as a whole. It forces us to offer higher than average salaries, which hurts our competition with foreign producers. When salaries get too high, we are forced to explore other options to produce the needed amount (e.g., contingency workers, etc.).
- Traditionally, we lose employees to customers. The benefit is that former employees continue to use our services (e.g., they become customers). The disadvantage is the high cost of replacement and retraining.
- We have also experienced the loss of employees to nonautomotive firms.
- We have had to increase our use of temporary help, which often reduces the rate of production due to a higher turnover rate of temporary personnel. Also, we have experienced increased downtime due to shortage of people to run the machines.
- When an experienced skilled machinist leaves, it is almost impossible to replace that individual. You must do everything you can to keep that employee, but you have to be very careful so as to not upset the apple cart in the manufacturing wage arena.

Discussion

Respondents most frequently mention higher recruitment and training costs as a significant impact of the loss of employees to other firms. The wide-ranging comments of the panelists suggest the loss of employees has had a significant, far-reaching impact on business operations. However, nine responses indicated that the loss of employees has had no significant impact on their business.

Strategic considerations

The richness of the comments, both in depth and breadth, is noteworthy. It is apparent that the historically high level of automotive employment, concurrent with very low unemployment rates has had a significant impact on automotive suppliers. Respondents list many ways in which the loss of an employee has impacted company operations. According to the respondents, the loss of an employee in a time of near full employment can present increased recruitment and training costs. Some responses indicate that the majority of employable individuals are already employed, and in order to find capable employees, companies are looking to find individuals already employed elsewhere. This competition has led to a (possibly temporary) higher wage structure.

A common theme among the responses is the loss of highly skilled individuals, and the costs associated with their departure. These losses include the obvious, such as lost productivity, the search and training costs for the replacement, and the deterioration of services to the customer, but also the concern of confidentiality and the negative impact on the morale of those employees that remain.

It is also noteworthy that seven responses clearly indicated that the loss of employees to their OEM customers has had a negative impact. Increasingly, the automotive industry is becoming a virtual system. As more responsibility is moved from OEMs to the supply chain, it is crucial to

ensure that the lower tier suppliers continue to achieve the increasingly high quality and productivity standards. The challenge to industry participants is to balance the good of the firm with the good of the system.

A final comment is worth noting. For those that are viewed as top performers, the human resource food chain represents outstanding opportunity—especially in the current environment. It is certainly not a negative that the human resource food chain exists in the automotive industry. However, it is crucial that industry participants and public policy makers are aware of it and understand its implications.

11a. How many hours of internal training (performed by your own employees) does a new-hire employee receive during his/her first year of employment currently, and how many hours do you expect a new-hire employee to receive 5 years from now in the following classifications. (Note: please answer with average hours per employee for each classification). (Note: this question was asked in round 2.)

Classifications	Median Response					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	45 hrs	32 hrs	30 hrs	49 hrs	40 hrs	38 hrs
Skilled trades labor	70	40	40	70	50	43
Supervisors	50	40	40	50	50	48
Engineers	70	40	40	70	50	50
Business managers	40	36	22	50	40	40
Clerical/Office	24	31	16	32	40	25

Classifications	Interquartile Range					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	40/90 hrs	18/40 hrs	13/40 hrs	48/50 hrs	20/66 hrs	17/60 hrs
Skilled trades labor	60/80	15/98	21/170	60/80	20/120	25/110
Supervisors	40/60	16/80	20/58	40/60	20/100	36/75
Engineers	60/80	14/80	20/95	60/80	26/100	30/100
Business managers	24/40	10/50	10/43	32/56	20/80	20/53
Clerical/Office	24/40	11/48	9/36	30/56	18/60	10/40

11b. How many hours of ongoing internal training (performed by your own employees) does an experienced employee (i.e., 1 year or more of seniority) receive per year currently and how many hours do you expect an experienced employee to receive 5 years from now in the following classifications. (Note: please answer with average hours per employee for each classification). (Note: this question was asked in round 2.)

Classifications	Median Response					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	32 hrs	16 hrs	18 hrs	39 hrs	25 hrs	20 hrs
Skilled trades labor	55	20	20	60	40	28
Supervisors	40	20	16	48	32	20
Engineers	43	16	20	55	31	25
Business managers	40	16	20	45	32	25
Clerical/Office	40	12	8	40	20	10

Classifications	Interquartile Range					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	24/40 hrs	8/28 hrs	10/25 hrs	30/48 hrs	15/40 hrs	15/42 hrs
Skilled trades labor	30/80	10/40	9/40	40/80	15/60	11/42
Supervisors	40/40	8/40	10/40	40/56	20/52	10/50
Engineers	40/45	8/40	12/38	50/60	10/60	20/50
Business managers	16/40	8/40	8/31	16/56	15/40	10/51
Clerical/Office	16/40	8/40	5/24	16/56	12/40	8/40

Selected edited comments

- All employees learn constantly from peers.
- All of the above mentioned groups have received or are receiving training. We train only when training is needed for people to perform their jobs as desired. Our focus has been to train or provide training internally.
- Entry-level skilled trades go through our informal apprenticeship training. When they reach 10,000 hours, they are considered to be fully qualified.
- Production and skilled trades labor receive much on-the-job training internally. Our supervisors are called team leaders and also are part of the floor teams.
- The rapid reengineering of our business processes has accelerated retraining—this does not include tuition programs.
- Training is done outside of the facility. We offer tuition reimbursement, but no one takes us up on it.
- Training will increase to keep up with the rapid pace of increasing technology.
- We have continuous training, depending on the addition of new products or principles.

Discussion

The extremely wide interquartile ranges indicate that the amount of internal training varies greatly between firms. The median estimate for new-hire production workers at Michigan suppliers is 32 hours of training in the first year of employment. The median response for new-hire skilled trades, supervisors, and engineers is 40 hours of training. For experienced employees (production, skilled, supervisors and engineers), the amount of time spent in training per year is roughly half of that of a new hire. The forecast indicates that respondents expect the amount of time spent in training will increase by at least 10 to 20 percent by 2003.

Strategic considerations

Respondents indicate that new hires receive approximately one week of training in their first year of employment. The respondents also report that the amount of training annually for experienced employees is one-half that of a new hire. However, the very wide interquartile ranges suggest that the responding companies have very different training strategies and needs.

In recent years, there has been an increased interest in the amount of training done by automotive industry participants. The heightened awareness is due, in part, to the documented high level of training at several Japanese-owned U.S. facilities. Quality standards such as QS-9000 have also led companies toward more rigorous training programs.

The data for this report has been divided into three groups: OEMs, Michigan suppliers, and non-Michigan suppliers. Upon review of the data, a further breakout appears to be of value. The Michigan supplier group consists of preproduction companies and component firms. If the Michigan preproduction suppliers are separated, it becomes apparent that this group has higher median training estimates than do the component firms. Especially noteworthy is the difference for skilled trades and engineers. Table 2.1 shows that the median for skilled trades and engineers at preproduction companies is twice that of the component firms. It is important to note that there were a few preproduction companies that reported annual new-hire training hours to be 10 to 15 times the median.

Although the training estimates by the two component groups are more similar to each other than to those of the preproduction group, they too show some differences. The non-Michigan suppliers estimate for the current number of hours of training for skilled trades is 10 hours per year—more than that of the Michigan component firms. Yet, that difference is forecast to disappear by 2003.

Table 2.1

Estimate of Hours of Internal Training for Michigan Preproduction Firms, Michigan Component Firms, and Non-Michigan Suppliers; Currently and 2003 (New Hires)

	Median Response					
	Preproduction		Michigan Component Firms		Non-Michigan Suppliers	
	1998	2003	1998	2003	1998	2003
Production labor	40.0	40.0	29.0	40.0	30.0	37.5
Skilled trades labor	80.0	100.0	30.0	40.0	40.0	40.0
Supervisors	40.0	70.0	30.0	50.0	40.0	43.0
Engineers	70.0	80.0	24.0	40.0	40.0	48.0
Business managers	40.0	50.0	20.0	40.0	24.0	40.0
Clerical/Office	40.0	60.0	18.0	34.0	16.0	25.0

One final note based on anecdotal comments from respondents, the request to aggregate this training data presented a significant challenge to many companies. The tracking of training programs—specifically between plants—does not appear to be nearly as complete as may be thought.

12. Please estimate the percentage distribution of internal training for your employees across the following types:

Training types	Median Rating					
	Currently			5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Formal apprenticeship	5%	2%	1%	—%	10%	3%
Formal, on the job	15.5	25	20	—	30	20
Informal, on the job	45	50	40	—	30	30
Classroom	20	15	20	—	20	30
Distance learning (e.g., TV)	5	0	0	—	5	5

Training types	Interquartile Range					
	Currently			Five years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Formal apprenticeship	5/5%	0/10%	0/10%	—%	0/15%	0/10%
Formal, on the job	1/30	10/40	17.5/30	—	20/50	20/50
Informal, on the job	35/75	30/75	20/60	—	20/50	20/40
Classroom	20/50	5/30	10/50	—	10/34	14/45
Distance learning (e.g., TV)	1/10	0/5	0/5	—	0/15	0/6.25

Number of responses=111

Other responses:

Computer-aided: currently - 5 percent, 5 years from now - 10 percent
Formal offsite: currently – 8 percent
Literature: currently - 25 percent, 5 years from now - 25 percent
New hire orientation: currently - 20 percent, 5 years from now - 20 percent
Seminar type: currently - 30 percent, 5 years from now - 50 percent
Vendor supplied - at their site: currently - 5 percent, 5 years from now - 10 percent

Selected edited comments

- Formal on-the-job training is required because of QS 9000 standards.
- I expect a progression towards more training and more classroom training.
- More structured training will be required a few years from now.
- We have increased apprenticeship training due to the current age of our skilled trades workforce. Distance learning will increase, particularly for engineers. Classroom training will probably decrease due to self-paced options.
- We have qualified for a regional grant, which is set up to begin in August. The biggest obstacle for us in providing training (besides funding) is time. Either we have a shortage of employees and cannot afford to have anyone off the floor learning or things slow down and we have to lay people off. Things are always one extreme to another in this industry.
- We need to focus more on training throughout the organization.

Discussion

On-the-job training—both informal and formal—is the dominant type of training as reported by the respondents. Respondents do forecast a shift in the distribution of internal training to include

more time spent in formal apprenticeship and classroom training. Again, the wide interquartile ranges indicate that there are significant differences between companies. Because the responses are presented in medians, they do not necessarily add to 100 percent.

Strategic considerations

The respondents indicated that automotive industry participants use on-the-job training for the majority of their training needs. Traditionally, the industry has heavily relied on informal job training as the orientation for new employees. However, the move to standards such as QS 9000 is likely to lead to more formalized training. Michigan and non-Michigan suppliers forecast a decrease in informal on-the-job training as a percent of total training.

Respondents expect to see distance learning gain in use in the next 5 years. Distance learning can take many forms. Several manufacturers are in the process of developing their own internal "colleges." As these programs mature, they will likely include increased reliance on distance learning technologies. As they do, the line between internal and external training will blur. The ability to offer the services to gain scale economies for the training may lead them to offer the programs to suppliers in a distance learning format.

For several years, remote, and even interactive, video courses have been available for engineering and other technical careers. With the continuing development of the Internet, Web-based education and training programs are becoming a reality. The Michigan Virtual Automotive College (MVAC) is a private not-for-profit 501(c)3 corporation formed by the State of Michigan, Michigan State University, the University of Michigan, the state's other colleges and universities, and the auto industry. MVAC has been developed to deliver the automotive education and training offerings of Michigan's higher education providers to the automotive industry. This Web-based "college" is intended to be a cost-effective, high-quality means of meeting the education and training needs of OEMs, suppliers, and those interested in automotive careers.

A course currently offered by MVAC illustrates the potential of distance learning. MVAC offers a Web-based version of the failure mode effects analysis (FMEA) problem-solving course offered at Ford Motor Company. This course is available to Ford employees and employees of suppliers. The goal of this on-line FMEA course as stated by the MVAC, is to provide the basic information necessary to generate design, process, and concept FMEAs. Programs such as this appear to be merely initial steps in tapping the potential of new technologies for distance learning.

13a. How many hours of external training (outside of the firm) does a new-hire employee currently receive during his/her first year of employment, and how many hours do you expect a new-hire employee to receive 5 years from now. (Note: please answer with average hours per employee for each classification). (Note: this question was asked in round 2.)

Classifications	Median Response					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	0 hrs	0 hrs	0 hrs	0 hrs	8 hrs	2 hrs
Skilled trades labor	0	8	8	0	16	9
Supervisors	8	12	9	8	20	18
Engineers	16	20	20	16	30	30
Business managers	16	20	8	16	30	22
Clerical/Office	0	8	7	0	10	13

Classifications	Interquartile Range					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	0/0 hrs	0/5 hrs	0/0 hrs	0/0 hrs	0/20 hrs	0/15 hrs
Skilled trades labor	0/0	0/25	1/14	0/0	1/40	5/16
Supervisors	0/16	3/20	6/19	0/16	5/30	12/29
Engineers	0/32	10/29	8/40	0/32	16/40	13/50
Business managers	0/32	9/25	8/40	0/40	15/40	13/55
Clerical/Office	0/32	0/15	0/14	0/40	4/28	4/23

13b. How many hours of ongoing external training (outside your firm) does an experienced (1-year or more seniority) employee currently receive per year and how many hours do you expect an experienced employee to receive 5 years from now in the following classifications. (Note: please answer with average hours per employee for each classification). (Note: this question was asked in round 2.)

Classifications	Median Response					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	0 hrs	0 hrs	0 hrs	0 hrs	5 hrs	0 hrs
Skilled trades labor	0	8	8	0	10	10
Supervisors	8	10	8	8	20	16
Engineers	16	16	14	16	24	30
Business managers	16	16	12	16	20	24
Clerical/Office	0	6	5	0	10	14

Classifications	Interquartile Range					
	Currently			Expected, 5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Production labor	0/0 hrs	0/8 hrs	0/4 hrs	0/0 hrs	0/20 hrs	0/12 hrs
Skilled trades labor	0/0	0/20	0/16	0/0	1/40	4/20
Supervisors	0/16	5/24	8/22	0/16	5/30	8/32
Engineers	0/32	8/24	9/23	0/32	14/40	10/40
Business managers	0/24	8/39	8/40	0/32	10/40	8/75
Clerical/Office	0/24	0/10	0/15	0/32	1/29	4/26

Selected edited comments

- Our employees attend seminars as appropriate when offered.
- Outside firms come to our facilities.
- Training is not systematized across the company. These job categories may receive large amounts of training in one section and no training in another section.

Discussion

Respondents indicate that production employees—new hires and experienced—receive no external training currently. However, they do expect to see some external training of production employees 5 years from now. The median response by suppliers for skilled trades is about one day a year of external training currently. This is expected to increase slightly in the coming 5 years. According to the respondents, experienced business managers and engineers receive about two days per year of external training, with new hires receiving slightly more. As with the other training questions, the wide interquartile ranges suggest substantial differences between firms

Strategic Considerations

The majority of responding companies do not use external training for their production employees. However, the other classifications have one to two days of external training per year. It is interesting to note that, in general, the median response for new hires is slightly higher than that of experienced employees.

The respondents were asked to rate the potential effectiveness of nine policy actions to improve labor conditions for the automotive industry (question 22a). Two of those were intended to measure the attractiveness of standardized training modules (i.e., the creation and training of generic training modules, and the creation and subsidy of distance learning technologies for automotive employees). Respondents indicated some interest in such programs. The ability to use off-the-shelf training modules for programs such as statistical quality control, and other basic knowledge may present a cost savings opportunity for industry. Such programs also may be well suited for development and distribution by external providers. The MVAC offers insight into the possible direction such programs may take. MVAC is a Web-based education provider funded by the Michigan Jobs Commission, chartered to deliver world class automotive industry-related training and education to OEMs and suppliers. In many ways the success or failure of the MVAC may likely have significant implications for the future of external training in the automotive industry.

The rapid evolution of technology is making distance learning, and with it generic training, a viable alternative. Several manufacturers are in the process of developing corporate learning centers (a.k.a. corporate universities). These programs will likely move toward the inclusion of some Web-based education modules. As these programs become technology-based, the ability to share knowledge—and cost—with suppliers will be tempting.

14. Please estimate the percentage distribution of external training for your employees across the following types:

External training types	Median Response					
	Currently			5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Vendor training	—%	45%	40%	—%	30%	50%
Public education programs/courses	—	40	50	—	50	40
Labor union training	—	0	0	—	0	0

Number of responses=96

External training types	Interquartile Range					
	Currently			5 years from now		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Vendor training	—%	20/75%	10/75%	—%	20/70%	10/80%
Public education programs/courses	—	10/70	20/80	—	20/77	20/75
Labor union training	—	0/0	0/5	—	0/0	0/0

Number of responses=96

Other responses:

Association training–AMA: currently - 25 percent, 5 years from now - 20 percent
Authors/Speakers: currently - 15 percent
College: currently - 20 percent, 5 years from now - 20 percent
Communication: currently - 20 percent, 5 years from now - 18.2 percent
Consultants/Trainers: currently - 20 percent, 5 years from now - 5 percent
Consultants: currently - 80 percent, 5 years from now - 20 percent
Consultants: currently - 9 percent
Corporate training programs: currently - 30 percent
CRT/CD ROM: currently - 10 percent
Customer training: currently - 30 percent, 5 years from now - 30 percent
Internet: currently - 5 percent, 5 years from now - 15 percent
Leadership: 5 years from now - 18.2 percent
Machinery/Computer: currently - 100 percent, 5 years from now - 100 percent
Miscellaneous: currently - 10 percent
OEM training: currently - 50 percent, 5 years from now - 50 percent
Private: currently - 49 percent
Professional design: currently - 20 percent
QS 9000: currently - 50 percent, 5 years from now - 25 percent
Sales skills training: currently - 60 percent, 5 years from now - 50 percent
Seminars, workshops, conferences: currently - 20 percent, 5 years from now - 20 percent
Seminars/Workshops: currently - 25 percent, 5 years from now - 10 percent
Technical courier: currently - 90 percent
Technical issues: currently - 20 percent, 5 years from now - 20 percent

Selected edited comments

- I expect vendor training to increase as the speed of technology increases.
- Tuition reimbursement is also used at my company.

Discussion

The median responses indicate that the percentage distribution of external training is relatively even between vendor training and public education programs/courses. However, the wide interquartile ranges suggest that the actual distribution of training by individual companies may not necessarily be close to the nearly even split that is represented by the median responses. Unfortunately, due to lack of completeness of responses, the estimates for the OEMs are not available.

Strategic considerations

The delivery of external training can be a very lucrative endeavor for providers of such programs. A shift toward either the vendor or public education providers would have significant implications for all involved. Importantly, the responses do not indicate any identifiable trend. The wide interquartile ranges suggest that there is a broad difference between companies, but those differences appear to “balance out.”

Technology will play an increasingly important role in the delivery of training services in the coming years. As training providers attempt to position themselves as technology leaders, it will be interesting to see how technology aids in training effectiveness and efficiency.

15. Based on your company's experience with recent job applicants and/or new employees, please rate your satisfaction with the following types of public education:

Where 1 = dissatisfied, 3 = neither satisfied nor dissatisfied, and 5 = highly satisfied

Public education types	Mean Rating		
	OEM	MI	Non-MI
Local K-12 public education	3.5	2.4	2.3
Community and technical colleges	3.8	3.4	3.2
4-year university business programs	3.8	3.3	3.6
4-year university engineering programs	4.0	3.5	3.9

Number of responses=133

Selected edited comments

Poor K-12 public education system:

- Colleges have to spend up to 30 percent of their time getting new students ready to enter college. That speaks very poorly for the K-12 education received.
- Public education (local K-12) needs to emphasize group skills to analyze and solve problems. Kids need to understand how to collect data, interpret it, and act on the message from the data. What comes after K-12 needs to be emphasized.
- The basic high school education is very weak—especially math, English, and science.
- The education system needs to include more practical experience and more manufacturing and automotive-related curricula.
- We live in an age of standardization, and mass production and education have fallen into that trap. Everyone learns at a different rate and is interested in different things. Educators do not have the time or the resources, if they do have the inclination, to provide that type of personal education. You have so many students crammed into a classroom that it lacks the intimacy and caring essential to helping children learn. Most of the applicants for the entry-level positions do not have a high school education. They are irresponsible and want instant gratification. These young workers often switch jobs and many have difficulty reading and writing. Many also have learning disabilities that may often go undiagnosed, or schools simply do not have the resources or interest in providing special education for these challenged individuals. When people get this kind of start with education, it is very difficult for them to have any interest in pursuing any type of formal secondary education to improve their quality of life.
- We need better K-12 public education in major urban areas to tackle future employment opportunities.

Poor university programs:

- College graduates bring little "real experience to the workplace." They need more internships, plus they must learn how to communicate in both the written and verbal forms.
- Community and technical colleges are working hard to meet the needs of the manufacturing industry. Four-year business programs are not preparing employees to think entrepreneurial—something necessary in today's manufacturing community.
- Decision-making abilities are lacking in the higher educated and paid employees. They are not aggressive-minded.

Other:

- Because we are currently considered low-tech, only the very basic skills are required.
- I believe education to be very beneficial in laying the groundwork. However, you cannot expect to learn everything you need from school.
- People are not being taught to think creatively to solve problems.
- Technology will be the catalyst for change.
- There is a lack of interpreting skills. Graduates need too much supervision.
- We do not see the shining stars of public education. They are encouraged to obtain higher education. We are increasingly alarmed at the lack of math, language, and social skills our applicants display. Many new employees do not have the basics to function even at entry-level positions. Many also have very poor reading ability. Many are unable to communicate effectively when writing and struggle with verbal communication. Basic math skills are barely at grade school levels. There is very little understanding of responsibility and personal accountability and no teamwork skills. It is difficult, at best, when dealing with *"new to the workforce"* employees and their lack of knowledge and social skills. The drug use and chronic absenteeism only compound this!
- We have an unrealistic societal push for college degrees. Realistically we need more emphasis on technical training at high schools and community colleges.

Discussion

In general, the respondents are slightly more satisfied than dissatisfied with the public education system. However, the Michigan (2.4) and non-Michigan suppliers (2.3) are somewhat dissatisfied with local K-12 public education. Conversely, the OEMs reportedly are rather satisfied with the community colleges (3.8), and the 4-year business (3.8) and engineering programs (4.0). The non-Michigan suppliers also report some satisfaction with the 4-year programs.

Strategic considerations

Public education is in many ways one of the most passionate aspects of the human resource/public policy topic. Each person is, in many ways, a product and a customer of the education system. Whether from the perspective of a parent, an educational administrator, teacher, human resource director, or even student, the educational system plays a critical role in the competitiveness of the country.

It is especially interesting to note the difference in perceptions of the local K-12 public education systems between the OEMs and the suppliers. This difference may be in part due to the higher wages paid by the OEMs. Because of these higher wages, they are likely able to be more selective in their hiring, therefore, not exposed to the full range of individuals produced by the K-12 system. It is possible that the response of the suppliers may present a more complete view of the recent K-12 performance.

The comment regarding the caliber of recent job applicants is worth noting. The economic prosperity of the last several years and the exceptionally low unemployment rates have led to increased difficulty in locating capable employees. Respondents report that a strong growth in industry sales has significantly affected the scarcity of labor (question 2a). The competition for entry-level production employees is further heightened by the poor image of manufacturing. Many potential employees view service sector employment as a more attractive alternative to manufacturing even if the wage structure may be somewhat lower. Because of these factors, many automotive suppliers have expanded their labor market to include individuals they previously may not have considered.

The relatively positive rating of the community colleges, especially by the Michigan suppliers and OEMs is not surprising. Previous MAP work has indicated that many businesses have been

impressed by the willingness of local community colleges to proactively develop programs that serve the needs of their customers—both the business and the students.

Conversely, given these same findings, it is somewhat interesting to find positive ratings for the 4-year university programs. Earlier work had indicated some dissatisfaction by automotive industry participants with the lack of applied knowledge by recent graduates. It is important to note that the comments do, in fact, reflect some continued dissatisfaction with the “real world” experiences provided by the education system. However, to their credit, 4-year university programs appear to be addressing the need to deliver competent, talented individuals with the technical and business skills necessary to compete in the global automotive industry.

16. Which of the following skills or aptitudes are most important in the performance of new production employees?

Where 1 = not important, 3 = neither important nor unimportant, and 5 = very important

Skills/Aptitudes:	Mean Rating		
	OEM	**MI**	**Non-MI**
Basic literacy skills (*please estimate minimum grade level proficiency*) **10th grade**	4.3	4.4	4.4
Basic arithmetic skills (*please estimate minimum grade level proficiency*) **10th grade**	4.3	4.5	4.3
Manual dexterity	3.7	3.9	4.1
Ability to work effectively in teams	4.0	4.2	4.1
Ability to work with other employees	4.3	4.6	4.4
Basic employability skills (work habits, punctuality)	4.7	4.7	4.6
Safety and health skills	4.3	4.2	4.2
Sufficient general manufacturing experience	2.7	3.1	3.1
Experience or mastery of specific processes or equipment	3.7	3.4	2.9
Quality systems support skills	4.3	3.5	3.3
Communication skills	4.3	4.1	3.8
Computer technology skills	3.7	3.2	2.9
Learning skills (i.e., the ability to learn new skills and adapt to new technologies)	4.7	4.5	4.3

Number of responses=130

Other responses:

Attitude - 5
Attitude to succeed and be promoted - 5
Hygiene - 4

Selected edited comments

- A basic understanding of business and economics is a need.
- All skills are important and must work in conjunction with performance at any level.
- Attendance and punctuality is one of the most common causes of termination. This usually stems from drug or alcohol abuse or a lack of work ethic. In many cases, it appears their parents never set boundaries for them. They have the mentality that they should be able to come and go as they please. Most also feel they are not paid enough, yet miss work once a week. Unemployment benefits perpetuate this problem. No matter how much documentation I have, I have yet to win an unemployment case where attendance has been the cause of termination.
- Give us an applicant who has a good work ethic, and we will be more than happy to train him/her.
- In the future, computer technology skills and the ability to analyze data and draw conclusions in problem-solving efforts will be very important.
- Motivation is a big factor if the employee has the capability to learn.
- Teamwork is key.

- The greatest area of deficiency in formal education would be math skills. Communication skills are important for those who wish to advance.
- There is some overlap between being able to work with other employees and being able to work effectively in teams.
- We have found that a person who has sufficient manual dexterity, good employability skills, and is able to work with others can be taught most other aspects of their job.
- Work ethic and the ability to read and write are crucial—the rest can be taught if they want to learn.

Discussion

All of the listed skills/aptitudes are rated as at least somewhat important. Basic employability skills received the highest rating by each group. When asked to rank the top three skills/aptitudes, 44 percent of Michigan suppliers, and 47 percent of non-Michigan suppliers listed employability skills.

OEMs also rated learning skills (4.7) as very important. Other skills/aptitudes rated as important by the OEMs include basic math and literacy skills, the ability to work with others, safety and health habits, quality systems support skills, and communication skills (all 4.3).

Michigan suppliers rate the ability to work with others (4.6), learning skills (4.5), and basic literacy and math skills (4.4 and 4.5 respectively) as important. The non-Michigan suppliers also rate highly the ability to work with others (4.4), and basic math and literacy skills (4.3 and 4.4 respectively).

The OEMs rate quality systems support skills and computer technology skills as more important than do either of the supplier groups. The OEMs also rate experience or mastery of specific equipment or processes, and communication skills as more important than do the non-Michigan suppliers.

The Michigan suppliers rate communication skills and computer technology skills higher than do the non-Michigan suppliers. However, when the responses of only the Michigan component firms are compared to the non-Michigan sample, the answers of the two groups are not statistically different. In fact, the responses of the Michigan component firms and the Michigan preproduction suppliers for five of the skills/aptitudes are significantly different. The preproduction suppliers rate basic arithmetic skills (4.7), sufficient general manufacturing experience (3.7), and computer technology skills (3.7) as more important than do the Michigan component firms (4.4, 2.1, and 2.9 respectively). Conversely, the component firms (4.4) rate safety and health skills higher than do the preproduction firms (4.0)

Strategic considerations

It is important to note that all three groups rate basic employability skills as very important. Comments from throughout this survey indicate that all industry participants face the challenge of finding new production employees that meet even the most basic needs requirements. There are many factors contributing to the difficulty in finding qualified individuals.

First, and possibly foremost, is the economic prosperity which the automotive industry, and much of the U.S., has experienced over the past several years. Many regions which have high concentrations of automotive employment are also experiencing very low unemployment rates. Respondents indicate that the strong performance of the automotive industry is a major factor in the current scarcity (question 2a). This strong performance, combined with a smaller number of people in the entry-level cohort group has led to significant labor scarcity.

The 1995 MAP report, *Driving America's Renaissance*[6] highlighted an increasing problem finding candidates for entry level production jobs that had an understanding of the basic requirements of employment. Employability skills were best described by a MAP member as the ability to be on time with your pencil sharp and your notebook open. The knowledge that respondents from all three groups in this 1998 survey rated basic employability as so critical points to the fact that many of the current labor challenges are rooted deep in societal issues. These issues may be in many ways far too endemic for industry, and even the education system, to quickly address. Comments from throughout the current survey, and follow-up interviews with MAP member companies indicate a continued lack of these basic job skills. Unfortunately, there does not appear to be an easy solution.

It can be argued that these companies are not necessarily facing a lack of qualified labor, but instead are experiencing difficulties locating capable employees due to a lack of a competitive wage. If a company experiencing difficulty in finding qualified labor would increase wages, the argument suggests, it would likely increase the available labor pool, and the company would be able to find capable candidates. While this is a reasonable and viable assumption, the fact that the OEMs (who pay by far the highest wages in the industry) are also very concerned about finding those with basic employability skills for production is noteworthy. Surely wages do play an important role in the quality of job candidates. However, in this case, it may be more than a wage issue; instead, it may be an indication of societal ills.

For decades, U.S. automotive industry participants have utilized the physical abilities of their employees. However, in an attempt to increase productivity and competitiveness, companies are now beginning to tap the mental skills of those on the production line. The rapid change of technology has also forced companies to search out employees that are capable learners. As work requirements and technology change, workers must be capable of learning and applying new methods with minimal training.

Another change in recent years has been the increased emphasis on diversity in the workplace. The ability to work with others is seen by the respondents as an important aptitude for new employees. As the workforce becomes increasingly diverse, and companies move toward self-guided teams, the ability to work with others is likely to be a critical success factor for employees.

The results indicate some interesting differences between the OEMs and suppliers. The OEMs rate experience of mastery or specific processes or equipment as much more important than do the non-Michigan suppliers. This may be an indication of differing local labor pools. OEMs (specifically the Big Three) still maintain a significant portion of their employment in Michigan, where they have access to a pool of experienced production workers from supplier firms. Further, the Michigan suppliers rating of experience of mastery or a specific skill or process was closer to that of the manufacturers than to the other suppliers. The general availability of a skilled workforce—albeit at the expense of the lower tier supply base—appears to be an important factor for those companies operating in Michigan. The OEMs also rated computer technology skills as more important than did either supplier group.

[6] Ibid.

17. Please describe the strategic consequences of the current education system's performance as it relates to your firm:

Selected edited comments

The company must train in basic skills, which increases costs (25):

- Basic math and communication skills are poor for the trades hired. Communication skills must improve so we can better understand customers and effectively solve their problems. Personal computer skills are marginal, and we support training at our cost. (This may be temporary as children with lifelong exposure to personal computers enter the workforce). These factors drive up our costs through inefficient process execution and higher training costs.
- Because of a poor basic education (reading and writing, work ethic, self-discipline, accepting responsibility) we are forced to waste precious time teaching the basics, which should be prerequisites for employment. As a company, we cannot advance with an applicant pool that is illiterate or otherwise unable to work.
- Because of the poor performance of the education system, we have to train people in basic math. Some employees read and write so poorly that it greatly limits the responsibility we can give them. You cannot do well in skilled trades if you can't read.
- Employees today are lacking fundamental skills in the sciences which translates into less capable employees in support of the company's technological equipment and quality support systems. We believe the current education system must emphasize the hard sciences and develop stringent standards for successful passage.
- More internal resources are required to teach new employees the basic skills that they should have had when hired. Because employability and monetary skills are not taught in the education system, many new hires (especially those in their first job) do not assimilate quickly. Almost all new hires do not understand business/economics adequately enough to contribute to the organization.
- More than half of the applicants fail our proficiency tests (8^{th} grade level). Therefore, remedial education is a must.
- The quality of the job applicant is lower, requiring more corporate assets to be allocated to training. Ability to problem solve, working in teams, and ability to learn is impacted by the education system's poor performance.
- Their failures have caused a lack of adequate future employees—students are not "job ready."
- Ultimately our ability to hire new employees with basic employability, technical skills, and the ability to learn will be hampered. Our training costs as well as other employment costs (i.e., turnover) will increase as well; we will become less competitive.

The education system does not adequately prepare students for vocational jobs (13):

- From our viewpoint, the education system reflects the cultural malaise that undervalues the importance of physical labor and technical skill.
- Students coming out of the K-12 system lack exposure to manufacturing and lack the skill sets needed to succeed—there is a major disconnect. Teachers, counselors, and administrators are ignorant of what is happening in industry today. Community colleges and universities, for the most part, are doing a good job.
- Students should be earmarked for vocational opportunities and encouraged to pursue them.
- The current education system (K-12) focuses on the few that go to college. This leaves about 70 percent of school participants not being nurtured for adult life. Thus, we in business now must teach and train.
- The education system does not require enough practical exposure.
- There are a limited number of trade schools relating to the mold-making field!

- Vocational educational classes have been eliminated from the public school system. Metal shop, wood shop, and automotive mechanics are a thing of the past.
- We have experienced our best recruiting from technical programs. Four-year engineering programs do not provide sufficient hands-on experience.
- We need to integrate work-based learning, advocate teacher internships and skill certificates, advocate parent responsibilities, and focus on employability skills.

The state/country will be unable to compete (8):

- If students in grades 8 through 12 are not made aware of skilled trades opportunities and are not encouraged to pursue careers in skilled trades, the industries in Michigan who rely on this labor force will no longer be the industrial leaders of the nation.
- Inadequate preparation in Michigan means our growth will be outside the state. What will Michigan do with all the unemployed, underqualified people? Especially after Michigan companies have built up operations elsewhere.
- The education system is not worldwide competitive. Production worker candidates are lacking basic math and problem-solving skills.
- The education system may force future relocations. It also may make us uncompetitive with other locations and/or countries that have higher levels of education.
- Will the U.S. be able to compete with foreign companies in the future?

The company is less efficient and unable to progress:

- Because of the poor quality of recent graduates, we have to screen many more applicants to find qualified candidates.
- Increased initial training costs, higher turnover, and increased hiring and selection costs are all consequences of the current education system's performance.
- It causes significant delay for employers and workers to get qualified people on the job. Also, the education system causes frustration and unhappiness for workers who feel they have failed because they have to work at a "factory" job.
- It slows progress and the ability to implement new technologies and programs.

The education system needs to change with technology:

- Because of the continuous advances in technologies, it is increasingly harder to find qualified workers.
- It is very important for people coming out of today's education system to be adaptable. Technology is swiftly changing. Though more and more students are becoming familiar with computers and technology, there is still a lack (particularly in K-12 education) of adequate exposure to technology.
- The education system does not provide up-to-date information.
- We find the product of the current education system to be adequate for current needs but not for the future. The technical changes in recent years have been dramatic and will continue to be so in the coming years. This, combined with problems in the K-12 portion of the educational system, will continue to cause a shortfall in people's ability to learn what will be required.

Available workers lack ability and desire:

- Available workers expect to be entertained and get bored very easily.
- It is difficult to bring new designs to market because of a lack of work experience and commonsense in workers fresh out of school. Young people used to work during summer vacation. Now they play, and employers suffer when they enter the work force.
- There also appears to be a decline in basic work ethics of employees. This may be a problem created by today's society. However, educational institutions need to adapt their methods to assist in addressing this area.

- Young employees lack discipline and a sense of direction with their life. In general, they know little about the world.

Other (15):

- "What current education system?" The education system should have some "strategic consequences."
- Better-educated and adaptable employees would reduce work errors, training time, and employee conflict levels.
- Corporations need to be more involved in their local schools.
- In the skilled trades, the people lack writing skills.
- It is hard to achieve QS 9000 certification if employees cannot read and understand documentation.
- Not only are computer skills, basic literacy, and arithmetic skills a must, but how your attitude has an effect on everything you do should be taught at an earlier age.
- Our engineers and technicians are trained "application-specific" on equipment. The lack of math skills affects candidates for training.
- Progressive learning is a problem when high turnover and temporary employment are used.
- The ability to learn is very rare.
- The current public school systems continue to pass students even if they are failing.
- The education system is a major concern, but not necessarily a critical one at this time.
- The educational system is a tactical issue only—we hire the best we can find.
- We are exploring options to get public school kids familiar with manufacturing (i.e., a school-to-work program). As we see skill deficiencies, we have to provide training for those skills internally.
- We train our production staff in specific skills that are required for our processes. We have found that the basic education and ability to learn are adequate.
- We use visual aids and assign training buddies to all new hires to help combat illiteracy problems. We have group and individual training sessions. We use a holistic approach to orientation and training. We are also trying to qualify for state funding and encouraging associates to enroll in education classes in their communities.

Discussion

The respondents most frequently noted the need to increase training efforts and the cost associated with the higher level of training (25 comments) as a strategic consequence of the current education system's performance. The respondents also indicated that the lack of good vocational education programs has had a significant impact on their operations. Others noted the potential for the decreased competitiveness of the company, state, and country due to the current performance of the educational system.

Strategic considerations

Again, the depth and breadth of the comments are worth noting. These responses indicate a concern over the recent performance of the education system. As the respondents have suggested throughout this survey, they are experiencing difficulty finding qualified new hires. A number of respondents suggest the most basic of skills—employability skills—are lacking for many recent graduates. Several of the comments allude to the need for remedial training and education for a large percent of new hires. Such remedial training is costly and hinders productivity.

Another common theme found throughout the comments is that of a lack of work ethic and discipline found in graduates of the education system. This may reflect more on the social ills and not necessarily on the competency of the education system.

The number of comments referring to decreased competitiveness is also noteworthy. The education system is the foundation of a competitive country. Respondents suggest that the lack of competitive graduates could lead to a significant decrease in this country's competitive position.

The strategic consequences, as described by the respondents, are indeed significant. The verbosity of the respondents with regard to this topic makes it apparent that, in the view of the respondents, the current performance of the education system leaves much to be desired. It also indicates that there is a need for industry participants to work with educators to affect reform on the system. Finally, while the vast majority of comments point out the failings of the education system, there are a few comments that offer hope.

18. With respect to the market for automotive employees, please rate your level of agreement/disagreement with the following attitudes toward automotive careers:

Where 1 = strongly disagree, 3 = neither agree nor disagree, and 5 = strongly agree

Attitudes toward automotive careers	Mean Rating		
	OEM	MI	Non-MI
Many people no longer respect physical work—even if highly productive and demanding.	3.7	3.6	3.4
Educators do not respect physical-work—even if highly productive and demanding.	4.0	3.8	3.7
Educators in K-12 education have little or no knowledge of automotive manufacturing and engineering.	4.0	4.2	4.0
There is a lack of general knowledge concerning careers in manufacturing.	4.0	4.1	4.0
Engineering graduates frequently lack applied knowledge or experience.	3.5	3.9	3.7
Educators in engineering respect or teach manufacturing career-related curriculum.	3.0	3.0	3.1
Engineering programs are sufficiently "automotive-based."	3.0	2.8	2.9

Number of responses=134

Selected edited comments

- Countries need a strong base of industries that produce something. Our economy is moving to an information-based economy. We still need to support engineering fields and manufacturing technologies or our job base will erode too quickly as we transition.
- Engineering programs vary by institution; some are becoming too theoretical.
- If there is a problem with the educational system, I think it is more noticeable at the high school level than at the college level.
- Manufacturing is not looked at as desirable by schools and universities.
- Many education courses only teach theory. More hands-on type of education is needed.
- Our society has created the myth that if people are not college bound they are bound for failure. This forces a lot of bright individuals who are mechanically inclined to seek management positions whether they have the necessary people skills or not—rather than pursuing a career in tool and die making for $90,000 a year.
- The cyclical ups and downs of the automotive industry have been cited as a deterrent to entering a career in the auto industry.
- The engineering interns we have begun to employ and the students who have done projects with our company have been bright, productive, and well prepared. General public school educators are relatively ignorant about the world of work.
- The physical component of manufacturing jobs has been vastly reduced in the last 10 years. However, the mental aspect of manufacturing jobs has increased.
- These questions cannot be answered generically.

Discussion

All three groups are in general agreement with regard to the listed attitudes toward automotive careers. They indicate a general lack of knowledge, by both educators and the general public, about automotive manufacturing and engineering. Respondents also somewhat agree that many

people, including educators, do not respect physical work—even if highly productive and demanding, and that engineering graduates frequently lack applied knowledge or experience.

Strategic considerations

The survey respondents indicate a lack of communication between the automotive industry participants and the education community. The lack of respect afforded manufacturing careers by the general public has been a continuing theme through this survey. In many ways, it is incumbent on automotive industry participants to address this perceived bias. Question 20a is an attempt to describe the level of communication between industry and education.

This lack of respect given manufacturing careers also may present an opportunity for public policy to assist in awareness and incentive programs, given that there would be a solid return on the investment for the government (i.e., a return on investment for the general public). That is, are the job skills promoted by a given public policy value added for the community? Public policy for skilled manufacturing positions may likely add significantly more value to the local economy than those aimed at the development of lower paying, sometimes more transient, general production skills.

The respondents also indicate that there is a lack of communication between the automotive industry and 4-year engineering institutions. Although being somewhat satisfied with the performance of the 4-year engineering programs (question 15), they report that graduates of those four-year engineering schools often lack applied knowledge and experience. The challenge for engineering programs is the balance between the theoretical nature of traditional academic work and the need to prepare students for employment.

19. A number of public policy actions have been proposed by state and local policymakers to improve general and technical education for manufacturing industries, such as the auto industry. Please rate your opinion of the potential effectiveness of the following policy changes.

Where 1 = is likely to be ineffective, 3 = neither effective nor ineffective, and 5 = potentially very effective

Policy changes	Mean Rating		
	OEM	MI	Non-MI
National standards for curriculum and content	4.3	3.4	3.6
Competency testing for graduation	4.7	3.9	4.2
Improved technical training on state-of-the-art technology	4.3	4.2	4.2
Higher or required certification of instructors	4.7	3.9	4.0
Expansion of co-op, school-to-work programs with private employers	4.7	4.2	4.3
Closer communication with school administrators and school systems	4.3	3.7	3.9
Closer communication between employers and individual instructors or teachers	4.0	4.0	3.9
Higher standards of conduct for students (stressing employability skills)	3.7	4.4	4.2
Higher work experience requirements for engineering and technical graduation	3.7	4.0	3.9
Locally determined (not national) higher standards for curriculum and content	3.7	3.7	3.8
Grade school and middle school automotive industry or manufacturing-awareness programs	4.0	3.5	3.4
Specific automotive trade academies	4.0	3.8	3.3
Increased business content in school curriculums	4.0	3.6	3.7
Training in team skills	4.3	3.8	4.0
Closer communication between engineering faculty and actual manufacturing firms	4.3	4.2	4.2

Number of responses=135

Other responses:

Need to focus programs on creative teaching methods keeping kids involved and in school - 5
Visit a plant floor - 5

Selected edited comments

- Associates with at least some experience in working with teams have been more valuable than the “booksmart” employees.
- Grade school and junior high are too early to stress manufacturing, but we can expand and integrate places like Focus Hope for all job training.
- I believe that the school administrators and school systems are slow to learn, making closer communication more difficult.
- I do not believe this can be legislated. Where do families and individual accountability fall into this scenario?

- I think there are a large number of potentially very good secondary education teachers in industry who are prevented from teaching due to the certification requirements!
- In my 30 years as an engineer, I have seen things go from bad to worse.
- Many of the design engineers for stampings lack a tool and die background. They lack an intimate understanding of how to form and stamp sheet metal, which makes it more difficult to take a product from design to production without a million engineering changes.
- National standards by professional groups like NACFAM, NCMS, etc. make sense, but the current political persuasion in the U.S. will not accept a national standard imposed on the states by the federal government.
- Our company has been highly involved with local community colleges and high schools. This involvement provides for a better working relationship between both parties and permits us the opportunity to submit ideas for program improvements.
- The development of local standards, closer links between educational facilities and companies, and higher standards of conduct, are all potentially effective.

Other strategic comments on education policy*:*

The education system needs to place more emphasis on vocational jobs:

- Educators at area schools (K-12) need to be informed of other opportunities that are considered "gold collar" jobs. These jobs do not require a 4-year degree to enter the workforce. Providing school-to-work curriculum and better social skills will greatly improve our manufacturing capabilities and standings as "world class" businesses.
- There is a need to increase technical training and eliminate the undesirable attitude toward technical vocational programs in the high school that exists among administrators, teachers, parents, and consequently, the students.
- We have more than enough college graduates, though somewhat lack engineers. Skilled trades and technical staff are extremely scarce, yet politicians only speak of increasing college opportunities.

The education system needs to improve its performance:

- Emphasis on the 3 Rs is the most important issue.
- The K-12 system seems to be the most deficient. University programs are generally adequate.
- The system is so ineffective, a list of local graduates is not available to employers to even send a brochure.
- We are beginning to see reforms being made in our area's educational system. One problem that exists is the lack of a coordinated effort across all levels of the educational system.
- We need to hold our schools (administrators, teachers, and school boards) accountable for the product (students) they teach and ultimately graduate.

Other:

- Many people have the attitude that "I don't have to perform and you cannot fire me." It's hard to aim people to a "no pride" job.
- More technical people, such as engineers, machine repairers, electronics technicians, tool and die makers and repairpersons are needed.
- The continued growth of computers will allow more of today's graduates the opportunity to share in the automotive experience. In today's environment, too many pockets exist where technology has never been introduced.
- The manufacturers have spoiled their employees by paying them too much. They do not contribute in teams or improvement like many employees of second and third tier suppliers.

- The work ethic of “Generation X” is not as strong as previous generations. They have expectations for immediate access to higher level positions and a high salary. We need workers too, you know!
- We are working with the Grand Rapids Community College to start a training program for new hires.
- We have “adopted” several skill centers.
- We recently began using temporary student help in the summer.

Discussion

All of the listed potential policy changes are rated as at least somewhat positive. The expansion of co-op programs and higher standards of conduct were rated as potentially very effective. OEMs and Michigan suppliers differ on 7 of the 15 policy changes. However, it is important to note that they are generally in agreement that the changes could be effective, but disagree on the degree of effectiveness of the seven actions.

The OEMs and the non-Michigan suppliers differ on five of the policy actions. Again, the difference is in the level of effectiveness of the policy changes.

Thirty-eight percent of the Michigan suppliers and 39 percent of the non-Michigan suppliers ranked higher standards of conduct for students among the top three potentially most effective policy changes.

Michigan suppliers (3.8) rate more favorably specific automotive trade academies than do the non-Michigan suppliers (3.3)

Strategic considerations

This question was intended to develop insight into the reported weakness in general education, and more specifically, technical education for the manufacturing sector. In general, the respondents are positive on the potential effectiveness of the listed policy changes, yet not necessarily enthusiastic. In many ways, the education system is a microcosm of society. The product of the general education system may best be described as a product of their environment. Educators, try as they might, are often not able to overcome the challenges of funding issues, drugs, crime, and all else that ails their local communities. Given their response to other questions in this survey, it is not surprising that respondents list a need for higher standards of conduct for students among the potentially most effective of the listed policy actions.

In many instances, technical education (especially for manufacturing vocations) has not been a focal point for public education in recent years. There are many contributing factors to this lack of interest, some industry-related and some educational-related. Even the social status of manufacturing jobs has had an effect on the availability and quality of the vocational education system. Each of the policy actions listed for the development of a better technical education system faces at least two specific barriers. First, there is resistance to change from some people within the educational system and the communication between education and industry has been less than outstanding in recent years. Second, manufacturing suffers from a poor image among educators, parents, and students. Individually, these barriers present a challenge; combined they may appear to be overwhelming. Any effort to overcome them will be difficult, yet critical, to the betterment of technical education.

Many respondents suggest that manufacturing offers the opportunity for the noncollege educated individual to develop a solid career. Yet, it is important to understand that although these opportunities do offer an alternative to the traditional college track, it does not mean that these careers do not require a high degree of training. To be sure, there will continue to be unskilled labor in manufacturing industries, yet these jobs will likely be low wage, and in many aspects,

tenuous. Conversely, as technology continues its rapid change, the need for highly skilled manufacturing careers will continue and will possibly even increase.

20a. Please indicate which of the following types of educational programs your company currently participates in: (check all applicable programs)

Educational programs	Yes, we do participate		
	Percent of responses		
	OEM	MI	Non-MI
Co-op work programs	66.7	57.6	69.4
School-to-work	66.7	40.2	59.4
Student internships	100.0	64.4	60.0
Student mentoring	33.3	41.5	25.8
Teacher job shadowing	33.3	24.4	30.0

Number of responses=129

Other "yes" responses:

Engineering students' projects
High school engineering awareness program
Student employment
Student loan program
Summer employment in high school and college
Summer work

Selected edited comments

Problems companies have experienced (6):

- Most co-op students are not interested in manual machines. They all want CNC machines.
- There are limited opportunities for this type of participation in our area.
- We used to have a co-op with the high school, but in the last few years we have offered it, there was no interest.
- We would like to participate, but there are few educational programs left.

Other options for companies:

- Other programs we have used include the Michigan Jobs Commission, training grants, and tuition payment plan for employees taking accredited college courses.
- The training department is currently establishing a move toward implementing a student ambassador program (school-to-work) that will target 7-12 grade students as well as educate their parents and teachers. We hope to educate the educators about manufacturing curricular needs.
- We do whatever we can to help, including assisting in starting a manufacturing academy for high school juniors and seniors. We are starting a Manufacturing Council Performance Place for teaching our employees.
- We fund training of public school teachers for technical courses.
- We offer an on-site GED program. We have an on-site learning center complete with computers staffed by the local community college.

20b. Round 1 results indicate that a majority of companies responding have participated in some form of educational programs such as school-to-work, co-op work programs, student internship, teacher job shadowing, and student mentoring. What are the critical elements for a successful educational program? (Note: this question was asked in round 2.)

Selected edited comments

Commitment from company/management (20):

- A well developed program that has management support and commitment
- Company commitment to make it work.
- Critical review of the real training needs of employees
- Effective methods to measure training effectiveness
- Managers need to be willing to invest the required time.
- Rotation of assignments by department
- Top management support

Meaningful work that applies training (19):

- Exposure to teamwork environments and skills such as group problem resolution, facilitation, planning and running meetings, time management, etc.
- Meaningful and challenging assignments; networking to increase integration into culture and social comfort
- Meaningful student assignments
- Practical real-world training in manufacturing processes and management
- That once the knowledge/skill is acquired, the performer has an opportunity to use it on the job, and they are supported (resources) and held accountable (feedback, expectations, consequences) for doing it on the job.
- Up-to-date technology in CNC and CAD equipment.
- We work with engineering co-op students. I feel that getting hands-on experience and talking to production labor is the most important part of this.

Communication between students and management (17):

- Ability to set standards and goals
- Complete understanding of goals, objectives, process, procedures, requirements by all parties involved
- Encouraging the improvement of all employees
- Open, honest shared communication
- That both sides take it seriously and have short term as well as long term expectations for deliverables.
- Well structured feedback/evaluation system for learning and efficacy

Commitment/Ability of the students (14):

- Commitment by the student
- Finding candidates to recruit into the programs. There does not seem to be an interest in the manufacturing sector.
- Receiving students who are punctual, bright, literate, math functional, and studious. Also, they must like their job and the skills associated with them.

- Start co-op/internships at junior, not freshman level – too immature and uncertain of plans to integrate into operations.
- Students need to have minimum skill base levels commensurate with their year in school. They need to demonstrate the drive and desire to learn and desire to accept challenging assignments. The company must provide the challenging opportunities.

Close relationship between industry and schools (11):

- Expand the vocational tech base in public schools
- Interchange with industry to ensure that proper educational programs are developed
- School advisory boards should include industry representation
- Some attitude training on the part of the school so students come into the work environment with an understanding of the world of work.
- The critical element of a successful educational program is local industry and local educational institutions working together so that the education being offered matches the employment need.

Other

- Companies must continue with on-the-job training at all times.
- Companies must plan for expenditures.
- Depends on marketing, the economy, and the make-up of the person.
- It is difficult to keep the co-op engineer after graduation due to the competitiveness and the salaries being offered in the market.
- Must find the right fit.
- Programs must deliver some value to the firm as well as to the student.
- Programs should allow companies some kind of protection so students work for the participating company. Experience shows that 4 years of internship and training usually results in a student trained by us at our cost, but goes to work for a company not participating. This does not allow a company to build, only to continually train.
- Programs should flunk the bottom 15 percent, and pay the top 30 percent 50 percent more than normal. I want schools to teach academics and push students to their limits. I do not want wimps. I want hard working intelligent people. I will teach machine operation and skills.
- Programs should include a mix of theory and practice in technical areas.
- Requires a clearly defined successive path with salary expectations to provide incentive for prospective candidates/applicants.
- Somehow, we have to let parents, teachers, school administrators, and students know about the jobs available in manufacturing. The students must know that we need smart, positive, team-oriented people, and not the "D" student. They have to learn about the opportunities and that they can get free education. They would also be in high demand.
- Students must learn to work as a *team*.
- Teachers – what are we doing to address the growing shortage of teachers?
- The training must be driven by a lack of ability to perform a critical expectation on the job. (Established performance gap).

Discussion

A majority of respondents indicate that their companies are active in programs with education systems. All OEMs report having student internship programs, while 64 percent of the Michigan suppliers and 60 percent of the non-suppliers have such programs. The companies also report a high level of involvement in school-to-work and co-op work programs. However, they report a much lower participation rate in student mentoring and teacher job-shadowing programs.

Strategic considerations

In recent years, it has been somewhat fashionable for automotive industry participants to be critical of the public education system. A member of the MAP suggested this question to assess the level of involvement by industry with their local schools. To paraphrase the MAP representative, it is an effort to see who is "walking the walk."

Over the past several decades, vocational education programs have been deemphasized in many school districts. Therefore, there have been fewer graduates with the technical skills necessary to enter the higher-skilled manufacturing sectors. In order to counteract this trend, many companies have proactively developed educational programs with their local school districts. Several MAP participants have indicated through interviews that, in many ways, these programs may be a more effective method of training than the traditional vocational education system. The cost of manufacturing equipment has become a barrier for many school districts in the development of a quality vocational education program. The cost burden of this equipment is compounded by the rapidly decreasing shelf life of many manufacturing technologies. The ability of a school to train students in the basic manufacturing skills and let the private sector assist in developing industry-specific skills may be a cost-effective approach to the development of graduates with the skills necessary to compete. These co-op or career-path programs may also give the company an opportunity to assess the student's potential prior to a commitment and allow the student a better understanding of the rigors of the chosen career.

The current school-to-work system has many similarities with the current engineering co-op and internship system. Survey respondents indicate many 4-year engineering graduates frequently lack applied knowledge or experience (question 18). Several MAP members indicate that they have developed engineering co-op programs to alleviate this problem. A co-op or intern program allows the university to focus on needed theoretical training, while giving the student the opportunity to gain "real-world" experience.

More recently, 4-year business programs have also began to incorporate real-world-based team projects that require students to work with local companies on short-term, highly focused projects in return for academic credit.

The comparatively low rates of participation for teacher job shadowing present an interesting opportunity. Respondents indicate that reform of K-12 is potentially the most effective action of the nine listed policy actions. An important part of any reform is making educators—including teachers—more aware of what skills their students need to be more competitive upon graduation.

For round 2, we asked respondents to indicate what characteristics were important in the successful implementation of an educational program. Those that responded indicated overwhelmingly that a clearly defined outcome, with a strong commitment by student, educator and company, and consistent communication among the parties, is the foundation to a successful education program. It is of interest to note that several comments highlight the need for the student to be of a high caliber. To make such a commitment worthwhile for the company, the student must be willing and capable. Conversely, several comments also highlight the need for the employer to make education programs challenging and applicable to real-world experiences.

21a. A number of public policy actions have been proposed by state and local policymakers to improve labor market conditions for the auto industry. Please rate your opinion of the potential effectiveness of the following policy changes.

Where 1 = is likely to be ineffective, 3 = neither effective nor ineffective, and 5 = potentially very effective

Policy changes	Mean Rating		
	OEM	MI	Non-MI
Subsidized apprenticeship training for small to medium automotive firms	3.7	3.9	3.4
Improved screening of potential job applicants by the employment service	4.0	3.1	3.4
Recruitment of skilled workers and engineers from out-of-state labor markets	3.5	3.2	3.2
Increased efforts to improve and reform K-12 public education	4.3	4.2	4.1
Creation and subsidy of generic technical training modules for automotive workers	4.0	3.7	3.4
Creation and subsidy of distance learning technologies for in-plant training	4.3	3.6	3.6
New state-level efforts to make university education "business relevant"	3.7	3.7	3.8
Job fairs and state marketing of careers in manufacturing	3.7	3.5	3.3
State programs stressing health and safety information	3.3	3.0	3.1

Number of responses=135

Other responses:

Better family involvement - 5
Increase high school emphasis on vocational technical education - 5
Recruit skilled trades from outside the U.S. - 5
Teach problem-solving techniques - 4
Training dollars for employees - 5

Selected edited comments

Policies could be effective:

- Let's focus on the basics for all students. Teach each student a skill that they do with their hands and provide opportunity for those who wish to go beyond a skill to attend universities.
- Public policy programs offer a means of communicating between manufacturers and students (even if it is one-way).
- This state needs to be right-to-work. Educational development equals workforce and allows for economic development.
- We believe that employers should have easier access to training dollars or tax relief for dollars spent on training. Today's system is just too difficult and time consuming for most companies.
- We need to introduce competition into the management of education, in particular K-12.
- We should increase H1B visa allotment because sufficient technical graduates are not available.

Policies could be ineffective:

- I do not feel government should get involved—we just need to produce more lucrative jobs in the industry on a lower level.

- It is best to leave public policy out of the picture.
- State-controlled programs would likely be too restrictive and complicated to be practical.
- The government needs to stop subsidizing industry.
- We need to train our employees our own way; public policy cannot anticipate everyone's needs.
- While it may sound appealing, throwing a lot of taxpayer money toward specific technical training is probably not money well spent. There is too much potential for it to turn into a boondoggle.

Other:

- The Michigan Employment Security Agency should be more proactive. They should offer some basic training and certification.
- The state and industry must be careful in the reform of K-12. We must improve what we have. Also, with regard to university education, there are enough business schools that specialize in this already; let students be students for 4 years. We all have to grow up and work eventually and the cream of the crop will rise.
- We need to wake up or lose all our good jobs—we have to enlighten management, government, unions, and educators that we are in this together. The rest of the world is our competition.

21b. Please rate the following policy options in terms of their potential to alleviate labor shortages for your firm, where 1 = no potential, 3 = moderate potential, and 5 = very high potential. (Note: this question was asked in round 2.)

Policy options	Mean Rating		
	OEM	MI	Non-MI
Recruit out-of-state workers	2.0	2.3	3.0
Improve regional transportation for potential employees	1.5	2.2	2.5
Support increased immigration levels of potential workers with shortage of skills	1.5	2.3	2.4
Subsidize training of unskilled applicants for skilled positions	1.5	3.2	2.9
Improve public transportation flow	1.0	2.1	1.7

Selected edited comments

None

Discussion

The respondents rated most of the listed policy changes as at least potentially somewhat effective. The respondents rated increased efforts to improve and reform public K-12 education as potentially the most effective. The manufacturers also rated highly the creation and subsidy of distance learning technologies for in-plant training. Michigan suppliers rated the subsidy of apprenticeship training for small to medium-sized automotive firms as potentially effective. All three groups rated state programs stressing health and safety as the least potentially effective. Overall, there does not appear to be overwhelming support for the policy actions presented

Strategic considerations

Throughout this survey, respondents have indicated labor scarcity in many labor markets. This question was intended to develop potential responses to the reported scarcity. The use of public policy to meet the needs of industry is, to say the least, somewhat controversial. While the respondents view the listed policy actions as at least potentially effective, several comments suggest that public policy should not have a place in training people for the automotive industry. The balance between the perception of public policy as social welfare for industry and an effective

means of economic development continues to be a challenge for those developing public policy strategy.

As indicated by their comments and the rating of the listed public policies, most respondents appear to support public policy efforts aimed at bettering the education system. Respondents leave little doubt that they feel the K-12 system is in need of reform.

However, there is far less agreement regarding efforts that are more industry-specific. Those that argue for the use of public policy to develop automotive-specific training cite the high transportability of these skills. It is argued that because there is portability of the skills, the high cost of training a skilled worker should be viewed as a benefit to the community, and therefore the public policy could take some of the burden from the company.

2.3 Expansion and Location

22. Past studies of the location decisions of automotive firms have identified a wide variety of factors used by firms in making such decisions. Please rate the relative importance of the following state location factors in your company's decision to site a new facility or expand existing facilities.

Where 1 = not important, 3 = neither important nor unimportant, and 5 = critically important

Factors	Mean Rating		
	OEM	MI	Non-MI
Freight cost in	3.3	2.9	3.4
Freight cost out	3.3	3.0	3.2
Land cost/availability	4.3	3.6	3.6
Local construction cost levels	3.7	3.5	3.3
Proximity to specific customers	4.0	4.2	4.1
Local labor costs	4.3	3.9	4.5
Local labor quality	4.3	4.3	4.6
Proximity to important suppliers	3.5	3.3	3.3
State and local business taxes	4.3	4.0	3.7
Unionization rate	4.0	3.7	4.5
Utility rates	4.0	3.5	3.9
Litigation climate	3.0	3.3	3.6
Regulatory climate	3.7	3.5	3.8
Workman's compensation and unemployment insurance costs	4.0	3.9	4.1
Proximity to other company facilities or headquarters	4.0	3.3	3.1
Quality and adequacy of transportation system	4.3	3.4	3.7
Strong economic and communicative economic development authority	4.0	3.2	3.5
Real and property tax rates	4.0	3.9	3.9
Security cost/insurance	3.0	3.3	3.3
Availability of training subsidies	3.7	3.3	3.3
Quality of education system	4.0	3.7	3.8
Quality and cost of health care system	4.0	3.6	3.7

Number of responses=122

Other responses:

Availability of technical profession - 5
Close to 2-year technical college - 5
Strong, technical labor base - 5

Selected edited comments

- Economic grant packages (not listed above) are an important factor.
- The product line may change the rating for proximity to other company facilities.

Discussion

OEM respondents rate land cost/availability, state and local business taxes, and quality of transportation as the most critically important of the listed factors. Michigan supplier respondents rated local labor quality, proximity to specific customer, and state and local business taxes as the most critical. Non-Michigan supplier rated local labor quality, local labor cost, and unionization rates as the most critical location factors.

The responses of the Michigan component firms to this question more closely match those of the non-Michigan suppliers than they do the Michigan preproduction suppliers. The Michigan component firms differ significantly from the non-Michigan suppliers on only two selection criteria: local labor cost and unionization rates. In both cases, the non-Michigan suppliers rate the criteria as more critical than did the Michigan component firms. However, the responses for Michigan component firms and preproduction firms are statistically different for nine of the criteria. Table 2.2 shows those criteria where the two groups differ. The Michigan component firms rate each of the selection criteria for which they differ as more critical than do the preproduction firms.

Table 2.2
Selected Expansion and Location Factors:
Michigan Component Firms and Michigan Preproduction Firms

Factors	Mean Rating	
	Michigan component firms	Michigan preproduction firms
Freight cost in	3.5	2.3
Freight cost out	3.6	2.3
Local labor quality	4.5	4.1
Proximity to important suppliers	3.6	3.1
Unionization rate	4.1	3.3
Utility rates	3.7	3.2
Quality and adequacy of transportation system	3.9	2.8
Strong economic and communicative economic development authority	3.6	2.7
Availability of training subsidies	3.5	3.0

Strategic considerations

The site selection decision process is very complex and dynamic. This question was an attempt to gain some insight into the factors that play a role when siting a new plant. While it is true that each of the listed factors is at least somewhat critical for some site location decisions, several factors do appear to be more critical. Local labor costs and quality are rated as highly critical by all three groups, yet Michigan suppliers do rate the cost of labor as less critical than do non-Michigan suppliers. Non-Michigan suppliers also rate the unionization rate as more critical than do the Michigan suppliers. Given Michigan's history as a higher wage state with high levels of unionization, it is not surprising that the two suppliers groups have statistically significantly different ratings of labor cost and unionization rates. It is also not surprising that the preproduction suppliers differ greatly from the component firms in their rating of the criteria. These companies supply far different services from the component firms, and therefore may have very different location decision measures.

The OEMs rate four factors significantly different than do either supplier group. Those four are local land cost, proximity to other company facilities or headquarters, quality and adequacy of

transportation systems, and strong economic and communicative economic development authority. In each case, the OEMs rate the factor as more critical than did the suppliers. In fact, overall, the OEMs tended to rate the location factors as more critical than did the suppliers.

23. What role, would you say, has globalization played in your firm's location of new facility investment?

Selected edited comments

Globalization is important (23):

- Globalization has played a significant role. Many customers have become global. There are substantial growth opportunities outside the U.S. Many countries require a local presence in order to have access to their markets.
- It is forcing us to look at locating future manufacturing sites in other countries. Currently, we can be competitive shipping relatively high value/low weight products from the U.S. (Michigan), but future exchange rates and product assembly changes at the OEM (modules) may force us to change.
- It is very important to construct manufacturing facilities globally, both to follow the customer and hedge currency risk and labor cost.
- The global automotive market has prompted our parent company to place manufacturing facilities in North America, as well as throughout the world. Automotive manufacturers increasingly want to have suppliers nearby to promote just-in-time manufacturing as well as to stimulate their local economy.

Globalization is not very important (11):

- At this point in our development/growth, globalization has not played a significant role in our decisions to expand our facilities.
- Globalization has played a minimal role—our business is dependent upon the automotive industry. Our main competition is local.
- It will have to be in Silicon Valley and California to stay on the technology curve.

Other:

- Because of globalization, we have been forced to gain a better awareness of cost for competitiveness.
- Globalization is simply one more factor to consider before expanding in Michigan. It can be the "major negative" factor.
- It has opened many previously disadvantaged locations for consideration.
- We are actively looking for joint ventures. Globalization has made us improve because our customers work with suppliers from around the world, so we have to be as good or better.
- We do not foresee any new facilities; however, globalization has had an effect on our products and processes.
- We will evaluate whether to grow in-state (Michigan) or take the lead and grow with a joint venture elsewhere.

Discussion

A majority of responses indicate that globalization has played a significant role in the location of new facility investment. The need to follow the customer to new markets, hedge international currencies, and cost competitiveness are frequently given as essential considerations in the decision to site plants globally.

Strategic considerations

This was obviously not intended to be an exhaustive exploration of the challenges presented by globalization within the automotive industry. Instead, it was an attempt to gain insight into the

extent of the role globalization has played in the site location decision. As was pointed out in the previous question, many factors are considered when locating a facility, not the least of which is the availability of financial resources. All companies operate in an environment of restricted resources. The decision to invest in local facilities is greatly influenced by the need to expand overseas.

There were 11 comments that indicated globalization has not impacted their location strategy. These firms are likely smaller, with a far more limited scope of operation than the larger suppliers. Whether or not globalization plays a direct role in the site selection decision of these companies, the industry-wide trend to globalization and its implications will likely affect their operation in the coming years.

2.4 Impact of Global Climate Change

24. The recent Kyoto Conference on Global Climate Change, the revision of the 1990 Clean Air Act, and various state initiatives regarding sales of low and zero emission vehicles are policy actions that could affect the characteristics of future vehicles. Which of the following changes are most likely, in your opinion:

Where 1 = not likely, 3 = neither likely nor unlikely, and 5 = very likely

Global climate change policy action	Mean Rating		
	OEM	MI	Non-MI
CAFE standards for passenger cars will be increased significantly.	3.8	3.5	3.8
CAFE standards for light trucks will be increased significantly.	4.0	3.8	4.0
State mandates for sales of alternative fueled or powered vehicles will proliferate.	3.5	3.1	3.2
New, positive opportunities for advanced technologies in vehicle design will develop.	4.5	3.7	3.8
Regulatory air quality standards affecting manufacturing operations will increase dramatically.	4.5	3.5	3.7
State and federal fuel taxes will increase.	3.0	3.9	3.8
Regulations that increasingly treat light trucks as passenger cars will increase.	4.0	3.8	4.0
Restrictions on consumer usage of vehicles (i.e., limit driving, car pooling requirements) will increase.	2.5	2.6	2.4

Number of responses=124

Selected edited comments

- For the U.S., much depends on whether or not Gore will be elected and the Democrats will have a majority.
- Global warming is a hoax.
- I think regulation in this area is coming, but it will be costly, ineffective, and based on emotion—not fact. The fact is, there are approximately 200 million cars on the road and at least 100 million plus are 10 years old. They are the problem—not the new ones. Trying to improve the new ones without dealing with the old ones is a great example of the law of diminishing returns.
- I think the U.S. manufacturers should stop fussing and follow Honda's lead—clean up the air!
- The answers reflect agreement to the Kyoto Conference by the U.S. Congress. If Congress does not ratify—the responses are too extreme.
- The global free market economy is such a competitive, unforgiving force that I have little expectation that global legislation will be effective! Look at Germany for example—that country has worked very hard to make environmental improvements and provide quality of life for its citizens. It plants grass on the roofs of buildings and in parking lots. People ride bicycles and are environmentally conscious. How is Germany being rewarded by the market? All its jobs in manufacturing are being eliminated and shifted to Eastern Europe where low-cost labor and lack of environmental concern make it competitive in the world market. I think the world sociological order is not set up to maintain the earth for more than 100 – 200 years.

Discussion

The OEMs differ in their responses from the suppliers in three significant policy actions. The OEMs rate two of the three (the opportunity for new, positive advanced technologies in vehicle design, and regulatory air quality standards affecting manufacturing operations will increase dramatically) as more likely than do the suppliers. Conversely, the suppliers rate the increase of state and federal fuel taxes as more likely than do the manufacture's. The suppliers also view increases in state and federal fuel taxes as much more likely than do the OEMs.

Strategic considerations

The impact of global climate change has become an issue of significant concern for all automotive participants. The major manufacturers have indicated that, while still unsure of the severity of any such change, they are implementing strategies to address possible causes. It is noteworthy that the OEMs are especially optimistic regarding the potential for positive opportunities for advanced technologies arising from the increased emphasis placed on environmental concerns. As William Clay Ford Jr. takes his position as Chairman of the Ford Motor Company, he has made it clear that his company will strive to be a leader in environmental issues. General Motors, with its immense research and development is also moving rapidly to develop alternative fuel vehicles. The merger of Chrysler with Daimler-Benz has helped Chrysler become more competitive by gaining access to Daimler-Benz's strong technological capabilities.

The opportunities for suppliers to present advanced solutions for environmental issues may never have been better than currently. Yet, even given this new commitment to environmentalism, economic and technological factors remain a critical challenge.

There is little doubt that market forces will have a profound affect on the future of alternative fuel vehicles. For decades, the political system has tended to place industry in a position of having to meet government standards that do not necessarily correlate with the needs of the consumer. Much as the California Air Resource Board has relaxed its zero emissions vehicle requirements as technology has proven temporarily unfeasible, technologic feasibility combined with economics should drive policy. The high rating by the OEMs for new positive opportunities for advanced technologies suggests that they believe that opportunity for such advances are viable.

Regardless of the technology, any change to a new powertrain paradigm will take years, or even decades, to reach full market penetration. Although conversion of the vehicle fleet would likely occur slowly, it does offer the industry an opportunity to obsolete the current product.

The OEMs indicate that they believe regulatory air quality standards affecting manufacturing operations will increase significantly. The potential for more stringent air quality standards presents a challenge for OEM assembly plants. Even as the industry converts to waterborne or powder paint shops, they face concerns over emissions from painting operations. Although these new facilities greatly reduce volatile organic compound emissions, they do not eliminate them. Emissions from paint shops and other large-scale manufacturing operations will likely be increasingly scrutinized by government in an attempt to reduce pollutants that may affect global climate change.

A final note on the differences in responses between OEMs and suppliers on the global climate change questions is pertinent. We suggest that the readers pay close attention to the responses given by the OEMs. The global climate change issue is of critical importance for all industry participants, yet the OEMs may be best positioned to evaluate the issue. We suggest that the OEMs may be the thought leaders, not only because they are in a sense the ones with the most to lose—and to gain—but they are also the ones that have the most resources to allocate to the topic. The identification of differences between suppliers and OEMs is an important element of this survey.

25. What percentage of your firm's sales and employment is and will be tied to the final sales of light trucks (including minivans), currently and in 2003?

	Median Response					
	Current			2003		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Sales	45%	35%	20%	4%	40%	20%
Employment	35	35	18	—	40	20

Number of responses=117

	Interquartile Range					
	Current			2003		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Sales	10/57.5%	13.75/50%	10/33%	—%	20/50%	12/37.5%
Employment	0/60	12.5/50	5/27.5	—	20/50	9/32.75

Number of responses=117

Selected edited comments

- All of our required expansion is due to more involvement in the light truck industry.

Discussion

The Michigan suppliers indicate a much higher percentage of sales and employment dedicated to light truck production. Interestingly, the percent of sales estimates tied to light trucks is much less than the share of light trucks of the overall market.

Strategic considerations

Sales records indicate that in November 1998 for the first time, light trucks outsold cars in the U.S. The heavy reliance on light truck sales for corporate profits has placed the automotive industry in a profitable, yet potentially precarious position. While many companies are making strong profits on light trucks, it is likely that few are doing so with small cars. Importantly, there are clouds on the horizon for trucks.

Respondents indicate that they expect CAFE standards for light trucks to increase significantly in response to global climate changes. While increased CAFE is certainly a possibility, increased emissions requirements such as those that the California Air Resource Board has recently developed are also a concern for companies that rely on light truck profits. Another potential challenge is from that of consumer safety groups that are raising concern over the mass differential between passengers and light trucks.

26a. If light truck CAFE standards are raised significantly (e.g., from 21 to 25 mpg), what will be the likely impact on the domestic vehicle market? (Assume light truck prices remain unaffected).

Where 1 = not likely, 3 = neither likely nor unlikely, and 5 = very likely

Impact on market	Mean Rating		
	OEM	MI	Non-MI
Light vehicle sales will fall permanently; buyers will not substitute higher fuel economy trucks or passenger cars.	2.5	2.6	2.7
Total vehicle sales will only fall marginally, as vehicle buyers switch to higher fuel-economy vehicles.	3.0	3.1	3.5
Light truck sales will fall only marginally, as vehicle producers offer new technologies (such as direct-injection diesel engines and lightweight materials) to meet mandates.	3.3	3.7	3.8
Vehicle buyers will not accept new technologies and sales will fall significantly.	3.5	2.2	2.2
Downsizing of light trucks will lead to reduced utility and sales.	2.8	2.7	2.6

Number of responses=123

Other responses:

Economy - 4
Fads, mousetraps, inventions - 4

Selected edited comments

Vehicle pricing will determine the impact on the market:

- If standards are raised for better miles per gallon and safety standards but pricing stays the same, light truck sales may increase; consumers who may have purchased a small car may opt for a truck instead.
- Most sales are driven by price. If there is stable pricing, there will be stable volume. Any decrease in truck size may drive users to larger vehicles.
- The OEMs who can offer the biggest vehicle and best performance, without too much of a price penalty, will have the market. Most buyers of light trucks want them for convenience of their size, and will continue to pay for that convenience as long as they still get comfort and performance.

Other:

- Give the consumer a vote in setting standards.
- It is not realistic to assume prices will not be affected.
- Light trucks will remain popular for some time.
- Results will also be dependent on fuel prices.
- Other crucial issues include economic status, generation cycles, upcoming fads, etc.
- There will be a natural move back to passenger and small cars as baby boomers age and their children get older. Minivans will still be popular no matter what happens.

Other strategic comments on the effect of higher light truck CAFE:

A higher CAFE will have a negative impact:

- Government interference here is a mistake. No good can come of it.
- Higher light truck CAFE will cause at least two market disruptions. First, it raises the barrier between where market demand is really going (i.e., large, powerful, useful transportation) and where government says the market should be. Second, it increases the likelihood of nonattainment and/or relocation of production to OEMs who would rather pay than switch.

A higher CAFE will have a positive or small impact:

- Better products will result from an increase in CAFE. Look at the effect of CAFE standards on automobiles.
- It may offer retooling opportunities that help OEM machine tool suppliers.
- Products we provide to the market are generally lighter weight versus the competition; thus an advantage is most probable.
- The sales of light trucks have increased because of consumer acceptance of the vehicles. I believe the market would be more affected by changing consumer trends than by a change in the CAFE.

Light trucks will be reengineered and redesigned:

- Higher CAFE will lead to an increase in the use of lighter materials.
- Trucks will get lighter and frontal areas will be reduced.
- Expect new vehicle designs to accommodate the change without major effects to the features of light trucks.

Other:

- Higher CAFE for light trucks will happen.
- I believe that the only people interested in CAFE are politicians.
- If increased light truck CAFE would lead to a reduction of sales, we would be negatively impacted.
- Manufacturers will attempt to bypass the regulation by importing, etc.
- The capability exists today to incorporate higher fuel economy into light trucks. It is already in cars that weigh more than the trucks. Profit margins in the truck market would likely suffer, though.
- Trucks will become more carlike; trucks will be negatively affected in the short term; and vehicle sales should be consumer-driven.
- We believe the light truck market will continue to grow.

26b. If light truck CAFE standards are raised significantly (e.g., from 21 to 25 mpg), what will be the likely impact on your firm's sales and employment?

Where 1 = not likely, 3 = neither likely nor unlikely, and 5 = very likely

Impact on sales	Mean Rating		
	OEM	MI	Non-MI
We will benefit from a switch to new technologies.	3.0	3.1	3.0
We will lose significant sales (20% or higher) and decrease employment.	3.0	2.1	2.3
We will switch product markets and maintain sales and employment.	2.0	2.7	2.9

Number of responses=121

Other responses:

Capitalism, creativity - 4
Minimal change - 4

Selected edited comments

- People will still buy vehicles in the longer term. There could be a short-term drop in sales as people hang on to older large vehicles a few extra years.

Discussion

Respondents were neither overly optimistic, nor overly pessimistic regarding any of the listed impacts. Suppliers rated the possibility that light truck sales will fall only marginally, as vehicle producers offer new technologies as the most likely of the listed impacts. Also, they rated the lack of acceptance by buyers of new technology as the least likely. OEMs differed significantly from suppliers in their rating of the acceptance of new technologies and in their prediction of a subsequent significant fall in sales. Whereas the suppliers viewed it as highly unlikely, the OEMs were more inclined to rate it as somewhat likely.

Strategic Considerations

As light trucks become a larger percentage of the total vehicle fleet, there increasingly becomes pressure to raise light truck CAFE standards closer to that of passenger cars. Respondents agree that it is likely CAFE will be increased (question 24). Yet, they do not appear certain of the likely impact of such an increase. The ratings and subsequent comments reflect this uncertainty.

Also, there is growing interest over the implications that more stringent emissions may have on light trucks. In an effort to reduce carbon dioxide emissions, many manufacturers had been developing cleaner diesel engines for light trucks. However, even these cleaner diesel engines are not likely to meet particulate levels that have been proposed by the California Air Resource Board.

It is worth noting an interesting difference in responses by OEMs. OEMs rates as somewhat likely that vehicle buyers will not accept new technologies and sales will fall significantly. Conversely, their response in question 26a regarding the opportunity for new positive opportunities for advanced technologies—for which they are much more positive. It is apparent that the technological and economic challenges presented by higher fuel (and emissions) standards are not simple.

Finally, it is interesting to note the relative lack of concern by respondents regarding the implications of higher CAFE on the respondents' firms. Respondents indicate little or no likely impact on sales or employment if CAFE were to be increased.

27. A number of federal public policy actions have been proposed to address global climate change concerns. Please rate the potential effectiveness of the following policy actions to address public concerns of global warming.

Where 1 = is likely to be ineffective, 3 = neither effective nor ineffective, and 5 = potentially very effective

Policy changes	Mean Rating		
	OEM	MI	Non-MI
Increase the amount of joint government/industry programs to develop advanced technologies.	3.8	3.2	3.3
Provide incentives designed to encourage consumers to use energy-efficient technologies.	3.5	3.7	3.7
Provide incentives to manufacturers for the use of energy-efficient technologies.	3.8	3.8	4.0
Undertake extensive cost-benefit analysis to establish parameters for action.	4.0	2.8	2.9
Senate ratification of Kyoto protocol	1.8	2.4	2.8
Take no action; wait for more conclusive evidence of climate change.	3.3	2.9	2.0
Allow for the inclusion of foreign companies in USCAR Partnership for a New Generation of Vehicles (PNGV) to increase opportunity for technological gain.	2.8	3.1	3.3

Number of responses=126

Selected edited comments

- Again, I am not that optimistic that environmental issues will be resolved worldwide.
- Based on the delay factor for government programs, and the severity of the situation, swift action must be taken now with major emphasis and support from world leaders.
- Global warming has not been shown to result from human activity at this time. However, we should consider “greenhouse gases” alongside other pollutants and minimize them where we can.
- When government is working with industry to develop advanced technologies that could reduce emissions, government gets a firsthand understanding of cost and time involved. Incentives to get people to buy vehicles that they do not like or want will not work too well.

Discussion

The OEMs indicate that they believe the use of extensive cost-benefit analysis to establish parameters for action is potentially the most effective of the listed actions. An increase in the amount of joint government/industry programs to develop advanced technologies, and incentives to manufacturers for the use of energy-efficient technologies are also ranked as potentially effective by the OEMs. The suppliers also rate incentives to manufacturers for the use of energy-efficient technologies as potentially effective. None of the three groups appears to believe that ratification of the Kyoto agreement by the U.S. Senate is an effective way to address global climate change concerns.

Strategic Considerations

It is likely that there will be continued pressure to develop public policy to address the global climate change concerns. However, the form of such policy appears to be far from certain. Respondents appear to believe that Senate ratification of the Kyoto protocol would not be an

effective approach to addressing global climate change. Although the manufacturers are not positive regarding the current political agreement, they do indicate a need for extensive cost-benefit analysis to determine a proper course of action.

Not surprisingly, the respondents are much more positive with regard to programs—for both manufacturers and consumers—designed to provide incentives to use energy efficient technologies. It is likely that many environmentally friendly technologies will not initially be cost competitive. Therefore, it may be essential to use some form of incentives to encourage both the development and use of such technologies.

Finally, the manufacturers' responses and comments from the other questions in this survey relating to global climate change indicate a need for government and industry to work together, and with all other concerned parities to develop an action plan.

2.5 Health Care

28. Does your company currently provide health care benefits to your employees?

	Percent of respondents		
Yes	**OEM**	**MI**	**Non-MI**
Health care benefits	100%	100%	100%

Number or responses=135

Selected edited comments

- Health care benefits are a major cost but a major recruitment factor.
- Health care benefits for hourly employees are negotiated with our major unions. Health care benefits for our salaried employees are modified periodically to remain competitive.
- Health care costs must be controlled.
- Our plan is co-pay with cost shared by the employer and the employee.
- WOW!! Cost-Cost-Cost (just to stay competitive with the competition and the auto companies).

Discussion

All responding OEMs and suppliers provide health care coverage for their employees.

Strategic considerations

The data suggest that providing health care insurance for employees is a necessity in the automotive industry across all company sizes and geographic locations.

Interviews with MAP members conducted as part of the Michigan Automotive Policy Survey indicate that production employees may consider manufacturing employment less desirable than employment in the retail and home construction industries. These industries often provide similar pay but do not carry the stigma of dirty facilities and difficult work that manufacturing employment sometimes does. Providing health care insurance, while a necessity in the automotive industry, may afford a strategic advantage over employers in other industries competing for the same labor.

It is important to note that this argument may only be true for production and low-skilled labor. High-skilled and white collar employees are more likely to demand health care benefits regardless of the industry in which they are employed.

29. If your company does provide health care, does your company self-insure?

	Percent of respondents		
Yes	**OEM**	**MI**	**Non-MI**
Self-insured	75%	42.1%	68.6%

Number or responses=131

Selected edited comments

- Self-insuring is the best thing we ever did—we have a great program.
- We feel it is the most cost-effective alternative.

Discussion

A majority of the OEMs (75 percent) self-insure their health insurance plans. It is important to note that the OEMs only self-insure a portion of their health care benefits and the remainder is provided by conventional insurance plans.

A higher percentage of non-Michigan suppliers report self-insuring than do Michigan suppliers (69 percent versus 42 percent).

Background

A self-insuring firm pays employees' medical expenses from a fund into which regular contributions are made. These firms generally also have Stop-loss policies provided by an insurance company for cases which get too expensive for the employer to cover. In some cases, particularly when a firm both self-funds and self-administers its health care program, self-insuring requires a significant amount of cash to be set aside and carries the risk of saddling the employer with large unexpected expenditures. For these reasons, self-insuring is generally considered a better option for larger companies with more resources to devote to such a plan.

Self-insuring is popular because it offers several potential benefits over conventional health insurance policies. Interest can be collected on the unused portion of a self-insurance fund. Self-insuring allows a high degree of flexibility in designing a health care package because self-insured plans are not subject to many state health insurance regulations. Also, payments are made only for expenses incurred with no extra expenditures which would otherwise be a profit for an insurance provider.

Self-insuring also has potential drawbacks. A self-insured company must either use new staff or hire a third party administrator (TPA) to handle the complex administration of the program.

According to the Bureau of Labor Statistics, United States Department of Labor, nearly half (46 percent) of medical plan participants were in self-funded plans in 1993.[7] Although this statistic is several years old, it does suggest that firms operating in all industries are turning to self-funding in an effort to control rising health insurance costs.

[7] Schwenk, Albert E. Trends in Health Insurance Costs. *Compensation and Working Conditions Online* [online serial], Winter 1996, Vol. 1, No. 3. Available: http://stats.bls.gov/opub/cwc/1996/winter/brief1.htm [November 24, 1998]

Strategic considerations

The survey data suggest that self-insuring is more popular with out-of-state suppliers than with those based in Michigan. This apparent result may be caused not by location but instead by a difference in the size of the firms in the survey sample. The non-Michigan suppliers in the survey sample tend to be larger than those based in Michigan (median employment of 413 for non-Michigan firms versus 175 for Michigan firms).

The difference in size is caused by the fact that preproduction suppliers (engineering firms and suppliers of tooling and major equipment) tend to be smaller than component suppliers. They also tend to locate in Michigan because they require proximity to OEMs more than do component suppliers. In fact, all of the preproduction suppliers in the survey sample are located in Michigan. Because the non-Michigan sample consists entirely of component suppliers, it has a higher median employment and, because larger firms are more able and more likely to self-insure, it may create the impression that non-Michigan firms are more likely to self-insure. To better illustrate the point, Michigan and non-Michigan component suppliers with employment greater than 500 are compared in the table below. The low number of responses from this size segment prevents a definite conclusion from being drawn but the data suggest that comparable non-Michigan suppliers are not more likely to self-insure than are their Michigan counterparts.

Table 2.3
Self-Funding Among Component Suppliers with Employment over 500

	Frequency	Percent
Michigan	13	86.7%
Non-Michigan	10	71.4

Because self-funding health insurance may require considerable resources (particularly for firms who self-administer their self-funded health care programs), it is believed to be an option better suited to larger companies. The table below compares responses from suppliers grouped by employment.

Table 2.4
Self-Funding Among Suppliers

Employees	Frequency	Percent
<100	4	9.5%
1-249	16	25.4
250-499	19	61.3
500+	30	81.1
1,000+	14	87.5

The table suggests that company size is a bigger factor in the decision to self-fund than is location. The largest suppliers (those with over 1,000 employees) show the highest level of self-insuring, suggesting that, because of their size, these suppliers can take advantage of an option not affordable to smaller firms.

30. What type of health care programs does your company offer (check all applicable programs) and what percent of your company's employees participate in the offered health care program?

Health care programs; Yes, we do participate:	Percent of responses		
	OEM	MI	Non-MI
Traditional indemnity	75%	59.4%	60.0%
Health maintenance organization (HMO)	100	68.7	68.0
Preferred provider organization (PPO)	100.0	83.8	82.6
Point of service (POS)	50.0	29.5	41.2

Number or responses=104

Other responses:

- Vision, dental, short-term disability, long-term disability: 100%
- 13 percent of our employees waive coverage.
- 13.4 percent of our employees elected no medical coverage because they were covered by another group medical plan (spouse).
- Employees are eligible to participate after 6 months of service. Benefits are 100 percent paid by the employer, thus 100 percent of those eligible do participate.
- For some employees, the company pays for coverage, but for others, they may participate but pay their own. However, all employees have PPO.
- HMO is a new option for hourly employees.
- Percentages are based on 1997 year-end (active and retired) hourly and salaried members. Our actual percentages do vary based on the covered population.

Selected edited comments

- Some retirees do not require insurance.

Discussion

All four of the responding OEMs report participating in HMO and PPO plans. Three of the four report participating in traditional indemnity plans, and two of the four participate in POS plans.

Among both Michigan and non-Michigan suppliers, preferred provider organization (PPO) plans are most popular, with 84 percent of Michigan and 83 percent of non-Michigan suppliers reporting participation. Health maintenance organizations (HMOs) are the second most popular plan reported, with 69 percent of Michigan and 68 percent of non-Michigan suppliers participating. Fifty-nine percent of Michigan and 60 percent of non-Michigan suppliers report participating in traditional indemnity plans, making them nearly as popular an option as HMOs. The respondents rank point of service (POS) plans a distant fourth with 30 percent of Michigan and 41 percent of non-Michigan suppliers reporting participation.

Background

Preferred provider organization (PPO) plans are most popular with the respondents. Under this plan, patients are free to choose their doctor from a network of participating physicians who work out of their own facilities. These physicians agree to charge a reduced rate for their services (generally around 15 percent below normal levels) in exchange for higher volume from the PPO. The plan then covers a predetermined percentage of charges. (The patients are also free to

choose doctors outside of this network but the plan covers a lower percentage of the costs charged by these physicians.)

The second most popular program is the health maintenance organization (HMO). Under this plan, most doctors are employees of the HMO and work at HMO clinics. These clinics are often able to provide a wide variety of tests and services. For care requiring facilities not owned by the HMO, patients use hospitals contracted by the HMO. The HMO then covers all or part of the cost of care. HMOs require little out of pocket expense from the patient but do not cover nonemergency care outside the HMO network.

Third in popularity among survey respondents are traditional indemnity plans. Under this plan, patients are often free to use any physician they choose for medical services. The insurance provider then pays a preset amount for the services. Any charges over that amount are generally paid on a percentage basis by the insurance provider, often with a deductible to be paid by the patient.

Least popular among respondents is the point of service (POS) Plan, sometimes referred to as an open-ended HMO. This plan functions like an HMO, but requires slightly higher copays from the patient. In exchange, patients have the option to use services from providers outside the POS network. The POS plan then pays a lower share of the cost.

Strategic considerations

Because traditional indemnity plans tend to be the most expensive, it is not surprising that respondents do not offer them as frequently as they offer their lower-cost rivals. PPO and HMO plans tend to be less expensive for both the employer and the patient. They also tend to offer as much coverage as a traditional indemnity plan. The popularity of these plans suggests that they are an attractive alternative in an environment of constantly rising costs.

In question 31, respondents are asked whether they expect their company's health care costs to rise in 1999. A large majority expect that their costs will increase. The responses to this question suggest that as automotive firms face greater costs, they will continue to turn to lower cost health plans such as PPOs and HMOs.

31. Compared to 1998, in 1999 do you expect your firm's health care costs to:

OEM	Percent of responses	Median Range	Interquartile Range
Increase	100%	5%	5/7.7%
No change	0	—	—
Decrease	0	—	—

Number or responses=132

MI	Percent of responses	Median Range	Interquartile Range
Increase	81.4%	7%	5/10%
No change	17.5	—	—
Decrease	1.0	12.5	0/25

Number or responses=132

Non-MI	Percent of responses	Median Range	Interquartile Range
Increase	77.1%	6%	4.5/10%
No change	17.1	—	—
Decrease	5.7	11.5	8/15

Number or responses=132

Selected edited comments

- Health care costs always seem to rise!
- Health maintenance plans cannot totally offset the rising costs of medical care.
- Medical inflation and an aging workforce have caused an increase in costs.
- The total trend, including the impact of prescription drugs and forecasted 1999 HMO rates, is "heating up" versus the mid-1990s.
- We will be switching to self-funding.

Discussion

Generally, the respondents agree that their health care costs will rise in 1999. Eighty-one percent of Michigan and 77 percent of non-Michigan suppliers expect their costs to rise. All four responding OEMs expect their health care costs to be higher in 1999.

Michigan suppliers who expect an increase in health care costs for 1999 expect that increase to be 7 percent. Non-Michigan suppliers expect an increase of 6 percent. OEMs expect their health care costs to increase by 5 percent. The relatively close interquartile ranges for all these responses indicate a strong consensus among all three groups of respondents.

Strategic considerations

The panel's almost unanimous agreement that their health care costs will rise indicates just how paramount the issue of cost is to health insurance. Cost dominates the comments made by the panelists for all questions in this section of the Michigan Automotive Policy Survey.

During the late 1980s and early 1990s health care costs rose at double-digit rates. According to the Bureau of Labor Statistics, United States Department of Labor, the highest cost increase of this period occurred in 1988, when costs increased almost 15 percent over the previous year.[8] The mid-1990s have seen that rate slow to single digit levels. The median for all panelists' responses indicates an expected cost increase of seven percent in 1999, indicating that the panelists expect cost increases to stay below the levels seen a decade ago.

Because cost is such a significant problem, many employers who provide health care benefits require participating employees to share the expense. According to the Bureau of Labor Statistics, in 1980 72 percent of employers providing health insurance paid for the coverage in full. In 1986, that number was down to 54 percent and down even lower to 38 percent in 1993.[9] The rising cost of health care insurance is proving a burden—not only for employers but also for employees who have to sacrifice a portion of their earnings to keep their coverage.

One panelist's comment raises an issue which may be of considerable importance in the future. While increases in the cost of health care have fallen to single digit levels, it is a concern that they may return to double-digit levels in the near future. Managed Care plans such as HMOs saw an increase in use and efficiency during the early and mid-1990s. It is possible that if the pace of efficiency gains in these organizations slows, the rate of cost increase may return to previous levels. In interviews conducted with MAP members as part of the policy survey, MAP members generally indicated that they had largely resolved their health care insurance problems to their satisfaction. A possible higher rate of cost increase in the future may prove a significant challenge to firms who have managed to cope with current levels of cost increases.

[8] Ibid.
[9] Ibid.

32. Does your company currently provide health care benefits to your retirees?

	Percent of responses					
	Yes			No		
	OEM	MI	Non-MI	OEM	MI	Non-MI
Health care benefits	100%	16.8%	22.9%	0%	83.2%	77.1%
If yes, do you require a premium?	50%	52.6%	75.0%	50%	47.4%	25.0%

Number or responses=130

Selected edited comments

None

Discussion

All four responding OEMs report providing retirement health care benefits to their employees. Conversely, only 17 percent of Michigan and 23 percent of non-Michigan suppliers provide retirement health care benefits.

Two of the four responding OEMs require a premium from employees for retirement health care benefits. Fifty-three percent of Michigan and 75 percent of non-Michigan suppliers who provide health care benefits require a premium.

Strategic considerations

Unlike health care benefits, retirement health care benefits have not become standard in the automotive supplier industry.

Because automotive suppliers are generally smaller firms than OEMs, they are less able to absorb the cost of a program as expensive as retirement health care. Retirement health care is an expense that is continually paid to employees who no longer contribute to a firm's revenue flow, therefore it is a considerable burden on a smaller company.

Retirement health care plans vary widely. Some are supplemental, covering care not provided by Medicare. Some are used as primary health care plans with Medicare covering care not provided by the retirement health care plan. Some employers only provide retirement health care benefits to early retirees until they turn 65 and become eligible to receive Medicare.

Retirement health care is not equally expensive for all companies. Newer suppliers and OEMs may have few or no retirees and therefore incur smaller losses despite providing retiree health care. Although this is only a temporary situation, it may give these firms an edge in cash flow for several years.

While it would seem that providing health care insurance is a necessity for automotive suppliers, that may not be the case for retirement health care. Automotive suppliers offering retiree health care benefits may have a competitive advantage over other automotive suppliers as well as firms from other industries (such as construction and retail) who compete for the same labor.

Of those automotive suppliers in the survey who do offer retiree health care, a large portion (50 percent of OEMs, 53 percent of Michigan suppliers and 75 percent of non-Michigan suppliers) require a premium. As discussed in question 33, cost appears to be the biggest issue confronting

firms providing health insurance benefits. The large proportion of sampled firms requiring a premium for retirement health care indicates that cost is also a critical issue in providing retiree health care benefits.

33. Please describe the strategic consequences of the current health care system's performance as it relates to your firm.

Selected edited comments

- Certain changes in federal laws have placed an extra burden on employers, whether considered as a previous or a new employer.
- Continual cost increases have caused our company to reduce benefits.
- Costs are high because we use traditional Blue Cross, but our employees are very satisfied with the benefits.
- Costs will rise as our work force ages. Absentee rates should decline as employees are healed and returned to work faster.
- Due to the steady increase in medical costs greater than inflation, we may be forced to pass more cost on to employees.
- Employees expect the benefit (health care) without acknowledgement of the dollar value of the benefit received.
- Health care costs are eating into profits.
- Health care costs continue to increase and will have to be offset by higher productivity.
- Health care costs, while not rising as rapidly as in the past, have become a very expensive benefit program that significantly impacts profits.
- Health care coverage at the high rates we provide is a cost of entry in the automotive market. This is a large cost we absorb. We are competing with GM, Ford, Chrysler, etc. for the same talent. It is a supplier's (i.e., labor) market, and they demand full-coverage.
- Health care is a major cost driver. It requires constant monitoring.
- Health care is a very expensive cost of doing business and employees do not appreciate changes.
- Health care is an area where costs cannot be controlled nor predicted. Health care, in general, should move toward proactivity (wellness) versus reactivity.
- Health care is an uncontrolled cost factor that affects our company's profitability.
- Health care is one of our highest variable cost items.
- Health care is our single highest indirect cost.
- Health care is very expensive.
- Health care premiums have risen dramatically the past 10 years. It is getting silly. The cost rises and the coverage drops. Cost sharing could be a reality within 5 years.
- Health care will continue to increase the cost of doing business and force the organization to look at other health care providers, and that may not be as satisfactory as our current plan.
- Health care, in a variety of forms including vision, dental, hearing, etc. is "required" to be offered in order to compete in our market place. It will become an ever-increasing part of our overhead in the future.
- If costs of health care continue to rise, a percent of the cost will have to be shifted to employees, or current benefit levels reduced, or a combination of both.
- It helps with women and older men. It hurts us with regard to young people, who do not feel the need for insurance. It could be a better factor if Medicare/Medicaid were further reformed so women had to work and had to take company insurance.
- It is our biggest expense except for wages. It has steadily risen in cost for the past 10 years! We are at their mercy.
- It is simply another cost item.

- Our challenge is to work on the elimination of waste and the improvement of quality in the health care delivery system. Best practices of care must be implemented as quickly as possible. Improving quality and reducing health care costs are the key visions achieved through organized systems of care, disease management, care management, utilization review management, and wellness and health promotion.
- Our cost for 1998 is up substantially from 1997.
- People are staying at work longer to keep health coverage until Medicare/Medicaid starts.
- Pressures to contain costs force us to be more restrictive regarding the types of coverage we can offer.
- Rising costs result in deterioration of profit margins as well as greater cost shifting to employees.
- Rising costs will affect competitiveness.
- Self-funding of our benefit plan has not proven profitable for our firm over the past two years, as costs have risen dramatically. We are shopping for other benefit options in order to better control these costs.
- Slowly but surely, like the world of academia, the health care system is becoming more efficient, cost-effective, and customer-orientated. If the trend does not progress, the effects would spell disaster for everyone.
- Stable rates make it much easier to plan in the future.
- The creation of preferred-provider organizations and managed-care organizations has helped to contain the double digit cost increases experienced several years ago, but the lack of emphasis on wellness components to health care is probably causing costs to be greater than they can be.
- The current health care system has had no real effect.
- The current system has shown increases of over 10 percent per year in recent years. We are being forced to explore other alternatives and are planning on self-insuring before the end of 1998.
- The current system makes health care a negative for people aging in the work force. Therefore, it impacts productivity.
- The increasing costs are making U.S. manufacturers less competitive globally.
- The managed care products currently are limited in the Battle Creek/Kalamazoo area. This is due primarily to the bad reputation of HMOs from the past 10 years.
- The present system has put market forces to work to the benefit of organizations paying for health care and has done so without penalizing the recipients. I hope we can keep this basic arrangement.
- The relative percent of payroll for health care continues to increase.
- We are looking at getting out of self-insurance.
- We are satisfied with the current health system.
- We feel health care is an incentive for higher quality and production.
- We must find a way to stabilize costs.
- We must improve the quality of health care service and reduce cost incurred to no more than the rate of inflation (consumer price index).
- We must push toward more cost-effective plans—more managed care.
- While we have experienced lower rates of cost growth in recent years, it has become apparent that we must fully analyze the drivers behind our health care costs and implement appropriate programming. We have been focusing on increased awareness of health risks, management of diseases, and health promotion as a way to manage costs in the future.

Discussion

The high cost of health insurance is by far the most frequent topic of comments. Eleven comments address high cost alone, seven address the impact of high health care costs on productivity and profits, and five address reducing costs or passing them on to employees. Another frequently mentioned topic is the necessity of providing health care to compete in the market for employees (five comments).

Strategic Consideration

The sheer number of responses to this question is an indication of the difficulty and frustration the issue of health care causes. The issue of cost, by a large margin, dominates the comments. Many of the comments which do not address cost directly address other ways high health care costs can negatively impact a firm. The panelists indicate that the high cost of health care insurance hurts their bottom line. It forces them to provide less expensive, and less comprehensive, medical coverage. It makes the sharing of cost with employees necessary and drives some respondents to consider self-funding as a source of relief.

The panelists suggest that health care is a necessity for their operation. Comments indicate that employees demand coverage and are not sympathetic towards their employer's difficulty in dealing with the expense. Because automotive suppliers are frequently located near OEM operations, they compete with them for labor. This makes providing a benefits package competitive with that of the OEMs a necessity for these firms.

The respondents' comments suggest that the issue of health care is a long way from being satisfactorily resolved. There appears to be a strong consensus that health care is currently too expensive and that while progress has been made in curbing the rate of cost increases, more changes will have to take place in the very near future.

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APPENDIX A

A.I. Sampling

A.I.1. Description of sampling

The survey sample for this study involved five different groups: the ES202 Record Population, the Machine Tool and Metalworking Roundtable, the MAP, AIAM, and the *ELM Guide*.

The ES202 Record Population is a facility population tape provided by the Michigan Employment Security Administration's (MESA) Division of Research and Statistics. The ES202 tape is an insurance record of all Michigan employers and includes information on every Michigan facility's employment and industry coding. OSAT requested a listing of all Michigan facilities with SIC codes for automotive components, tool and die, and engineering and testing. The SIC codes and classifications used are as follows:

Automotive Components	
2396	Automotive Trimmings, Apparel Findings, and Related Products
2531	Public Building and Related Furniture
3465	Automotive Stamping
3519	Internal Combustion Engines, Not Elsewhere Classified
3592	Carburetors, Pistons, Piston Rings, and Valves
3647	Vehicular Lighting Equipment
3691	Storage Batteries
3694	Electrical Equipment for Internal Combustion Engines
3711	Motor Vehicles and Passenger Car Bodies
3713	Truck and Bus Bodies
3714	Motor Vehicle Parts and Accessories
Tool and Die	
3544	Special Dies and Tools, Die Sets, Jigs and Fixtures, and Industrial Molds
3545	Cutting Tools, Machine Tool Accessories, and Machinists' Precision Measuring Devices
Engineering and Testing	
8711	Engineering Services
8731	Commercial Physical and Biological Research
8734	Testing Laboratories

OSAT analysts removed from the tape all facilities belonging to motor vehicle manufacturers and all facilities belonging to engineering and testing companies with fewer than 10 employees. After these deletions, the tape listed 4,028 facilities with combined employment of 217,005. OSAT analysts then determined the number of companies, not facilities, represented on the tape. Facilities were removed from the tape if multiple facilities belonged to the same company and the company was already represented. In such cases, the facility chosen was the likely headquarters or primary manufacturing facility. The remaining population of 3,745 companies was divided into three employment-size strata: 1 to 249 employees, 250 to 499 employees, and over 500 employees. Companies then were sampled randomly by industry-size strata. They were sampled on the basis of anticipated automotive status, probable response, and relative share of the substrata in overall Michigan automotive population. The rate at which the companies were sampled is as follows:

	1 to 249 Employees		250 to 499 Employees		Over 500 Employees	
	MI Facilities	Sampled	MI Facilities	Sampled	MI Facilities	Sampled
Automotive Components	904	7.41%	87	35.63%	51	100.00%
Tool and Die	1844	5.97	15	100.00	3	100.00
Engineering and Testing	819	8.42	13	100.00	3	100.00

OSAT staff located the telephone numbers for the sampled companies and screened them by telephone. Companies were asked if a major portion of their business was for the automotive industry. If they reported significant automotive business, they were asked for the company's headquarters and the name of the company's president or chief executive officer, someone to whom the survey should be sent. Surveys were mailed to 392 companies selected from the ES202 tape. Seventy-two (22 percent) of the companies responded.

Members of the Machine Tool and Metalworking Roundtable were added to the sample to increase the representation of Michigan capital equipment firms that supply the auto industry. Capital equipment firms produce cutting, forming, and shaping machinery. They also produce equipment such as transfer lines or robotics. MESA reports that there are 448 equipment manufacturing facilities in Michigan with a total of 18,818 employees. Sixty companies are members of the Michigan Jobs Commission Business Roundtable for Machine Tool and Manufacturing firms. OSAT sent surveys to all sixty. Sixteen (27 percent) of the companies responded.

All companies in the MAP were included in the sample. The MAP includes the 3 major vehicle manufacturing companies and 25 automotive suppliers. The 25 suppliers were selected based on their business activity, size, and location. OSAT sent surveys to all 28 MAP members. Sixteen (57 percent) of the companies responded to the first round, including all three vehicle manufacturers.

Companies in the AIAM with significant Michigan employment were included in the sample. Three companies were sent surveys and one company responded. It is included as a vehicle manufacturer.

Non-Michigan companies also were included in the sample. Companies were selected randomly from *The ELM Guide: A Database for the Automotive Industry* (Version 2.9.2, 1997), which lists 2,107 major automotive components suppliers in the U.S. OSAT analysts narrowed the database to the 1,528 companies without significant manufacturing or research and development capacity in Michigan. These non-Michigan companies were included in the sample so the Michigan industry could be compared to the non-Michigan industry and so conclusions could be drawn for the entire U.S. automotive economy. One hundred seventy-five companies were selected randomly from the *ELM Guide*. Thirty-six (21 percent) of these companies responded to the first round survey.

A.II. Weights

A.II.1. Michigan Weights

Overview of the Michigan Weighting Method:

The Michigan weighting method rests on the assumption that the population of Michigan automotive companies can be divided into subpopulations. Subpopulation divisions are made on industry and size classifications. Each subpopulation has its own weight within the total population, which is calculated by dividing the subpopulation into the total population. The sum of the weights of the subpopulations, therefore, is always one (or 100 percent). A subpopulation has two types of

weights, an employment weight and a company weight. Employment weights are based on the number of employees in each subpopulation and the total population. Company weights are based on the number of companies in each subpopulation and the total population. Each survey respondent is placed in the appropriate subpopulation (or substrata). Weighted results are calculated by multiplying the result for each substrata (the mean response for firms in the substrata) by the substrata weight. This product is then added to the products of other substrata results and substrata weights.

Employment and Company Weights:

The Michigan population is divided into six industry strata: preproduction companies, Michigan components manufacturers, OEM1, OEM2, OEM3, and OEM4. The individual OEM strata are combined into a total OEM strata, the other companies are combined into a total Michigan non-OEM strata, and all companies are combined into a total Michigan companies strata. The industry strata are divided into three size strata: 1 to 249 employees, 250 to 499 employees, and over 500 employees. The size strata are combined into a total strata.

The total population of employees and companies for each substrata is based on the information in the ES202 record. The population for preproduction companies is a combination of the total population for tool and die companies, engineering and testing companies, and capital equipment manufacturing companies (SIC codes 3535, 3541, 3542, 3548, 3563). Capital equipment manufacturers were not selected from the ES202 record. They were selected from either the Machine Tool and Metalworking Roundtable or from the MAP. All capital equipment manufacturers were placed in the smallest size strata (1 to 249 employees) because a breakdown of facilities by employment was not available. The MESA provided the total number of facilities and employees, so the average number of employees per facility could be calculated. Because the average number of employees per facility is 42, all capital equipment manufacturers were placed in the smallest size category. The population for Michigan components manufacturers consists of the populations for each of its relevant SIC codes. The population for each of the OEMs, including the respondent from the AIAM, is based on each company's self-reported employment.

The total population is adjusted to include only the portion of the population that is part of the automotive industry. The automotive population for each substrata is calculated by multiplying the total population by the estimated percent of the substrata companies that are automotive. The percent automotive was calculated early in the study when companies from the population were screened by telephone to determine their automotive status. The percent automotive was calculated for each substrata based on the percent of companies in the substrata that reported significant automotive business.

The automotive population is used to calculate the weights. The substrata automotive population of employees or companies is divided into the relevant overall automotive population. The overall automotive population depends on the type of weight being used. There are six different types of weights: size, size - non-OEMs, industry, industry - non-OEMs, OEMs, and total. Size weights are calculated across the size strata (i.e., 1 to 249 employees) so that each substrata is a portion of the total size strata. Industry weights are calculated down the industry strata (i.e., preproduction companies) so that each substrata is a portion of the total industry strata. OEM weights are calculated so that each OEM is a portion of the sum of the OEMs. Non-OEM weights (i.e., industry – non-OEMs) are calculated like industry or size weights but exclude OEMs. The total weight is calculated so that each substrata is a portion of the overall automotive population. Within each weight classification, the sum of the weights of the substrata is always one. Algebraically, this is represented as:

Size weights: $\sum_{i=1}^{n} N_i/N_S = 1$

Size – non-OEMs weights: $\sum_{i=1}^{n} N_i/N_{SNO} = 1$

Industry weights: $\sum_{i=1}^{n} N_i/N_I = 1$

Industry – non-OEMs weights: $\sum_{i=1}^{n} N_i/N_{INO} = 1$

OEM weights: $\sum_{i=1}^{n} N_i/N_O = 1$

Total weights: $\sum_{i=1}^{n} N_i/N_T = 1$

where:
- n = the number of substrata in the relevant category
- N_i = automotive population for the substrata
- N_S = automotive population for the size category
- N_{SNO} = automotive population for the non-OEMs in the size category
- N_I = automotive population for the industry category
- N_{INO} = automotive population for the non-OEMs in the industry category
- N_O = automotive population for the OEMs
- N_T = automotive population for the total

A.II.2. U.S. Weights:

Overview of the U.S. Weighting Method:

Because population figures were not available for the entire U.S. automotive economy, a different weighting system was used for U.S. figures than was used for Michigan figures. With the Michigan weights, substrata weights are the substrata's total Michigan population relative to the state's total Michigan population. With the U.S. weights, only information for the respondents was available. U.S. weights are calculated as the substrata's respondent population relative to the overall U.S. respondent population. Company weights are based on the number of surveys received. There were 141 surveys received, so the total company population is 141. Substrata company weights are the number of surveys received that fit into the substrata relative to the number of surveys received overall. Employment weights are based on the self-reported employment of the companies that responded. The 141 respondents reported U.S. employment of 624,956. Substrata employment weights are the employment of respondent companies within the substrata relative to the overall employment.

Employment and Company Weights:

The U.S. population is divided into seven industry strata: preproduction companies, Michigan components manufacturers, Non-Michigan components manufacturers (from *ELM Guide*), OEM1, OEM2, OEM3, and OEM4. The individual OEM strata are combined into a single OEM strata, preproduction and Michigan components manufacturers are combined into a total Michigan companies strata, preproduction companies, Michigan components manufacturers, and non-Michigan companies are combined into a total non-OEMs strata, and all companies are combined into a total companies strata.

There are eight different types of U.S. weights: size, size – Michigan companies, size – non-OEMs, industry, industry – Michigan companies, industry – non-OEMs, OEMs, and total.

U.S. weights are calculated like Michigan weights. The population of each substrata is a percent of the relevant overall population. Algebraically, the weights are represented as follows:

Size weights: $\sum_{i=1}^{n} N_i/N_S = 1$

Size – Michigan companies weights: $\sum_{i=1}^{n} N_i/N_{SM} = 1$

Size – non-OEMs weights: $\sum_{i=1}^{n} N_i/N_{SNO} = 1$

Industry weights: $\sum_{i=1}^{n} N_i/N_I = 1$

Industry – Michigan companies weights: $\sum_{i=1}^{n} N_i/N_{IM} = 1$

Industry – non-OEMs weights: $\sum_{i=1}^{n} N_i/N_{INO} = 1$

OEM weights: $\sum_{i=1}^{n} N_i/N_O = 1$

Total weights: $\sum_{i=1}^{n} N_i/N_T = 1$

where
- n = the number of substrata in the relevant category
- N_i = automotive population for the substrata
- N_S = automotive population for the size category
- N_{SM} = automotive population for the Michigan companies in the size category
- N_{SNO} = automotive population for the non-OEMs in the size category
- N_I = automotive population for the Industry category
- N_{IM} = automotive population for the Michigan companies in the industry category
- N_{INO} = automotive population for the non-OEMs in the industry category
- N_O = automotive population for the OEMs
- N_T = automotive population for the total

Automotive population is based on the number of surveys returned and the respondent's self-reported employment .

A.III. Weighted Results

A.III.1. Getting to Hourly, Salaried, and Total:

In many questions, responses were collected for the categories of trades, other production, engineer/technician, and other (salaried) employees. Calculations are made to generate summary results for the categories of hourly, salaried, and total employees for each of the substrata. Trades and other production workers are combined into the hourly category. Engineer/technician and other (salaried) are combined into the salaried category. All employees are combined into the total category.

Hourly results are calculated by multiplying the mean result for trades by the percent of hourly workers that are trades employees and adding it to the mean result for other production times the percent of Hourly workers that are other production employees. Salaried results are calculated by multiplying the mean result for engineer/technician times the percent of salaried workers that are engineer/technician and adding it to the mean result for other (salaried) times the percent of salaried workers that are other (salaried) employees. Total results are calculated by multiplying the mean result for each category by that category's percent of total employment (taken as the sum of

the four categories) and adding it to the similarly calculated product for the other categories. These calculations are made for each substrata and are based on the mean results in the substrata and the mean employment in the substrata. Algebraically, this is represented as:

$$\text{Weighted hourly result} = \sum_{i=1}^{n} X_i * N_i/N_H$$

$$\text{Weighted salaried result} = \sum_{i=1}^{n} X_i * N_i/N_S$$

$$\text{Weighted total result} = \sum_{i=1}^{n} X_i * N_i/N_T$$

where n = the number of categories (trades, engineer/technician, etc.)
X_I = the mean result for the category
N_I = the mean employment of the category in the substrata
N_H = the sum of mean hourly employment (trades plus other production)
N_S = the sum of mean salaried employment (engineer/technician plus other (salaried)
N_T = the sum of mean total employment (all categories)

This method is not used to generate hourly, salaried, and total categories for the weighted strata. In the weighted strata, the hourly, salaried, and total categories are calculated using the results from the substrata.

A.III.2. Weighted Results:

Weighted results are calculated the same way, regardless of whether Michigan or U.S. weights are used. The mean responses for substrata are used to generate the weighted responses for strata. The substrata mean response is multiplied by the relevant weight (depending on the type of calculation and the appropriate strata analysis) and added to the similarly calculated product for other substrata. Algebraically, an example of this is represented as:

$$\text{Weighted total result} = \sum_{i=1}^{n} X_i * N_i/N_T$$

where n = the number of substrata in the relevant category
X_I = the mean response for the substrata.
N_I = automotive population for the substrata
N_T = automotive population for the total

A more detailed explanation is shown on the next page:

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APPENDIX B

I. HUMAN RESOURCES FORECAST

COMPANY INFORMATION

1. What is your company's primary automotive business?

Primary automotive business	Number of responses	Percent of total responses
*Motor vehicle manufacturing		
Special tooling for motor vehicle manufacturing (e.g., dies, jigs, end effect tooling)		
Major equipment for automotive manufacturing (e.g., conveying, cutting, forming, painting, welding)		
Engineering and/or design services		
Manufacturer of vehicle components or parts		
(If multiple components, please choose the one with largest sales)		
Seat/trim/safety		
Chassis and brake parts		
Drivetrain (including electronics) and fuel delivery components		
Interior component systems		
Chassis electronics		

Number or responses=143

** Companies in the motor vehicle manufacturing classification are not included in round 1 responses*

2. What was the percentage change in your company's 1997 U.S. dollar sales from 1996? (Please indicate plus or minus)

	Mean Rating	Median Response	Standard Deviation	Interquartile Range
Percent change in total sales 1996 to 1997				

Number of responses=135

3. What is the expected percentage change in your company's 1998 U.S. dollar sales from 1997? (Please indicate plus or minus)

	Mean Rating	Median Response	Standard Deviation	Interquartile Range
Expected change in total sales 1997 to 1998				

Number of responses=135

U.S. EMPLOYMENT PROJECTION

4. What is your company's 1998 U.S. employment? (Please give by category and total if possible.)

Category	1998 U.S. employment			
	Mean Rating	Median Rating	Standard Deviation	Interquartile Range
Hourly				
Trades				
Other production				
Salaried				
Engineer/Technician				
Other (salaried)				
Total U.S. employment				

Number of responses=136

5. Compared to 1998, in 1999 do you expect your firm's U.S. *employment,* by category, to: (Please indicate a percentage increase or decrease if possible.)

Category	Percent of total respondents		
	Increase	No change	Decrease
Hourly			
Trades			
Other production			
Salaried			
Engineer/Technician			
Other (salaried)			

Number of responses=121

Please indicate a percentage increase:

Category	Percent Increase	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=62

Please indicate a percentage decrease:

Category	Percent decrease	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=9

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6. Compared to 1998, in 1999 do you expect your firm's U.S. *hiring,* by category, to: (Please indicate a percentage increase or decrease if possible.)

(Note: Due to attrition, *hiring* may not equal change in employment.)

Category	Percent of total respondents		
	Increase	No change	Decrease
Hourly			
Trades			
Other production			
Salaried			
Engineer/Technician			
Other (salaried)			

Number of responses=118

Please indicate a percentage increase:

Category	Percent increase	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=63

Please indicate a percentage decrease:

Category	Percent decrease	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=3

---

7. What percent of your current production and managerial employment is comprised of contingent (i.e., supplemental/temporary) employees? What percent of your production and managerial employment do you expect to be contingent five years from now (2003)?

Employment classification:	Current			
	Mean Rating	Median	Standard Deviation	Interquartile Range
Production Employment				
Managerial Employment				

Number of responses=129

Employment classification:	2003			
	Mean Rating	Median	Standard Deviation	Interquartile Range
Production Employment				
Managerial Employment				

Number of responses=119

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8. Are any of your employees organized by a union?

Employment Category	Percent of respondents	
	Yes	No
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=123

MICHIGAN EMPLOYMENT PROJECTIONS

9. What is your company's 1998 Michigan employment? (Please give by category and total if possible.)

Category	1998 Michigan employment			
	Mean Rating	Median Rating	Standard Deviation	Interquartile Range
Hourly				
Trades				
Other production				
Salaried				
Engineer/Technician				
Other (salaried)				
Total Michigan employment				

Number of responses=114

10. Compared to 1998, in 1999 do you expect your firm's Michigan *employment,* by category, to: (Please indicate a percentage increase or decrease if possible.)

Category	Percent of respondents		
	Increase	No change	Decrease
Hourly			
Trades			
Other production			
Salaried			
Engineer/Technician			
Other (salaried)			

Number of responses=95

Please indicate a percentage increase:

Category	Percent increase	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=48

Please indicate a percentage decrease:

Category	Percent decrease	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=6

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11. Compared to 1998, in 1999 do you expect your firm's Michigan *hiring,* by category, to: (Please indicate a percentage increase or decrease if possible.)

(Note: Due to attrition, hiring may not equal change in employment.)

Category	Percent of respondents		
	Increase	No change	Decrease
Hourly			
Trades			
Other production			
Salaried			
Engineer/Technician			
Other (salaried)			

Number of responses=97

Please indicate a percentage increase:

Category	Percent increase	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=51

Please indicate a percentage decrease:

Category	Percent decrease	
	Mean	Standard Deviation
Hourly		
Trades		
Other production		
Salaried		
Engineer/Technician		
Other (salaried)		

Number of responses=3

COMPENSATION

12. What is the average hourly compensation (not including benefits) currently paid by your company to *production* workers? (Check box if not applicable.)

Category	Average hourly compensation ($/hour)			
	Mean Rating	Median Rating	Standard Deviation	Interquartile Range
Hourly trades				
Other hourly production				

Number of responses=104

13. What is the average current annual starting salary (not including benefits) paid by your company to newly-hired engineers?

Engineers	Annual salary			
	Mean Rating	Median Rating	Standard Deviation	Interquartile Range
Manufacturing engineers				
Design engineers				
Product engineers				

Number of responses=92

14. Please list your company's expectations for the next 12 months, regarding changes in U.S. monetary compensation (by labor type listed below).

Where: 1 = increase, 2 = no change, and 3 = decrease

Labor type	Percent of Total Responses			
	Mean Rating	1	2	3
Production workers				
Skilled trades workers				
Engineers/technicians				
Other salaried				

Number of responses=130

Please give an expected percentage change (this is for the increase only):

Labor type	Median Response	Interquartile Range
Production workers		
Skilled trades workers		
Engineers/technicians		
Other salaried		

Number of responses=115

Selected edited round 1 comments:

Labor shortage (4):

- Because of the shortage of qualified skilled trades, there is a premium to keep our own employees.
- Our corporate policymakers in Human Resources keep salary increases low and noncompetitive, and let the individual plants worry about high turnover due to a low unemployment job market.
- Our experience has been that, despite the labor shortage, compensation increases have remained fairly constant, averaging 3-4 percent.

Other:

- All skilled positions, not just skilled trades, will see very significant increases in the next few years. Unionized suppliers will need to increase the differential between pay for lower and higher skilled people, but will the membership allow it? Unions are democratic organizations.
- As a supplier, we cannot pass on price increases to the OEMs. We must maintain our labor cost and automate where possible.

III. Expansion and Location

36. Compared to 1998, in 1999 will your firm's level of capital spending:

Level of capital spending	Percent of responses	Mean Rating	Median Response	Standard Deviation	Interquartile Range
Increase					
Maintain					
Decrease					

Number or responses=134

Selected edited comments:

None

37. Compared to 1998, in 1999 will your firm's facilities:

(select one for U.S. and one for Michigan)

U.S.	Percent of responses	Percent change			
		Mean Rating	Median Response	Standard Deviation	Interquartile Range
Increase the number of facilities or initiate major expansions at existing U.S. sites					
Maintain capacity					
Reduce U.S. capacity					
Michigan					
Increase the number of facilities or initiate major expansions at existing Michigan sites					
Maintain capacity					
Reduce Michigan capacity					

Number or responses = U.S. – 134; MI – 106

Selected edited round 1 comments:

None

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