Regional Employment Effects of Motor Vehicle Industry Job Loss in Michigan Counties: 2001 to 2008

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Roland Zullo, Research Scientist

Kallol Mukherji, Research Assistant

Institute for Research on Labor Employment and the Economy

University of Michigan

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Executive Summary

Michigan, the historic center of auto production in the United States, experienced an approximate 46 percent reduction in motor vehicle manufacturing jobs from 2001 through 2008. Using establishment data from the Bureau of Labor Statistics, we estimate the county-level multiplier effects of this decline on other 3-digit NAICS industries. Our analysis identifies the sectors of the regional economy affected by economic dislocation in motor vehicles, emphasizing the effect on industries that do not directly engage in commercial activity with the motor vehicle industry.

As anticipated, regional manufacturers are significantly and negatively affected by job losses in motor vehicle manufacturing. Associated job losses are greatest for Machinery Manufacturing (NAICS 333), followed by Fabricated Metal Product Manufacturing (NAICS 332). We estimate that 152 jobs were lost in manufacturing for every 100 jobs lost in the motor vehicle industry over the time period.

The estimated loss of jobs in construction is 136 per 100 jobs lost in the motor vehicle industry. Specialty Trade Contractors (NAICS 238) take the largest hit, followed by building construction. It should be noted that the motor vehicle industry does contract directly with the specialty trades.

The four-year estimated job loss in retail trade is 127 per 100 jobs lost in motor vehicles. Losses are greater for NAICS subcategories that employ more people, such as General Merchandise Stores (NAICS 452) and Food and Beverage Stores (NAICS 445).

An estimated 110 positions in Administrative Support and Waste Management and Remediation Services (NAICS 56) were lost for every 100 positions lost in motor vehicles, and this effect grew with time. This category includes temp agencies, call centers, custodial services, travel agencies, waste collection, and waste treatment and disposal.

Associated job losses in two NAICS categories lead us to conclude that when motor vehicle manufacturing jobs exit, so do many of the higher-paid professional and technical positions. We estimate that 66 positions in Professional, Scientific, and Technical Services (NAICS 54) were lost for every 100 jobs lost in motor vehicles, and 46 jobs in Management of Companies and Enterprises (NAICS 551) were lost with every 100 positions lost in motor vehicles.

Moreover, services that are geographically anchored to the region, such as Educational Services (NAICS 61) are not immune. We estimate that 64 education positions, primarily teachers in K-12 public schools, are lost with every reduction in 100 motor vehicle industry jobs.

Numerous industries showed no relationship with motor vehicle jobs (e.g., agriculture, utilities). And many other 3-digit NAICS industries showed a statistically significant, but substantively small association with motor vehicle job loss.

All told, we found a multiplier of about 1 to 8, meaning that one lost job in motor vehicle manufacturing translated into 8 lost jobs in the region. This multiplier estimate is higher than others we have seen, but we believe that it is because our analysis differs from prior work in two important respects. First, we examine historical data that includes an

estimated 99 percent of all jobs. Other estimates are projections based on the financial relationships of industries. Second, we examine the contemporaneous time period, as well as a four-year lagged effect. Prior estimates extend only one year out.

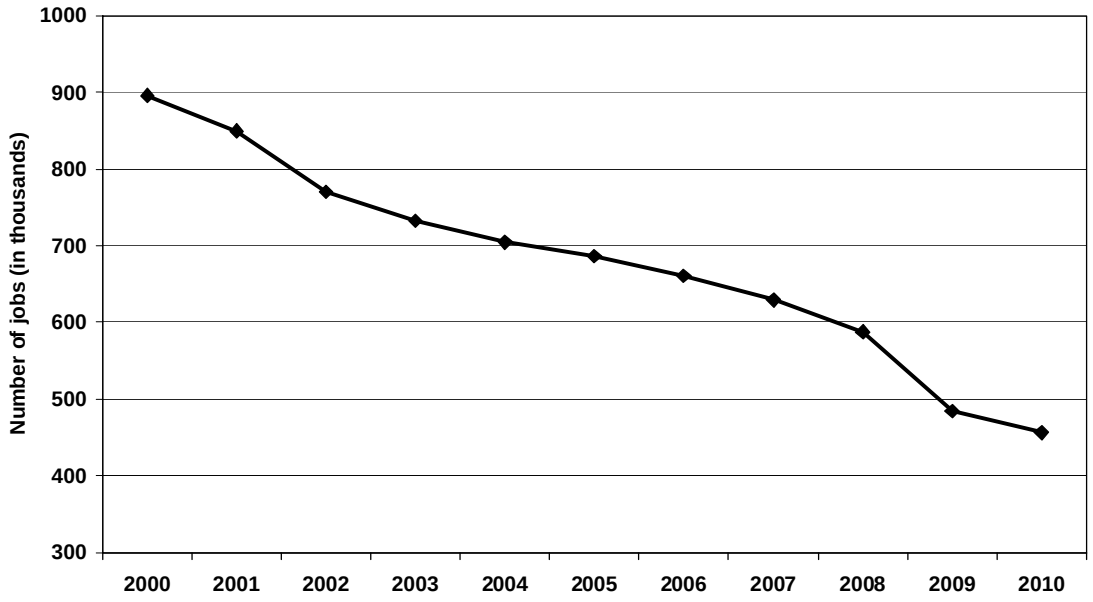
Testing for longer-term multiplier effects yielded the most intriguing result: the multiplier effect grows over time. Empirically, this is because while certain industries are affected by a loss of motor vehicle jobs immediately, many other industries experience lagged effects. Substantively, this finding suggests that the most severe repercussions of a plant closure or mass layoff occur years later. Stated differently, the result challenges the notion that local economies quickly recover from a sharp loss of manufacturing jobs.

Introduction

Few states are more dependent on manufacturing than Michigan. In the May 2008 State Occupational Employment and Wage Estimates compiled by the Bureau of Labor Statistics, the State of Michigan ranked highest in the Midwest in terms of mean production worker salary.[1] Manufacturing has historically served as a major economic engine to our region, providing direct gainful employment and, in turn, customers for local private business and a source of tax revenue for public services.

The job loss in manufacturing for Michigan over the past decade has been stunning. Graph 1 below charts the decline in Michigan manufacturing jobs from 2000 to 2010.

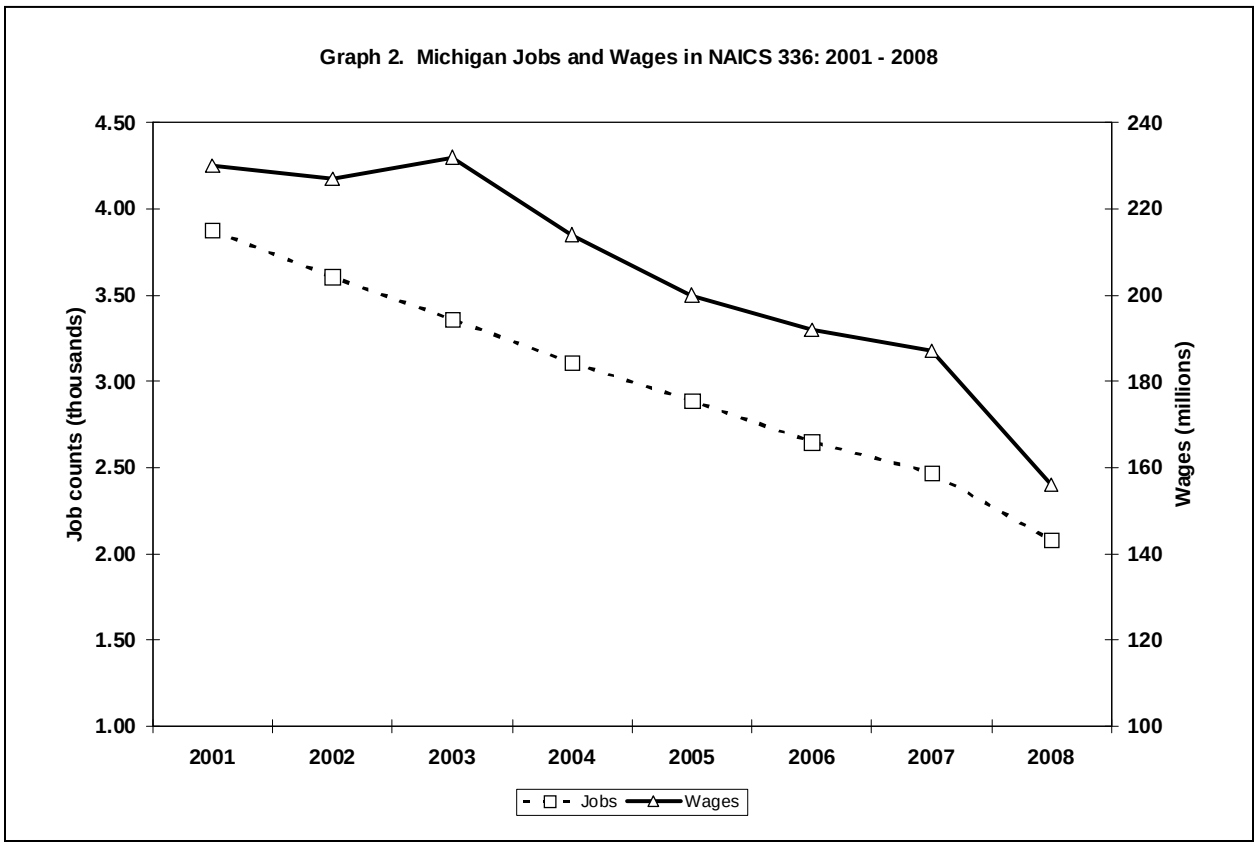
Graph 1. Manufacturing Jobs In Michigan: 2000 to 2010



Source: BLS, March figures.

Embedded within these aggregate figures is the decade-long decline in motor vehicle industry jobs. In the twentieth century Detroit emerged as the Motor City, with production facilities that spread regionally into cities such as Flint, Dearborn, and Lansing. Firms in nearly every county in Michigan's Lower Peninsula had some role in supplying parts or services, or in the direct assembly of automobiles and trucks. Yet since 2000, Michigan's motor vehicle industry has mirrored the steady decline in manufacturing. Graph 2 below presents the average number of jobs and total wages for positions in the North American

[1]Mean production worker salary for Michigan was $37,120; Minnesota $34,160; Indiana $33,880; Ohio $33,560; Wisconsin $33,380; Illinois $32,660; and Iowa $31,120. See: http://www.bls.gov/oes/2008/may/oessrcst.htm



Industry Classification System (NAICS) 3-digit code 336, Transportation Equipment Manufacturing, across all Michigan counties in years 2001 to 2008.

Measured by both jobs and wages, the motor vehicle industry has contracted dramatically over the period. The average number of jobs per county dropped by roughly 46 percent and wages by 32 percent, from 2001 to 2008.

In this report we develop estimates of the regional job effects related to the decline in the motor vehicle industry for the period 2001 to 2008. To do this, we compare the change in jobs within NAICS 336 with the change in jobs for all other 3-digit NAICS groups across Michigan counties during an eight-year time period. We gain an understanding for the timing of the effects of job dislocation in the motor vehicle industry by capturing both contemporaneous and lagged effects of job loss for NAICS 336. Our objective is to identify the areas of the regional economy affected by economic dislocation in motor vehicles, including sectors that do not directly engage in commercial activity with the motor vehicle industry.

Policy Debate

Two intellectual camps spar over the broader regional employment effects caused by lost manufacturing jobs. The first, advocates of neoliberal economic policy, maintains that the effects of job loss in manufacturing are of minor importance. More critical, they argue, is that national policy encourages dynamic economic activity, achieved by minimizing barriers to international trade and reducing industry regulation. Unrestricted trade, in particular, leverages regional comparative advantages, creating competitive pressure that

eventually lowers the cost of manufactured goods. Lower-priced goods, in turn, place wealth in the pockets of consumers who then have more to spend on domestically produced goods and services. Deleterious effects of manufacturing job losses are thus offset by gains in jobs in expanding areas of the economy. And while the nation might lose "sweating" occupations located within manufacturing plants, the "thinking" jobs related to design, engineering, and business administration would grow in demand with elevated economic activity. Such reasoning informed "free trade" advocacy for NAFTA and CAFTA, and was championed by influential economists, most notably Alan Greenspan.[2]

The second camp, frequently derided by the first as "protectionist," favors neo-mercantile policy aimed at encouraging domestic manufacturing. Contrary to neo-liberals, the neo-mercantilists insist that all jobs are not equal. Jobs in manufacturing have greater social and economic worth than service jobs because, unlike most non-professional services, manufacturing is a highly value-added economic activity.[3] As such, manufacturing creates opportunities for workers to find vocations where they enjoy middle-class earnings. Persons with limited career options, particularly the roughly half of U.S. citizens who do not earn degrees beyond high school, are especially dependent on manufacturing. As is the case in motor vehicles, persons with a high school education have historically achieved middle-class livelihoods due to both the opportunity to engage in highly value added work and the fact that many of these jobs are unionized. Relatively few comparable options exist in the service sector for persons without college degrees.

Manufacturing is therefore important if we want a large segment of society to have access to gainful employment. It is a view that acknowledges variation in skill across occupations, respects the temperament and mechanical aptitude required to work in a manufacturing setting, and is sympathetic to providing persons without formal advanced education a productive role in the economy.[4]

Neo-mercantilists, however, go beyond the effects of manufacturing job loss to the worker and his or her immediate family by emphasizing the dependency between local economies and the manufacturing sector. Manufacturing brings wealth into a region from national or international markets. The importation of wealth and its distribution among workers and suppliers becomes an economic base for the community. Closing a large manufacturing facility disturbs the economic base and has negative repercussions for local business and public services.[5]

Our research weighs in on this debate by estimating the regional effects of the decade-long decline in jobs in the motor vehicle industry. A neo-liberal position would posit that the

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[2]Siegel, Jeremy J. 2003. Upside to the Jobs Downslide. *Investing* 57 (10):52.

[3]Value added is defined by the Bureau of Economic Affairs as an industry's gross domestic output (operating income, commodity taxes, and inventory) minus the intermediate inputs (consumption of goods and services from other industries or imported). Value added can be conceptualized as an industry's ability to generate wealth for distribution to labor and investors.

[4]Not surprisingly, this view has been expressed by persons close to the manufacturing sector. Peters, Richard C. 2004. Don't Let Job Losses Erode Skills and Knowledge. *Modern Machine Shop* 77 (5):146.

[5]Modic, Stan. 2003. Deindustrialization of America: Jobs are only the beginning of what we'll lose. *Tooling & Production* 69 (5):10.

economy is resilient to the shock of manufacturing job loss. Thus, while we may witness negative economic effects from plant shutdowns, mass layoffs, and so forth, the effects of such events on the region should be short-term. In a dynamic economy, wealth moves on to new value-added opportunities, other industries expand or are created, and lost jobs are quickly replaced. Placing trust in the capacity of private enterprise to regenerate, a neo-liberal position would call for minimal government intervention in response to a major loss of manufacturing employment.

The neo-mercantile position, on the other hand, would posit that manufacturing job loss has relatively long-term effects on the regional economy. This occurs because the loss of manufacturing sets in motion the decay of the infrastructure necessary for renewal. A plant closure, for instance, is often followed by the dismantling, removal, or destruction of equipment needed to perform value-added work. Idle buildings that had once employed many become environmental liabilities. Most important, perhaps, is that skilled workers migrate from the region. The loss or erosion of these assets, in turn, makes the region less attractive to new investment. Hence, the neo-mercantile position calls for government intervention to stabilize the manufacturing base and to act to preserve human and capital resources in the event of a major manufacturing loss.

Literature on Multiplier Estimates

Economic contractions draw attention to the broader economic effects of manufacturing job loss. In the widely read text from the 1980s recession, *The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industry*, Bluestone and Harrison map the direct effects of workers displaced from manufacturing jobs: lower earnings, lost wealth, physical and mental stress.[6] The authors discuss the "ripple" effects on the community: the decline in local economic activity, the increased demand for social assistance, population out-migration, the drop-off in charitable giving, and so forth.[7] Bluestone and Harrison also cite studies that attempt to quantify the multiplier effect of plant shutdowns. In the book, evaluations of the automobile industry from that era report a multiplier of 2.4 to 3.0, meaning that for every job lost in the auto industry the economy lost a total of 2.4 to 3 jobs. [8]

The current recession, officially beginning in December 2007, and the recent downturn in the automobile industry which began several years earlier, have rekindled interest in this topic. Indeed, the automobile industry bailouts of 2008 were predicated on the belief that mass shutdowns in auto plants would trigger a wave of industry-related and residual layoffs, and thus exacerbate the economic downturn.

Researchers at the Center for Automotive Research (CAR) regularly produce economic reports on the automobile industry. In a summary memorandum, McAlinden, Dziczek, and Menk (2008) projected an economy-wide job loss of nearly 3 million jobs if, under the most

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[6]Bluestone, Barry, and Bennett Harrison. 1982. *The Deindustrialization of America: Plant Closings, Community Abandonment, and the dismantling of Basic Industry.* New York: Basic Books Publishers.
[7]Bluestone and Harrison. 1982. Chapter 3.
[8]The study cited was: MacLennan, Carol, and John O'Donnell. 1980. *The Effects of Automotive Transition on Employment: A Plant and Community Study*. Washington, DC: U.S. Department of Transportation.

pessimistic scenario, the three major domestic automobile companies shuttered their operations.[9] Within this 3 million estimate are 1.2 million jobs that are provided either directly by the "Detroit Three" or by major suppliers. Thus, 3 million divided by 1.2 million yields a multiplier of 2.5.

In a recent analysis by CAR, Hill, Menk, and Cooper (2010) estimate the national direct, intermediate, and "spinoff" employment effects of three auto industry groups: original equipment manufacturers (OEM), parts suppliers, and auto dealerships.[10] Direct employment data for OEMs total 313,449 positions, and include headquarters, office, research, design and development, manufacturing, assembly, and logistics classifications. Intermediate employment, tallied at 1,067,000 jobs, consists of the supply network of first-tier parts and services suppliers along with the lower-tier suppliers who provide the basic materials and services to the first-tier group. Finally, CAR researchers add an estimated 1,765,000 spin-off jobs in the regional economy to capture the economic activity from spending by the people employed in the direct and intermediate categories.

Thus, the approach by CAR is to begin with a count of the direct and intermediate auto industry jobs. CAR researchers then add an estimate of spinoff jobs using an economic forecasting model. All told, Hill, Menk, and Cooper estimate a multiplier effect of 10.0 for OEM, 4.1 for parts suppliers, and 2.1 for auto dealerships.

We take an alternative approach to estimating the multiplier. Using data collected by the Bureau of Labor Statistics (BLS), we begin with a count of the manufacturing jobs in Michigan that relate to motor vehicle production. Our initial count is admittedly less precise than the one used by CAR; we begin with the BLS counts for positions within the 3-digit NAICS 336 code. Category 336, Transportation Equipment Manufacturing, includes motor vehicle and parts manufacturing, as well as aerospace, railroad, and ship building. While these various industries may suggest a wide range of occupations, in the case of Michigan, the motor vehicle industry dominates the job counts in NAICS 336. For 2008, the employment breakouts (percentages) for the 4-digit NAICS codes within NAICS 336 are as follows: Motor Vehicle Manufacturing (3361), 49,416 (28.3%); Motor Vehicle Body and Trailer Manufacturing (3362), 7,396 (4.2%); Motor Vehicle Parts Manufacturing (3363), 112,274 (64.3%); Aerospace Product and Parts Manufacturing (3364), 2912 (1.7%); Railroad Rolling Stock Manufacturing (3365), 20 (0.0%); Ship and Boat Building (3366), 1,820 (1.0%); Other Transportation Equipment Manufacturing (3369), 840 (0.0%).

Thus, extrapolating from the BLS data, roughly 3 percent of the jobs in our initial counts are for aerospace, railroad, and shipbuilding. This introduces some noise into the analysis. Also, unlike CAR, we do not disaggregate OEM from parts suppliers; the two are included within NAICS 336 counts. What are excluded from NAICS 336 are the suppliers to the auto

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[9]McAlinden, Sean, Kristin Dziczek, and Debra Maranger Menk. 2008. *CAR Research Memorandum: The Impact on the U.S. Economy of a Major Contraction of the Detroit Three Automakers.* Ann Arbor, MI: Center for Automotive Research.

[10]Hill, Kim, Debra Maranger Menk, and Adam Cooper. 2010. *Contribution of the Automotive Industry to the Economies of All Fifty States and the United States*. Ann Arbor, MI: Center for Automotive Research.

parts suppliers (e.g. machinery, hardware). Such firms would likely show up in another 3-digit NAICS category.

Another difference between CAR estimates and our approach is in the projection method for determining lost jobs due to reductions in regional wealth. CAR estimates are based on an economic forecasting program that uses the financial dependencies among industries to calculate eventual job losses should the level of commercial activity across businesses change. The CAR projections include adjustments for estimated population flows and changes in discretionary spending. Finally, the estimates in Hill, Menk, and Cooper were for the nation, and projected for one year after the change in auto industry employment.

Our approach uses historical data, 2001 through 2008, to estimate the relationship between employment in the motor vehicle industry and employment in other NAICS categories. Thus, rather than project the residual job losses, we compare actual changes in motor vehicle jobs with actual changes in other industries. We also limit our estimate to Michigan, which may or may not produce results that match CAR's nation-wide analysis. Finally, instead of one year, we model an estimated lag of four years in order to address whether the multiplier effect of a motor vehicle industry contraction extends beyond the short term.

Data and Analysis

The data are compiled from the Quarterly Census of Employment and Wages, otherwise referred to as ES-202, which provides a headcount of workers and a tally of wages for employers that are subject to state unemployment insurance. According to the BLS, the ES-202 covers over 99 percent of wage and salary civilian employment. Annual data on job numbers and wages were compiled by county and prepared for a longitudinal analysis spanning from 2001 through 2008.[11]

An important limitation of the ES-202 data is that it does not include self-employed or contract workers. It is a census of employers, and in some circumstances a firm will contract for labor, legally making the worker an independent contractor that is exempt from unemployment coverage. The practice can be the norm for an industry; for instance, real estate agents often work as independent contractors. The ES-202 omits such labor market participants. Our analysis therefore covers the job dislocation effects on more formal types of employment.

We employ an analytical approach referred to as a fixed intercept method. Job levels in NAICS 336 for the 83 Michigan counties are regressed onto job levels for all remaining 3-digit NAICS categories, controlling for the unmeasured time-invariant traits or conditions of each county. The equations include controls for the years to factor out time trends. We use the model:

$$Y_{it} = \alpha + \alpha_i + \beta_1 X_{it[-4:0]} + \beta_2 \text{Year}_t + \varepsilon_{it}$$

Where Y represents the employment levels for each 3-digit NAICS category for county *i* in year *t*, and $X_{it[-4:0]}$ are employment levels for NAICS category 336 for county *i* in years *t* through *t–4.* Symbol α is a sample intercept, α_i is a county-specific intercept, and ε_{it} is a

[11]Annual ES-202 data are released approximately nine months after the end of the calendar year.

residual term. The β coefficients are the slopes for the relationships between Y and the independent variables, X and Year.

Our interest is in β_1, the association between employment levels in NAICS 336 and all other 3-digit NAICS subcategories. For much of this report, we plot β_1 for five points: year 0 to year 4, where year 0 provides an estimated contemporaneous effect of a change in motor vehicle employment on a change in employment in another sector (i.e., a NAICS 3-digit category), year 1 gives an estimated effect one year later, year 2 an effect two years later, and so forth. Using this method, we capture the immediate and longer-term effects of the motor vehicle contraction on regional employment.

Sector-by-Sector Findings

The findings are organized by 2-digit NAICS categories. For each 2-digit sector we discuss the 3-digit NAICS subcategories that appear to be affected by changes in motor vehicle manufacturing. Major relationships are illustrated by plotting estimates for the number of workers in the 3-digit sector as a function of a change in 100 motor vehicle manufacturing jobs. A table that summarizes the estimated job dislocation effects for all the NAICS 3-digit subcategories is provided in the conclusion.

Manufacturing (NAICS 31–33)

We begin with the NAICS category that is the major theme of this report, manufacturing. Outside of the 3-digit NAICS category that includes motor vehicles, Transportation Equipment Manufacturing (336), the NAICS has twenty 3-digit subcategories within manufacturing: Food Manufacturing (311); Beverage and Tobacco Product Manufacturing (312); Textile Mills (313); Textile Product Mills (314); Apparel Manufacturing (315); Leather and Allied Product Manufacturing (316); Wood Product Manufacturing (321); Paper Manufacturing (322); Printing and Related Support Activities (323); Petroleum and Coal Products Manufacturing (324); Chemical Manufacturing (325); Plastics and Rubber Products Manufacturing (326); Nonmetallic Mineral Product Manufacturing (327); Primary Metal Manufacturing (331); Fabricated Metal Product Manufacturing (332); Machinery Manufacturing (333); Computer and Electronic Product Manufacturing (334); Electrical Equipment, Appliance, and Component Manufacturing (335); Furniture and Related Product Manufacturing (337); and Miscellaneous Manufacturing (339).

At the outset we point out that the firms within these 3-digit NAICS subcategories do not produce parts for the motor vehicle industry; such firms are classified in NAICS 336. Thus the foregoing analyses are capturing the potential change in manufacturing jobs that are at best on the periphery of the motor vehicle and motor vehicle parts industries.

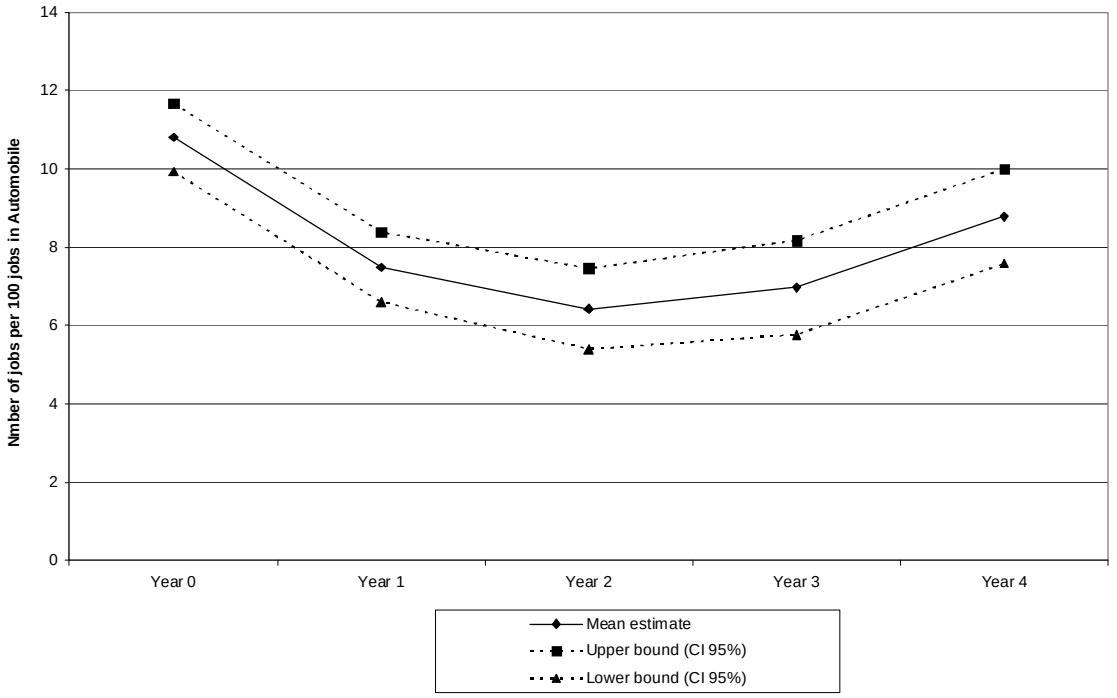
We found no relationship between the loss of motor vehicle manufacturing jobs and job loss in ten of the 3-digit NAICS manufacturing subcategories: Food Manufacturing (311); Beverage and Tobacco Product Manufacturing (312); Textile Mills (313); Textile Product Mills (314); Apparel Manufacturing (315); Leather and Allied Product Manufacturing (316); Wood Product Manufacturing (321); Paper Manufacturing (322); Petroleum and Coal Products Manufacturing (324); and Furniture and Related Product Manufacturing (337). An absence of a statistical association implies that regional firms in these subcategories were unaffected by the decade-long contraction in motor vehicle

employment, presumably because their product markets are national or international, the motor vehicle industry is not a major customer, or both.[12]

The loss of motor vehicle industry jobs does appear to affect some areas of manufacturing. Unsurprisingly, the strongest relationships are in sectors that depend on and serve motor vehicle production.

Machinery Manufacturing (333), for example, lost an estimated at 40 jobs per 100 in motor vehicles over the time period. The effect is evident in the current year and in lagged years, as Graph 333 illustrates.

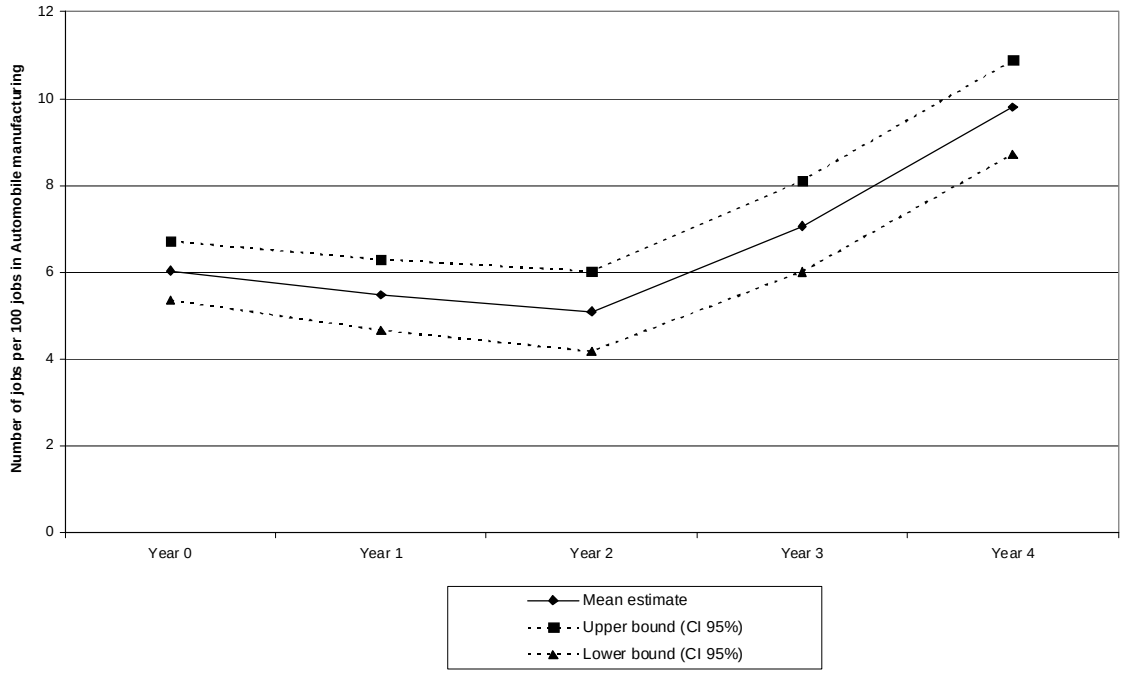
Graph 333. Predicted change in Machinery Manufacturing (NAICS code 333) employment per 100 jobs change in Automobile Manufacturing



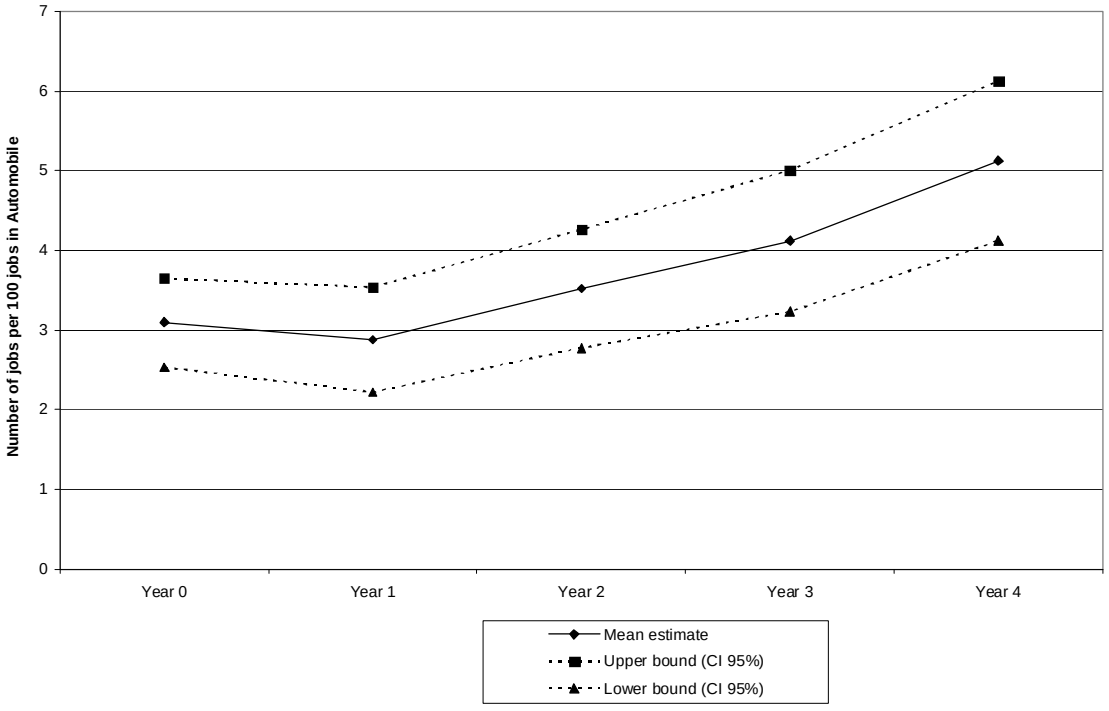
An estimated 33 jobs per 100 motor vehicle jobs were lost in fabricated metal products (332), while plastics and rubber products (326) lost an estimated 19 jobs. Both of these 3-digit NAICS subcategories indicate a strong and increasing lagged effect, as shown by Graphs 332 and 326.

[12]It can also mean, of course, that these industries do not exist in sufficient levels in Michigan counties to be picked up by our analysis. Thus, a supplier to the motor vehicle industry can exist outside of Michigan, for instance, and be severely affected by the contraction in NAICS 336, yet not be detected by our study. Our focus, as emphasized in the introduction, is on the regional effects of the motor vehicle industry contraction.

Graph 332. Predicted change in Fabricated Metal Product Manufacturing (NAICS code 332) employment per 100 jobs change in Automobile Manufacturing



Graph 326. Predicted change in Plastics and Rubber Products Manufacturing (NAICS code 326) employment per 100 jobs change in Automobile Manufacturing



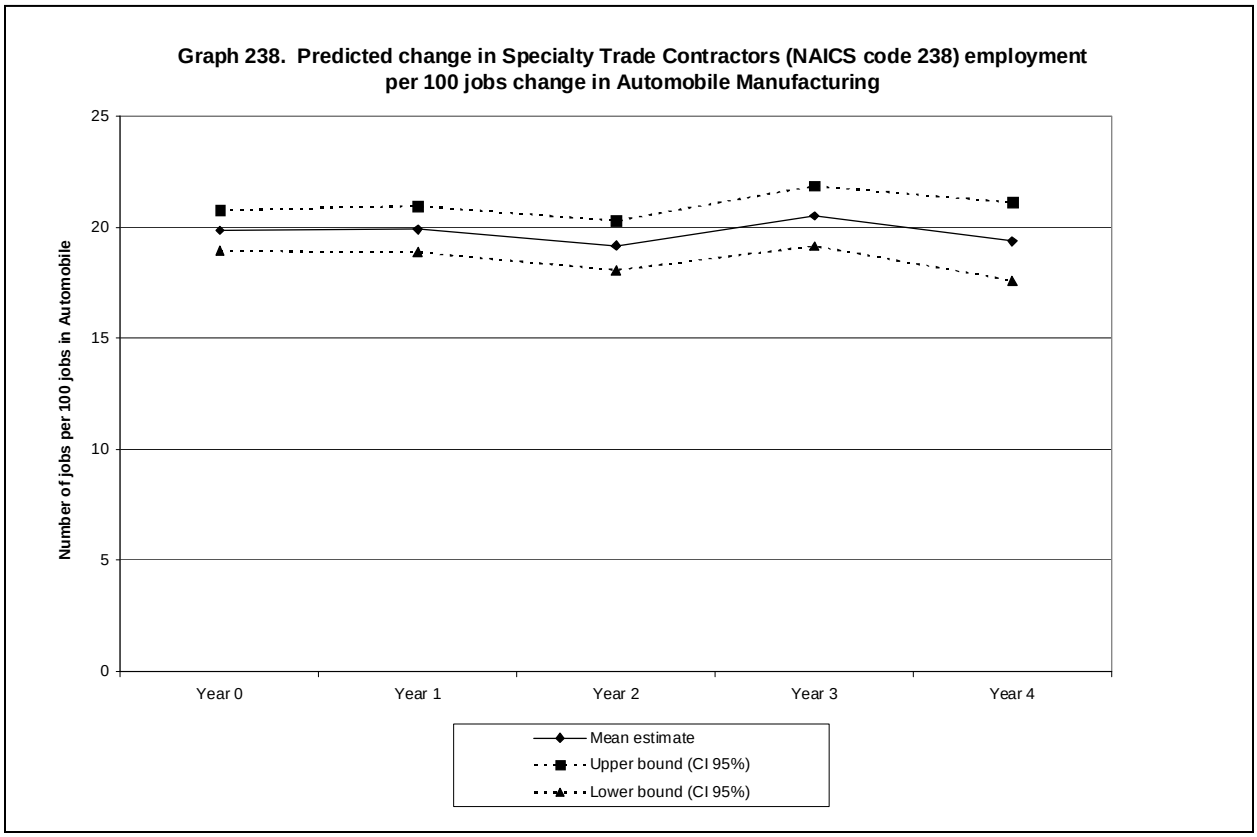
The lagged pattern for fabricated metal products (332) and plastics and rubber products (326) suggest that downsizing accelerated in these industries in the years following job dislocations in motor vehicle.

Job loss in the remaining 3-digit NAICS manufacturing sectors is moderate. Areas of manufacturing such as printing (323), chemicals (325), nonmetallic minerals (327), primary metals (331), computer and electronic products (334), electrical equipment, appliances and components (335), and miscellaneous (339) lose from 5 to 15 persons per 100 motor vehicle jobs lost. We speculate that businesses in these sectors supply markets that are minimally affected by motor vehicle production, or perhaps the most severe effect happens in locations outside Michigan, which might be the case for primary metals.

Summary: across all Michigan manufacturing (NAICS 31–33), we estimate that 152 jobs were lost for every 100 jobs lost in the motor vehicle industry over the time period. Job losses in plastics and rubber products (326), nonmetallic minerals (327), and fabricated metals (332) tend to accelerate in the years following a major reduction in motor vehicle employment. Several other 3-digit NAICS industry subcategories demonstrate a contemporaneous job loss, with the effect diminishing in later years.

Construction (NAICS 23)

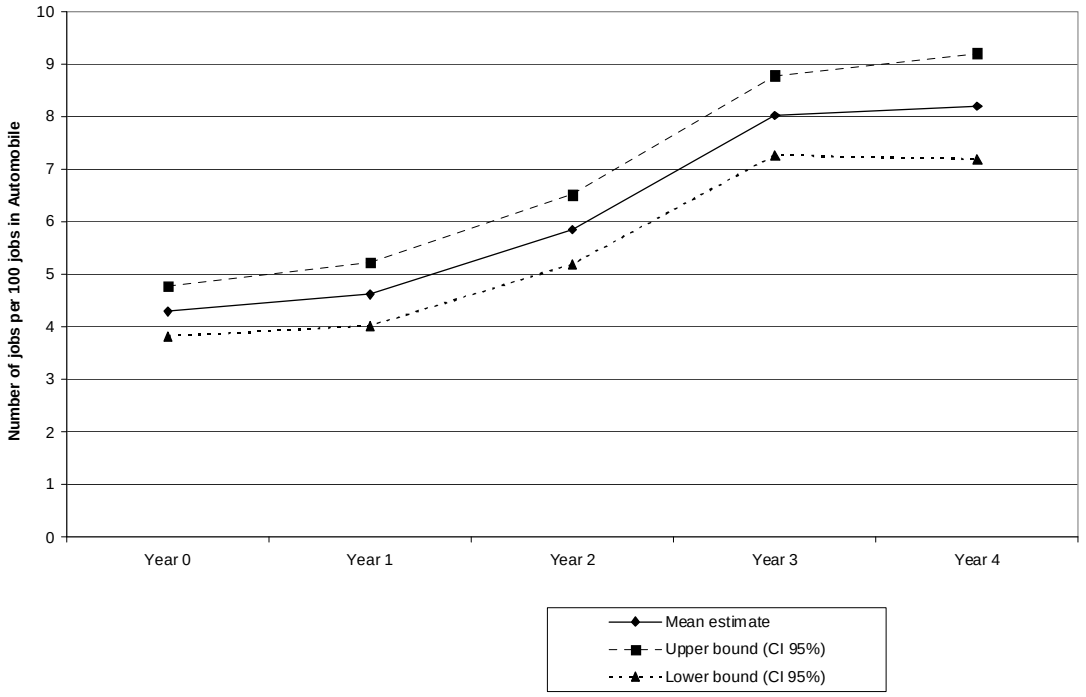
Construction comprises three NAICS 3-digit categories: Construction of Buildings (236); Heavy and Civil Engineering Construction (237); and Specialty Trade Contractors (238). Of these, Specialty Trade Contractors (238), which would include smaller firms acting as subcontractors for house and building construction, as well as those engaged in remodeling and improvements, has the strongest association with motor vehicle industry employment. Graph 238 shows the association.



The pattern is constant over the time period, with about 20 jobs in the specialty trades lost per 100 lost in motor vehicles each year. The accumulated effect of 100 motor vehicle industry jobs lost equates with 100 lost in specialty trade contracting.

Construction of Buildings (236), depicted in Graph 236, has a lagged relationship with motor vehicle manufacturing. We posit that since housing developments and building construction require longer planning horizons, a decline in the regional economy due to motor vehicle industry dislocation would have a delayed effect on this industry. For the full time period, 100 jobs lost in the motor vehicle industry equate with approximately 31 lost jobs in the Construction of Buildings subcategory.

Graph 236. Predicted change in Construction of Buildings (NAICS code 236) employment per 100 jobs change in Automobile Manufacturing



By comparison, the association between motor vehicle manufacturing and jobs in Heavy and Civil Engineering (237) is small: only 5 jobs per 100 over the full time period. This matches our expectations, since employment in NAICS category 237 is dependent on state and municipal funding, rather than motor vehicle industry business, and many of the projects are large-scale and have long planning time horizons.

Summary: employment in construction (NAICS 23) has been negatively affected by job loss in the motor vehicle industry. The effects are most acute for specialty subcontractors, followed by building contractors, and lastly by heavy and civil engineering contractors. The estimated loss of jobs in construction is 136 per 100 jobs lost in the motor vehicle industry.

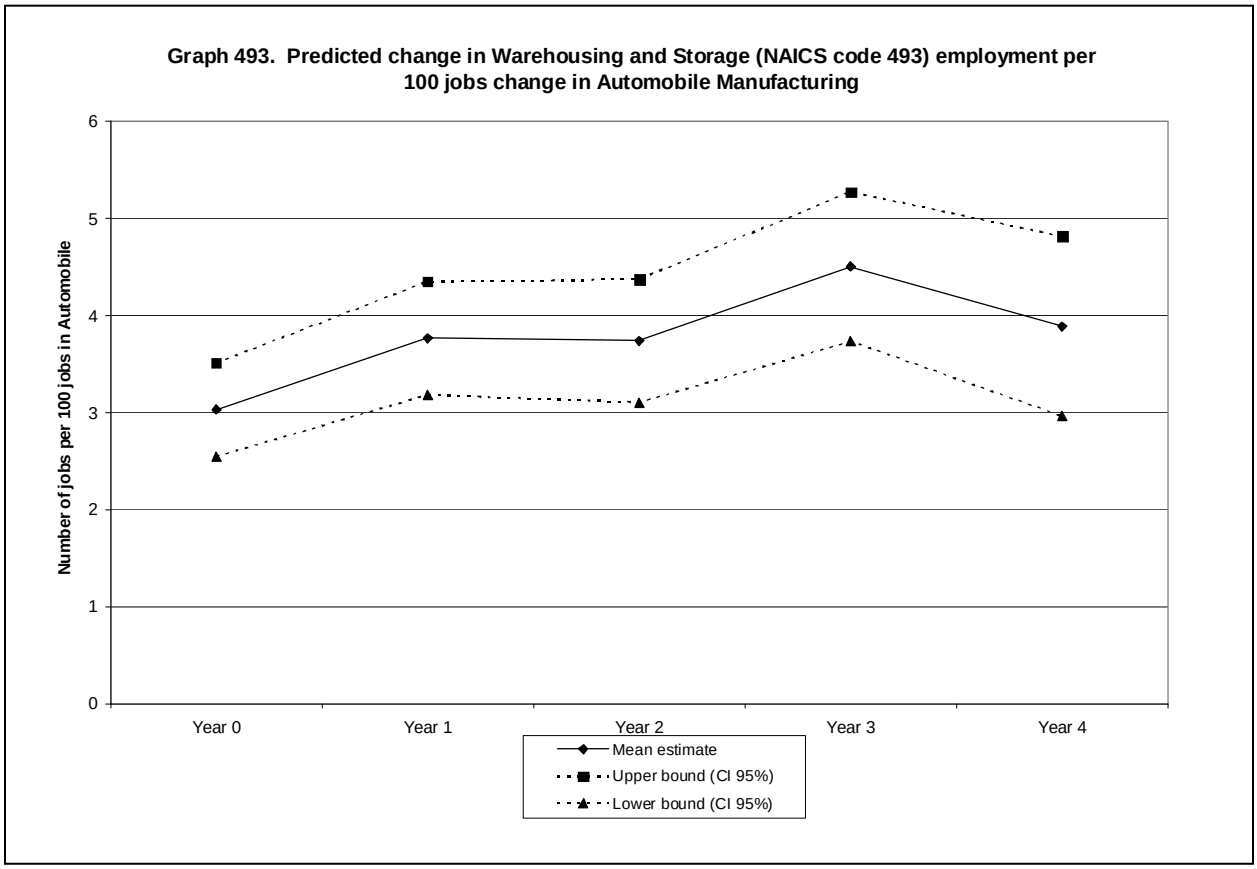
Transportation and Warehousing (NAICS 48–49)

Transportation and warehousing encompasses the following NAICS 3-digit categories: Air Transportation (481); Rail Transportation (482); Water Transportation (483); Truck Transportation (484); Transit and Ground Passenger Transportation (485); Pipeline Transportation (486); Scenic and Sightseeing Transportation (487); Support Activities for Transportation (488); Postal Service (491); Couriers and Messengers (492); and Warehousing and Storage (493).

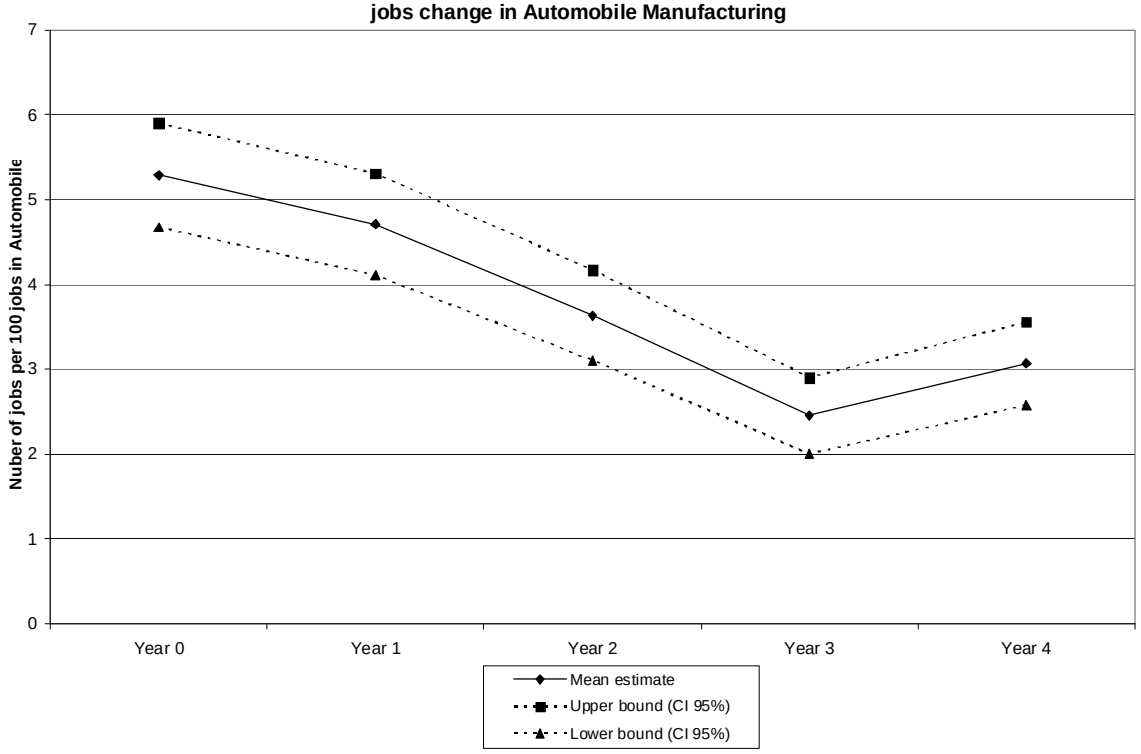
Of these, Warehousing and Storage (493), Air Transportation (481), and Postal Service (491) appear to be the most sensitive to changes in motor vehicle manufacturing. Graphs 493, 481, and 491 map these relationships.

For Warehousing and Storage (493), the results show an upward trend in job change for outward years totaling 20 jobs lost per 100 lost in the motor vehicle industry. The job loss is comparable for Air Transportation (481), with an estimated a reduction of 19 jobs for every 100 lost in motor vehicles.

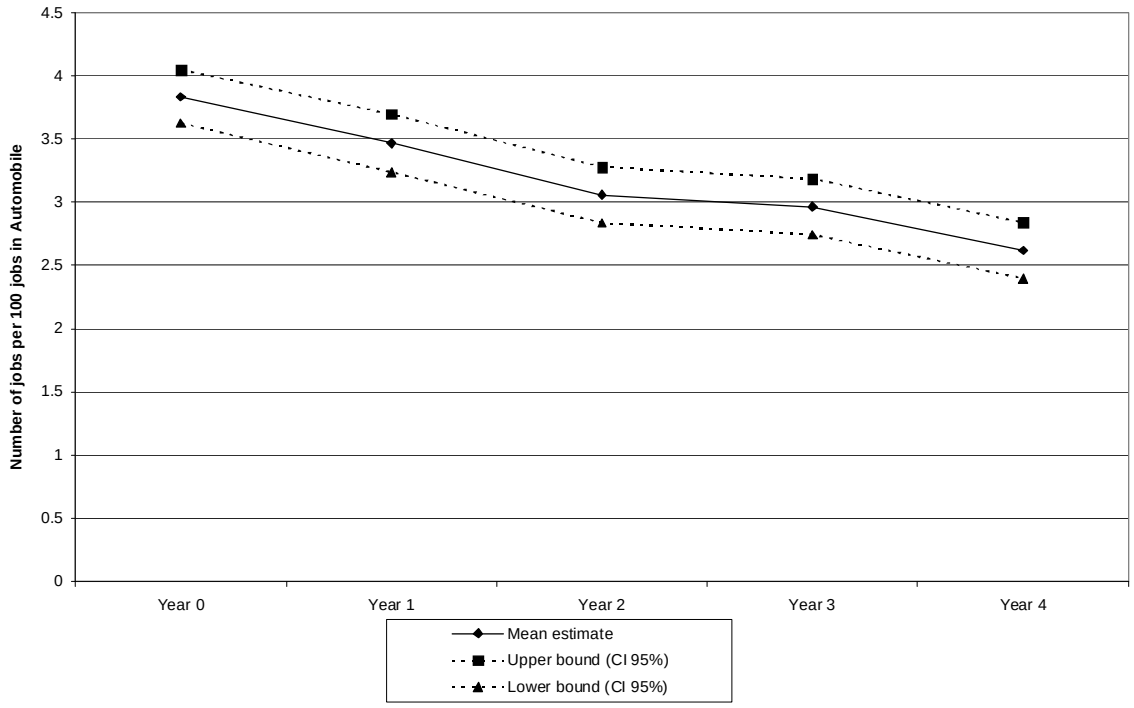
The effect of motor vehicle industry job loss on Postal Service (491), a quasi-public industry, steadily declines over time, with a predicted loss of 16 postal jobs with every 100 jobs lost in motor vehicles.



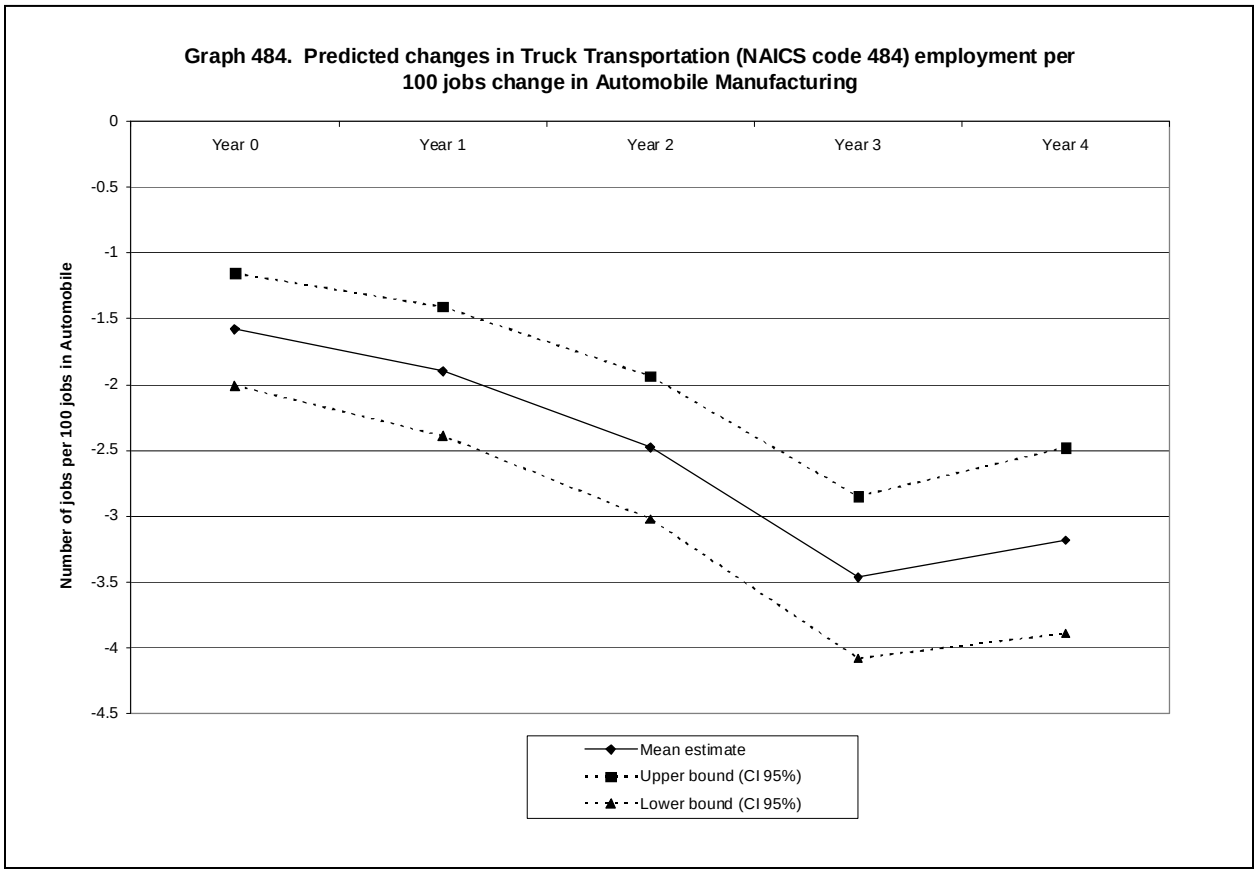
Graph 481. Predicted changes in Air Transportation (NAICS code 481) employment per 100 jobs change in Automobile Manufacturing



Graph 491. Predicted change in Postal Service (NAICS code 491) employment per 100 jobs change in Automobile Manufacturing



In contrast to these trends, we estimate a gain of 12 jobs in Truck Transportation (484) per 100 lost jobs in motor vehicles. This finding implies that motor vehicle dislocation increases the demand for trucking, perhaps to move persons and assets out of the region. Graph 484 illustrates this relationship.



Finally, for jobs in the Couriers and Messengers (492) subcategory, 100 lost motor vehicle jobs yields a reduction of 7 positions. All remaining subcategories indicate no change.

Summary: for Transportation and Warehousing (NAICS 48–49), motor vehicle job displacement produces divergent patterns. Warehousing and Storage (493), Air Transportation (481), Postal Service (491), and Couriers and Messengers (492) show a combined loss of 62 jobs per 100 lost in motor vehicles. This decline is partially offset by an increase of 12 jobs in Truck Transportation (484), for a net loss of 50 positions in this 2-digit NAICS category per 100 lost in motor vehicles.

Retail Trade (NAICS 44–45)

There are twelve 3-digit NAICS categories under Retail Trade: Motor Vehicle and Parts Dealers (441); Furniture and Home Furnishings Stores (442); Electronics and Appliance Stores (443); Building Material and Garden Equipment and Supplies Dealers (444); Food and Beverage Stores (445); Health and Personal Care Stores (446); Gasoline Stations (447); Clothing and Clothing Accessories Stores (448); Sporting Goods, Hobby, Book, and Music

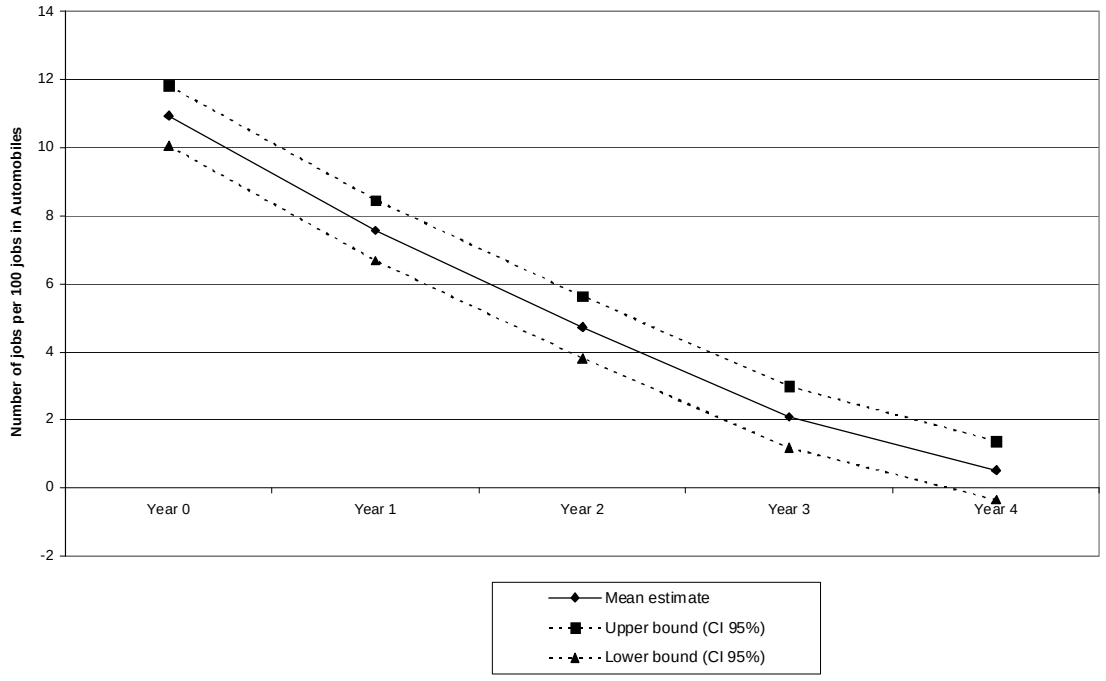
Stores (451); General Merchandise Stores (452); Miscellaneous Store Retailers (453); and Nonstore Retailers (454).

Areas of retail trade that do not appear to be affected by job loss in the motor vehicle industry include those under Electronics and Appliance Stores (443), Building Material and Garden Equipment and Supplies Dealers (444), Health and Personal Care Stores (446), Gasoline Stations (447), and Nonstore Retailers (454).

While the analysis indicated no association between employment in these sectors and change in motor vehicle industry employment, it is still quite probable that these sectors suffered financial loss with the motor vehicle contraction. Smaller retail establishments, in particular sole proprietorships, may not respond to a financial downturn with layoffs. Moreover, certain sectors may represent only minor employers in the local economy, and thus are not captured in the analysis.

For the remaining 3-digit NAICS subcategories, the data do suggest that employment in local retailers is affected by changes in motor vehicle manufacturing employment. In the case of General Merchandise Stores (452), which includes firms such as Walmart, Kmart, and Costco, the effect appears to be immediate. Graph 452 below plots the predicted change in general merchandise employment.

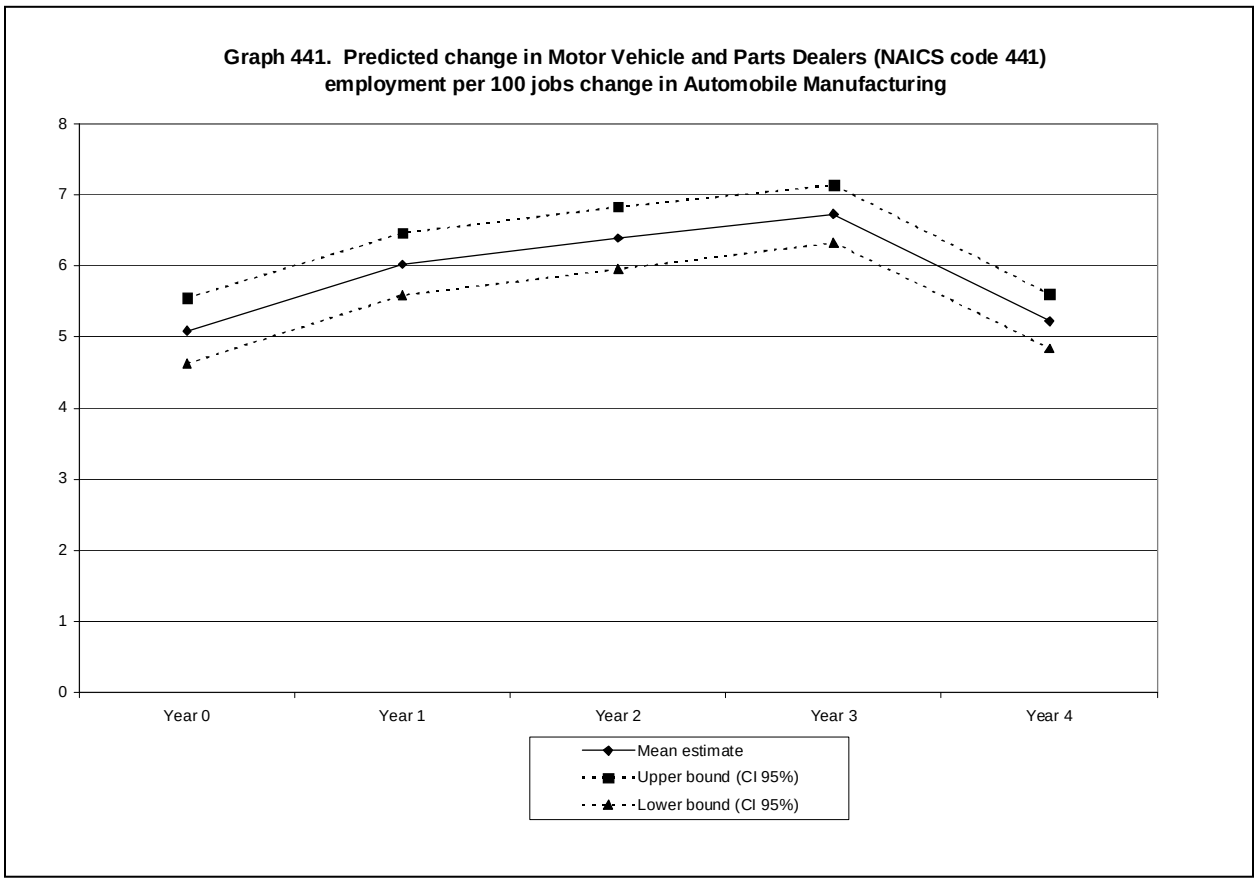
Graph 452. Predicted changes in General Merchandise Stores (NAICS code 452) employment per 100 jobs change in Automobile Manufacturing



As shown, a loss of 100 motor vehicle manufacturing jobs is associated with approximately 11 jobs in general merchandise stores in the year in which the job loss occurs, with the

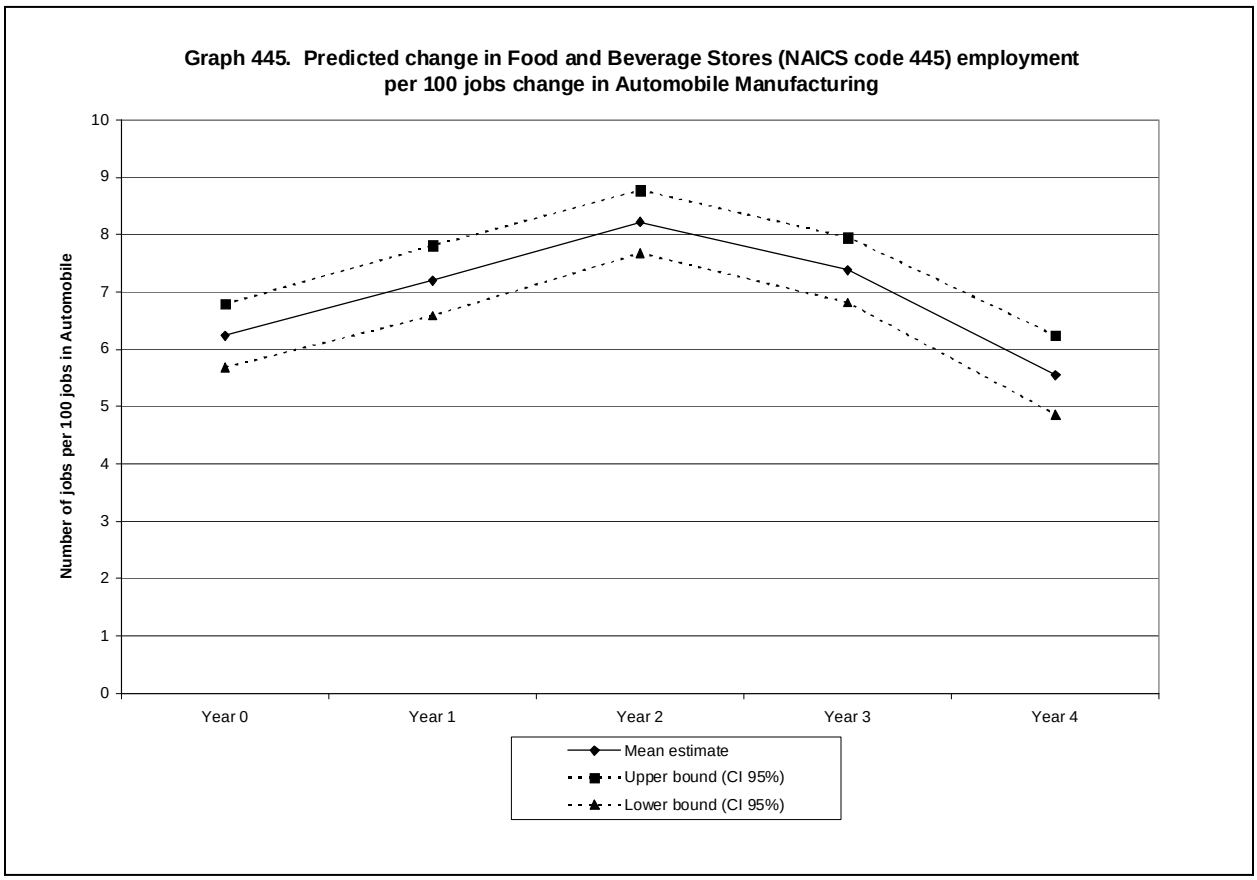
trend declining in later years. Over the five-year span, a loss of 100 motor vehicle jobs equates with an estimated loss of 26 positions in general merchandise.

Employment in Motor Vehicle and Parts Dealers (441) suffers a comparable loss, although the effect is more distributed across the time period. Graph 441 shows the change in motor vehicles and parts. Across the period, employers in retail sales for motor vehicles and parts shed approximately 29 jobs for every 100 lost in motor vehicles.



Food and Beverage Stores (445) includes large grocery chains. As graph [445] illustrates, the predicted job effects in this NAICS subcategory have a bell-shaped distribution, with the peak in year two. Over the total five-year span, food and beverage stores lose approximately 34 persons per 100 in motor vehicles.

Other subcategories of the retail job market appear to be negatively affected by job losses in the motor vehicle industry, although not at the magnitude of the NAICS subcategories already mentioned. We estimate that Furniture and Home Furnishings (442) lost 10 jobs per 100 in motor vehicles; Sporting Goods, Hobby, Book, and Music Stores (451) lost an estimated 8 jobs per 100; Clothing and Clothing Accessories Stores (448), which yields a lagged pattern of effect, lost an estimated at 8 persons per 100; and finally, Miscellaneous Store Retailers (453), which includes discretionary goods such as novelty and pet stores, lost 12 jobs per 100 in motor vehicles. Again, magnitude variation will partially reflect the importance of the sector as a regional employer, in addition to other factors such as product market.



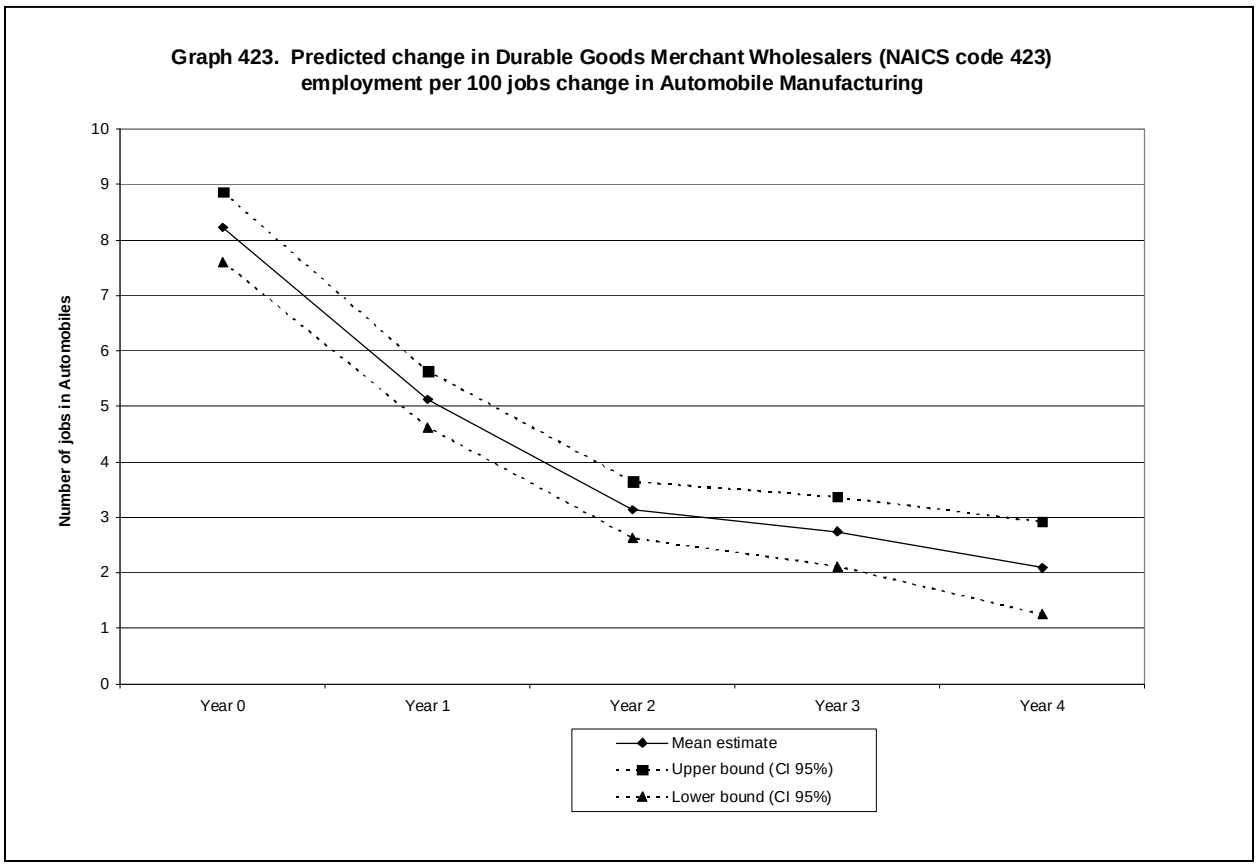
Summary: job loss in Retail Trade (NAICS 44–45) is not uniform across the wide variety of retail establishments. Losses tend to be greater for NAICS subcategories that employ more people, such as general merchandisers and grocery chains. The overall four-year estimated job loss in retail trade is 127 per 100 jobs lost in motor vehicles.

Wholesale Trade (NAICS 42)

There are three 3-digit NAICS subcategories within Wholesale Trade: Durable Goods Merchant Wholesalers (423); Nondurable Goods Merchant Wholesalers (424); and Electronic Markets and Agents and Brokers (425). All indicate an immediate effect of job loss due to job losses in motor vehicles, but it tapers off in later years.

To illustrate the patterns, Graph 423 presents the predicted association between change in motor vehicle jobs and change in Durable Goods Merchant Wholesalers (423).

Summary: over the time period, within Wholesale Trade (NAICS 42) we estimate that Durable Goods Merchant Wholesalers (423) loses 21 jobs for every 100 lost in motor vehicles; Nondurable Goods Merchant Wholesalers (424) loses 17 jobs; and Electronic Markets and Agents and Brokers (425) loses 11 jobs. The total job loss for Wholesale Trade is 49 per 100 lost jobs in the motor vehicle industry.



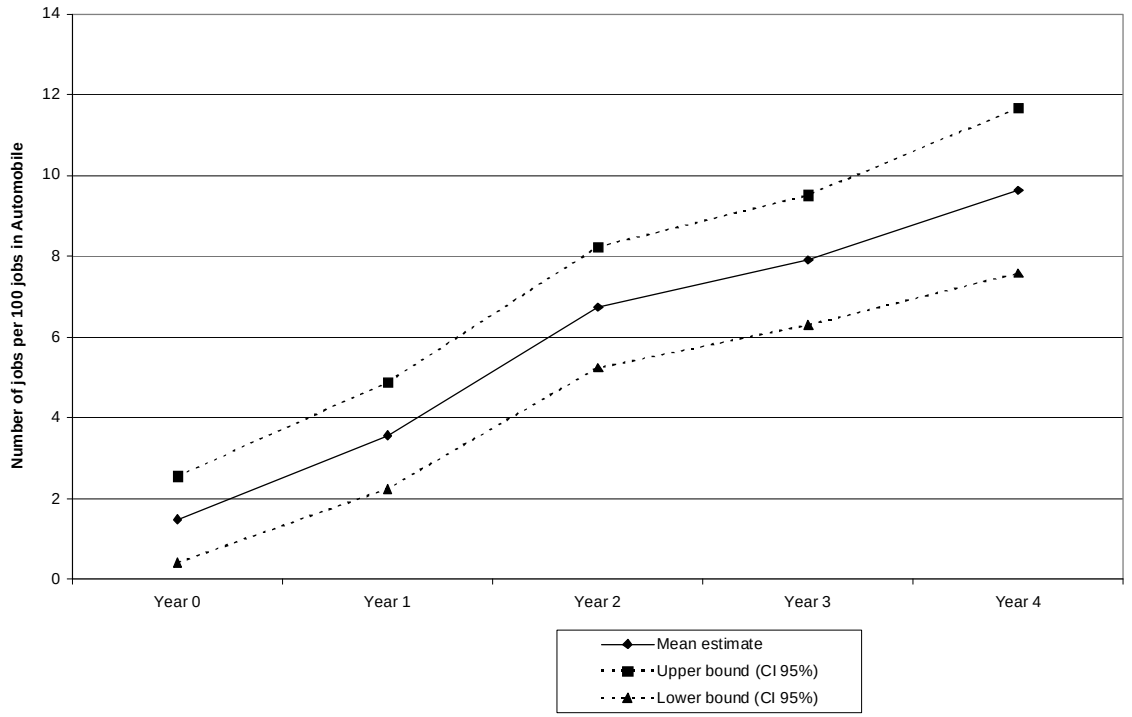
Finance and Insurance (NAICS 52)

Job levels for two subcategories within Finance and Insurance, Credit Intermediation and Related Activities (522) and Insurance Carriers and Related Activities (524), appear sensitive to changes in motor vehicle employment. For credit intermediation, the estimated number of jobs is 30 lost for every 100 motor vehicle jobs lost. The upward slope of graph [522] indicates that employment change in this industry in response to motor vehicle employment accelerates over time.

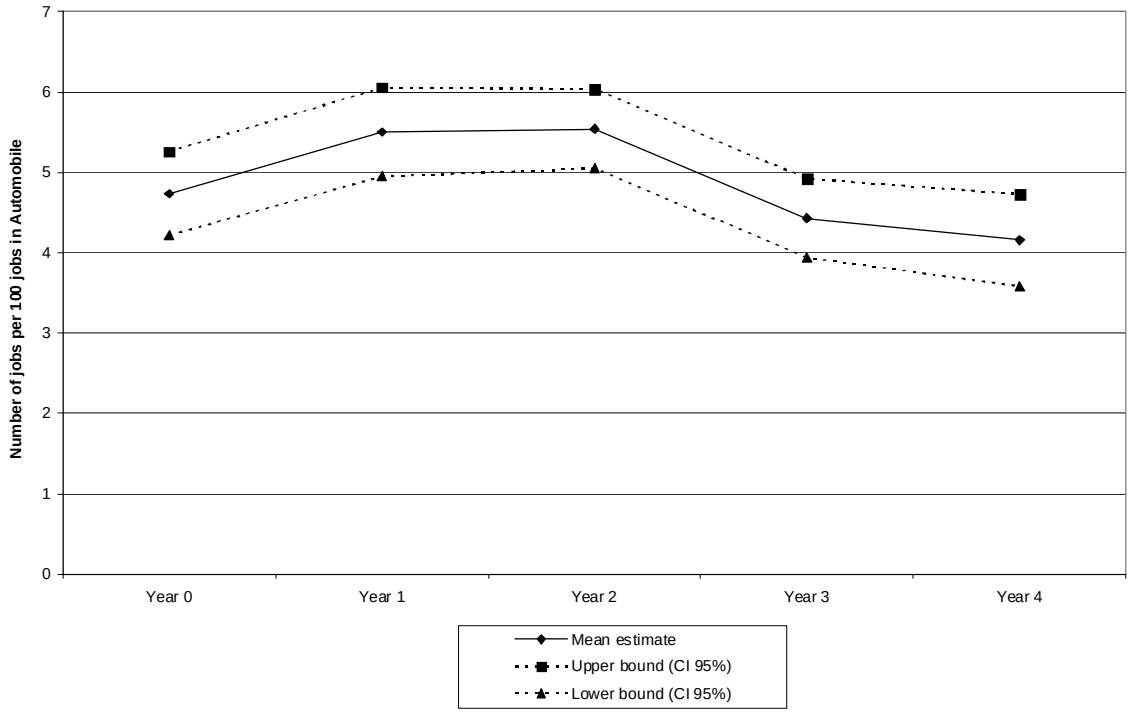
For insurance carriers (524), we estimate that 25 jobs are tied to every 100 motor vehicle manufacturing jobs lost. The trend in the change in employment is comparably flat, as Graph 524 depicts.

Summary: firms in Finance and Insurance (NAICS 52) shed 55 jobs for every 100 motor vehicle jobs lost during the time period.

Graph 522. Predicted change in Credit Intermediation and Related Activities (NAICS code 522) employment per 100 jobs change in Automobile Manufacturing

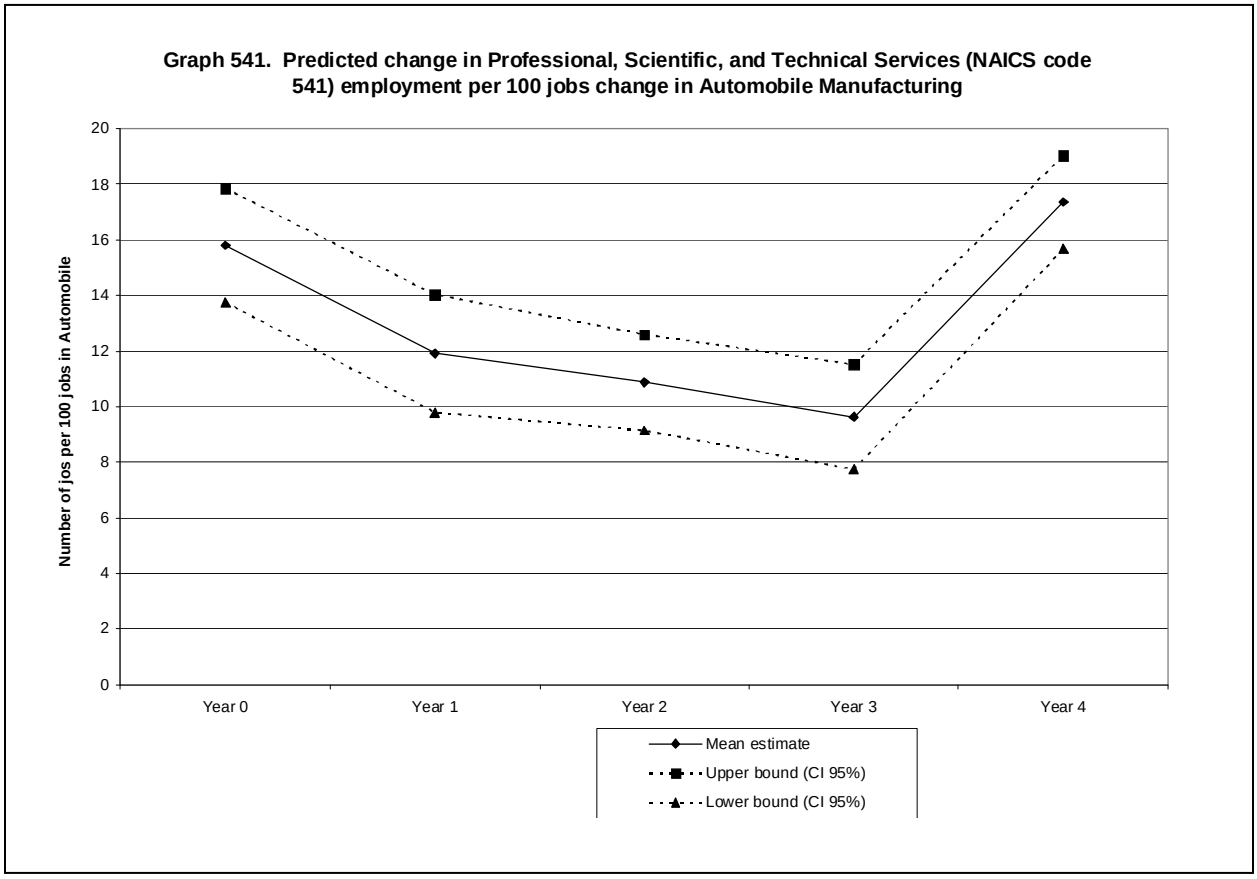


Graph 524. Predicted change in Insurance Carriers and Related Activities (NAICS code 524) employment per 100 jobs change in Automobile Manufacturing



Professional, Scientific, and Technical (NAICS 54)

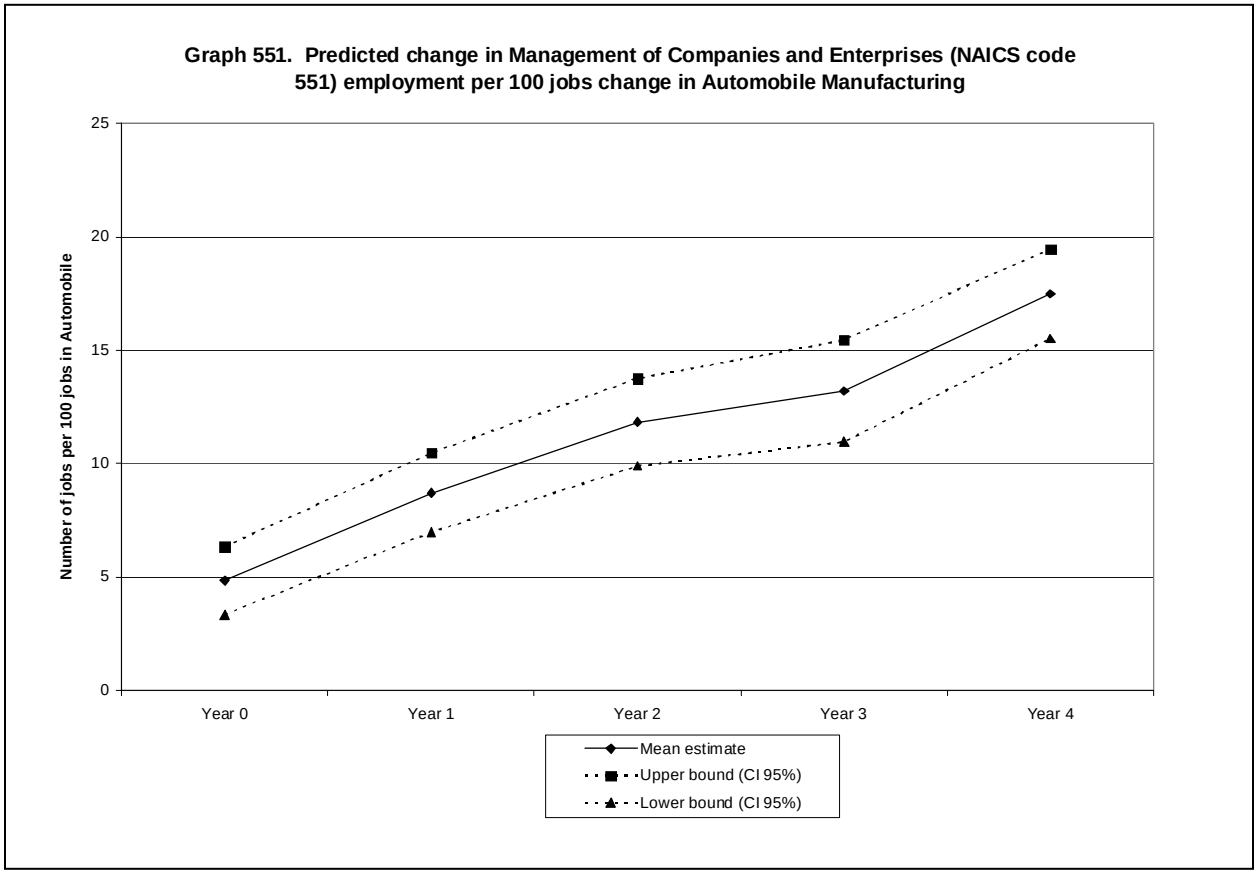
Professional, Scientific, and Technical Services has only one 3-digit NAICS category of the same name (NAICS 541). Included in this category are legal, accounting, architectural, management consulting, and advertising positions, among others. Professional, scientific, and technical has a strong association with motor vehicle industry employment, as shown in Graph 541.



Summary: over the time period, an estimated 66 Professional, Scientific, and Technical Services (NAICS 54) positions were lost for every 100 jobs lost in motor vehicles.

Management of Companies and Enterprises (NAICS 55)

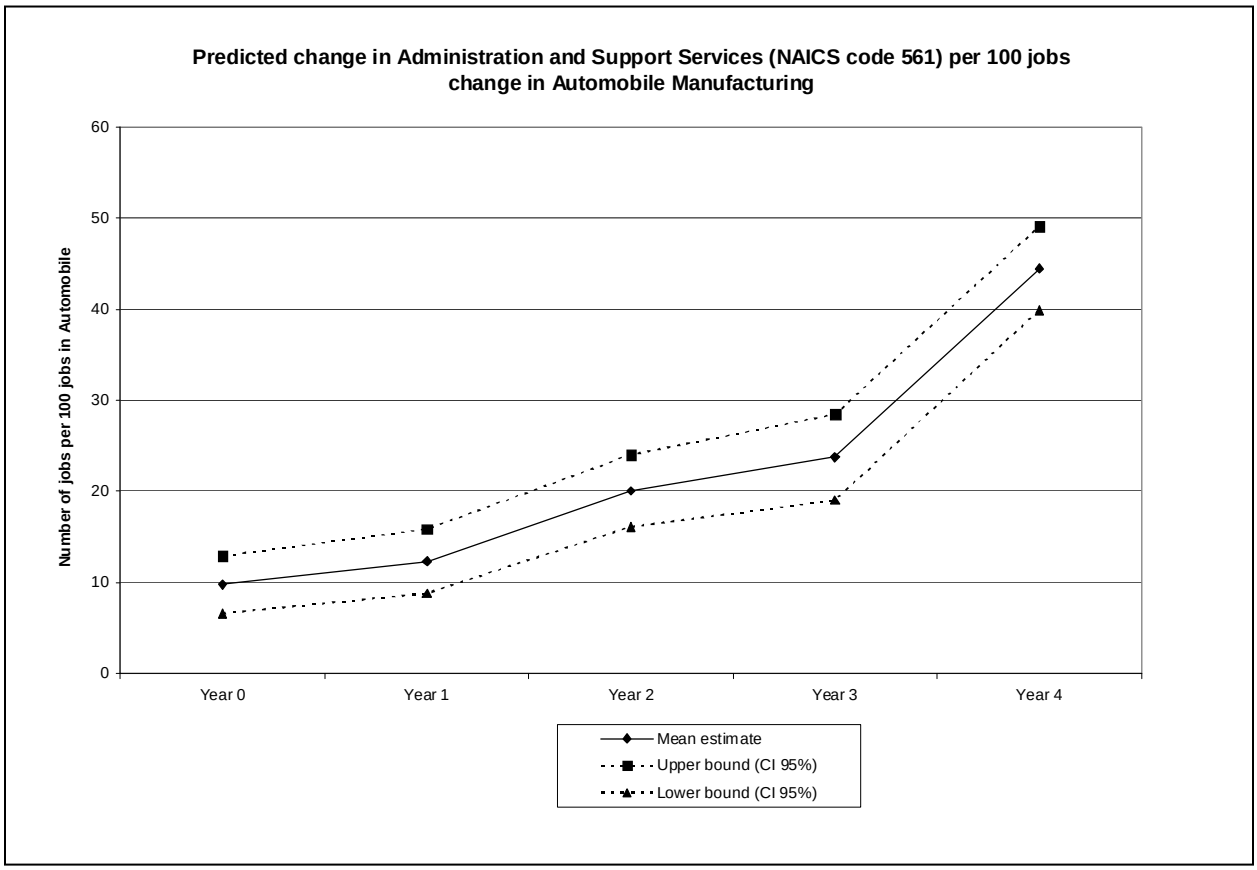
The 3-digit NAICS category Management of Companies and Enterprises (NAICS 551) comprises corporate positions. For this group, there is a strong association with the motor vehicle industry that increases over time. Graph 551 illustrates the relationship.



Summary: we estimate that about 46 jobs in Management of Companies and Enterprises (NAICS 551) were lost with every 100 positions lost in motor vehicles.

Administrative and Support and Waste Management and Remediation Services (NAICS 56)

There are two subcategories within NAICS 56: Administrative Support Services (NAICS 561) and Waste Management and Remediation Services (NAICS 562). The former includes positions in services such as temp agencies, call centers, custodial services, and travel agencies, and was found to be associated with the motor vehicle industry. The latter includes positions in waste collection, waste treatment and disposal, and remediation, and was not associated with a change in motor vehicle positions. Graph 561 shows the relationship between Administrative Support Services (561) and jobs in motor vehicles.

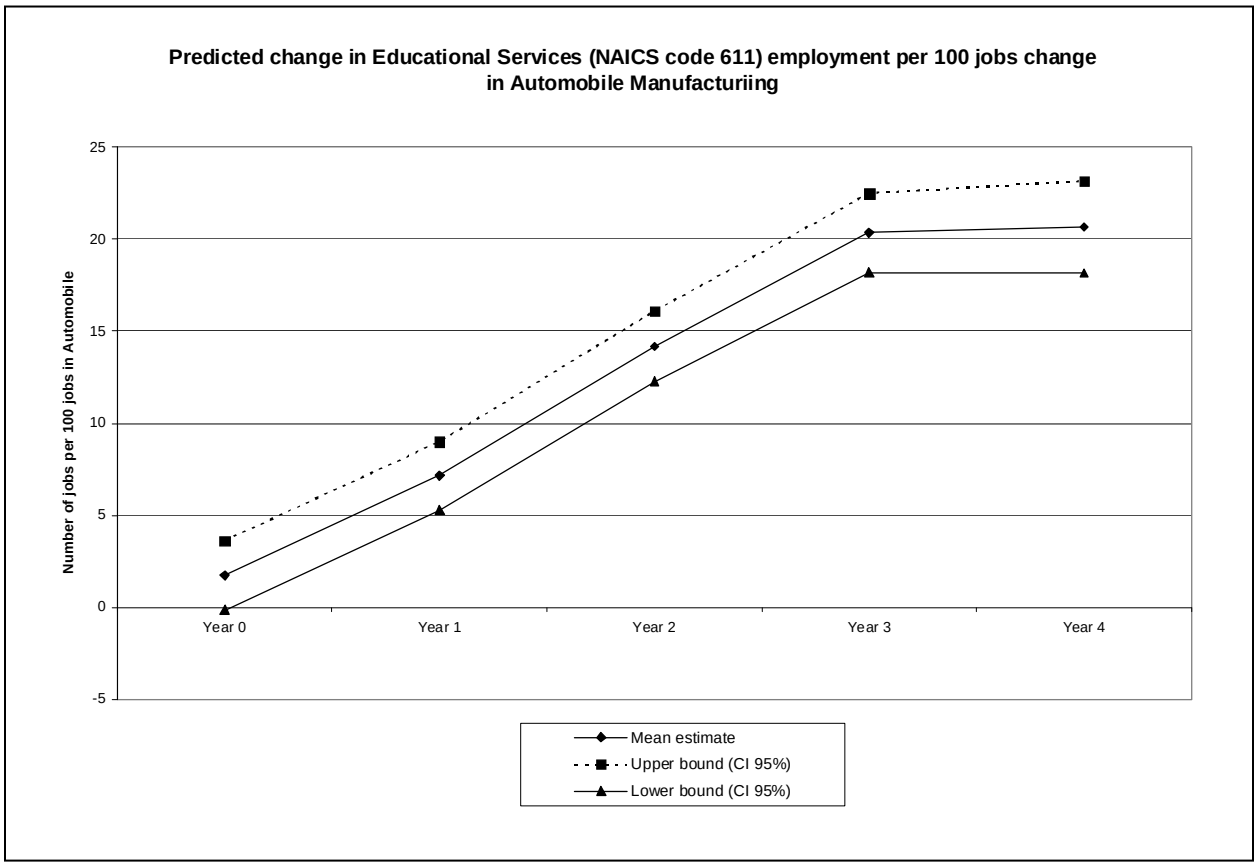


Summary: over the time period, an estimated 110 positions in Administrative Support Services (NAICS 56) were lost for every 100 positions lost in motor vehicles, and this effect grew with time.

Educational Services (NAICS 61)

Educational Services has one 3-digit category (NAICS 611) of the same name. About 65 percent of the jobs in this subcategory are primary and secondary educators (i.e., largely public school teachers). Other types of instructional jobs in this subcategory include college, apprenticeship, technical, and trade positions, as well as instructors for specialty fields, such as flight training and sports.

Graph 611 shows that the immediate effect is small, but that the effect accelerates rapidly in later years, perhaps reflecting the delay in population or demographic shifts.

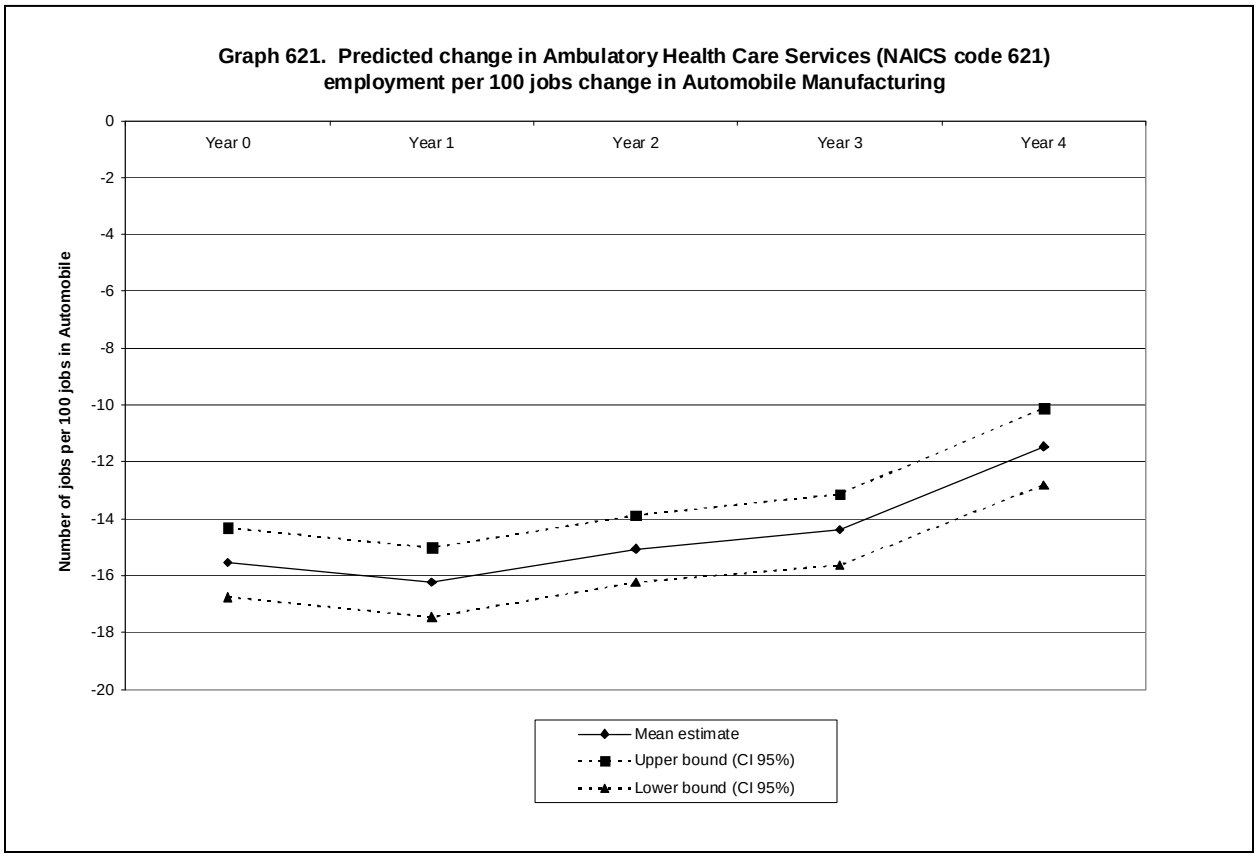


Summary: We estimate a loss of 64 Educational Service (NAICS 61) positions with every reduction in 100 motor vehicle industry jobs. Education practitioners, even public school positions, are not immune to job loss in manufacturing. The effect is strongest after two years of the motor vehicle job dislocation.

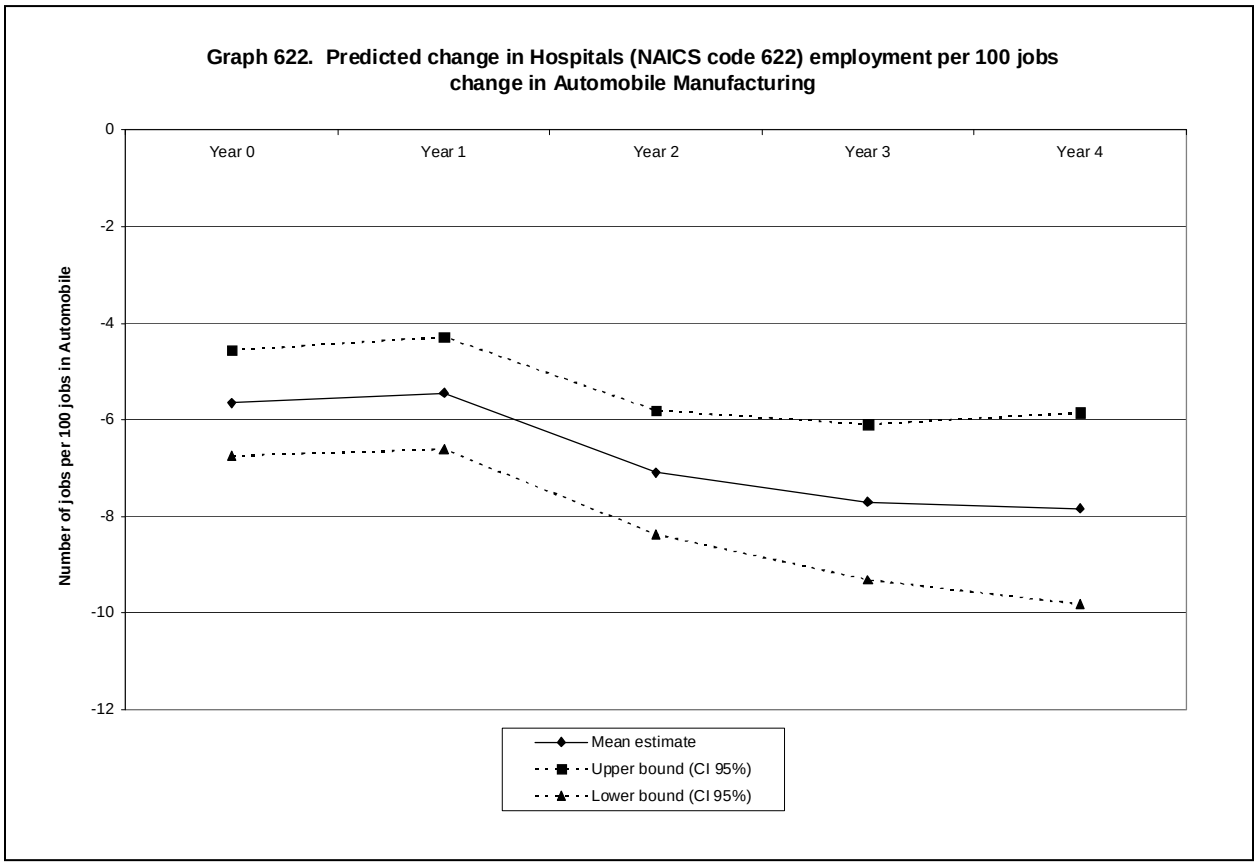
Health Care and Social Assistance (NAICS 62)

There are four 3-digit NAICS subcategories within Health Care and Social Assistance: Ambulatory Health Care Services (621), Hospitals (622), Nursing and Residential Care Facilities (623), and Social Assistance (624). While at different magnitudes and patterns, all indicate a gain in employment as motor vehicle employment declines.

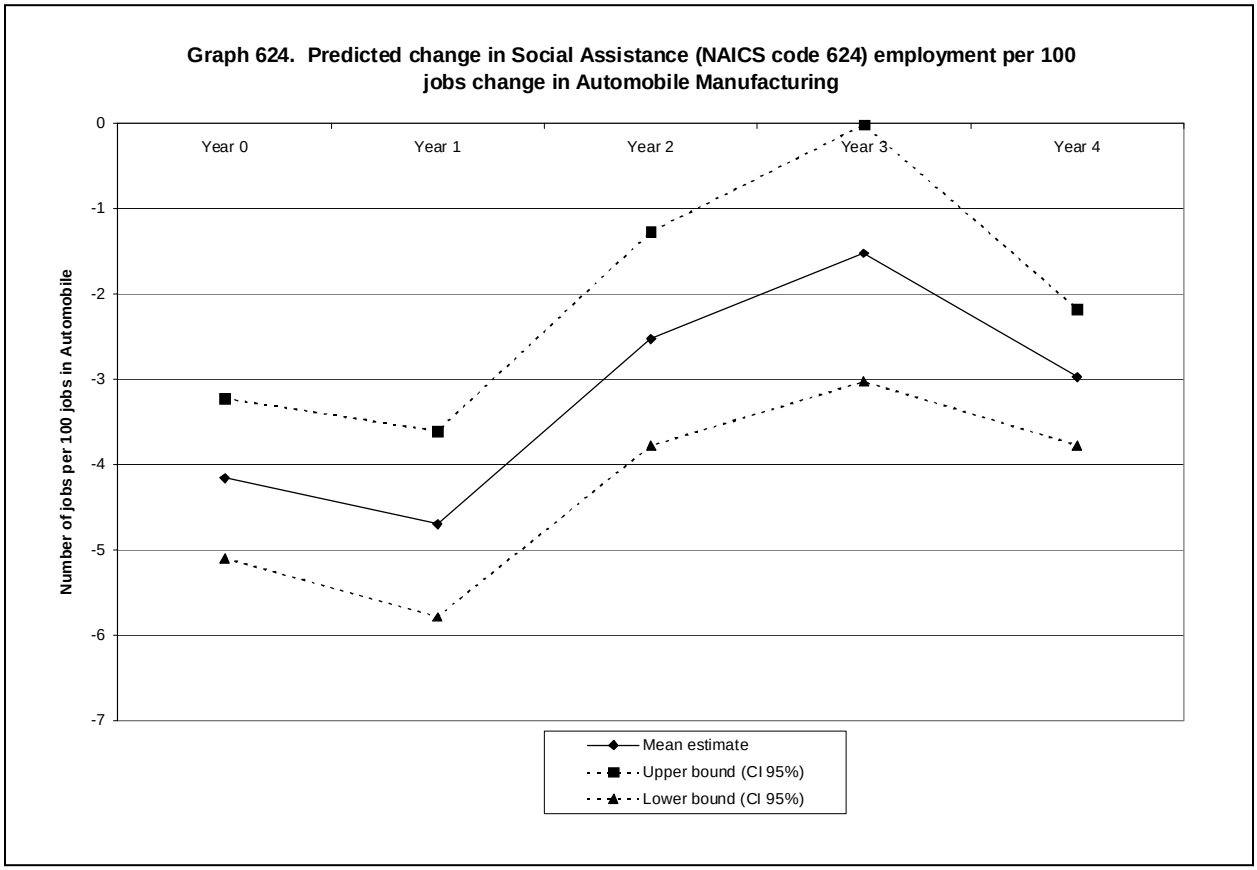
Ambulatory Health Care Services (621) has the largest gain of the four subcategories, with an estimated gain of 72 positions per 100 lost in motor vehicle manufacturing. The pattern decreases slightly over the time period, as Graph 621 illustrates.



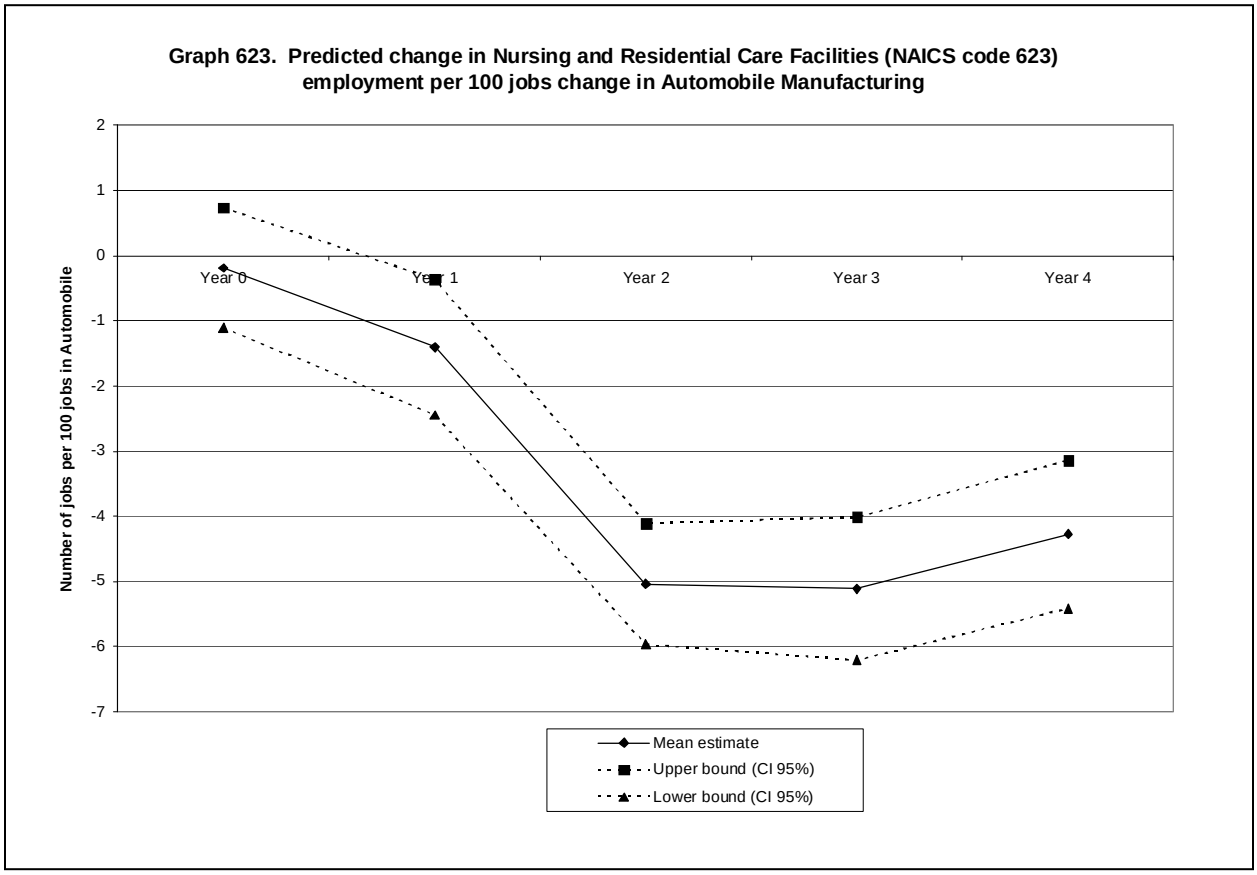
Hospitals (622) gain 34 positions for every loss of 100 motor vehicle jobs. The pattern of change is steady, as Graph 622 illustrates.



Social Assistance (624) positions grow by 17 for every loss of 100 motor vehicle manufacturing jobs. Most of this gain is in the early years, reflecting the deployment of state and local public assistance to the region. Graph 624 shows the pattern.



Finally, Nursing and Residential Care Facilities (623) gains 15 positions with every 100 positions lost in motor vehicle manufacturing. The pattern in Graph 623 indicates a lagged effect of two years.



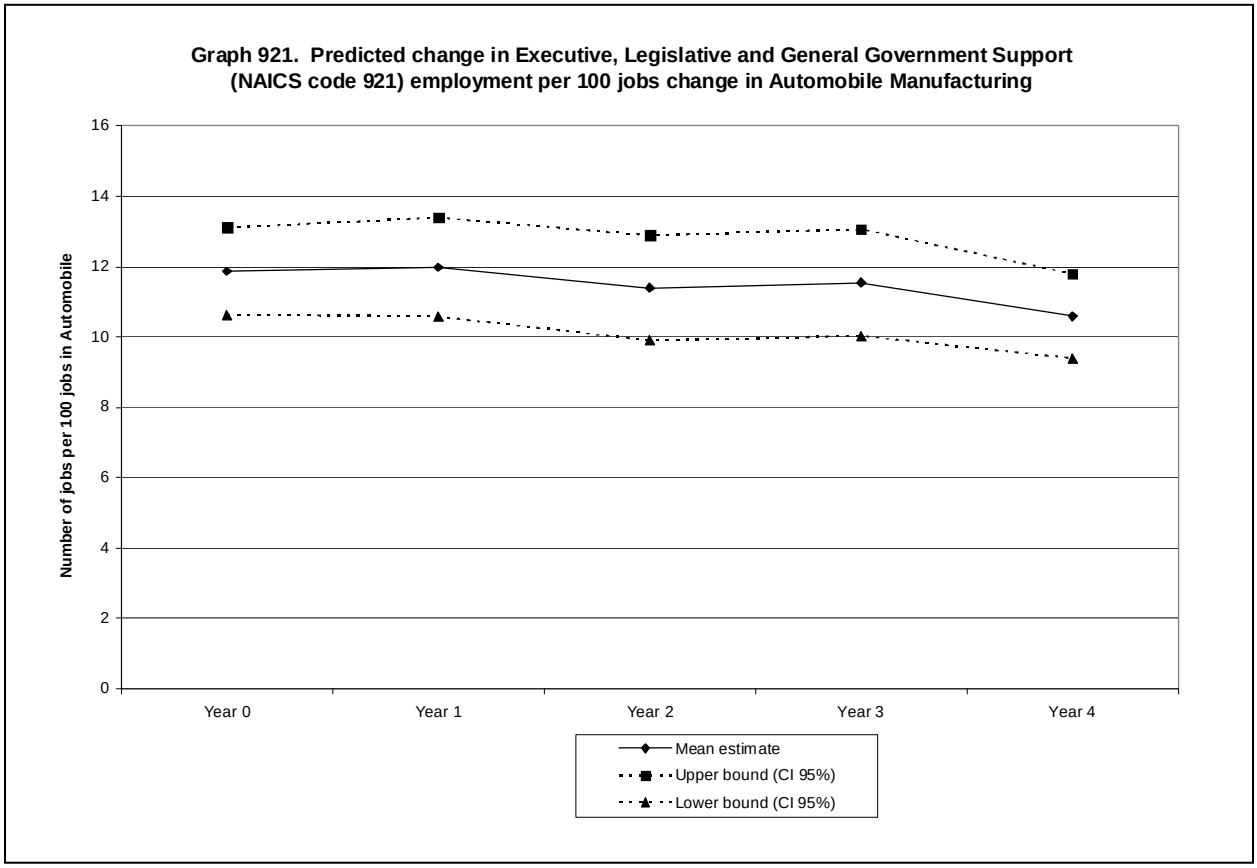
Summary: Health Care and Social Assistance (NAICS 62) gains approximately 138 jobs for every 100 lost in motor vehicles. This finding may represent an increase in demand for health care and other forms of social support that occur with a regional job dislocation.

Public Administration (NAICS 92)

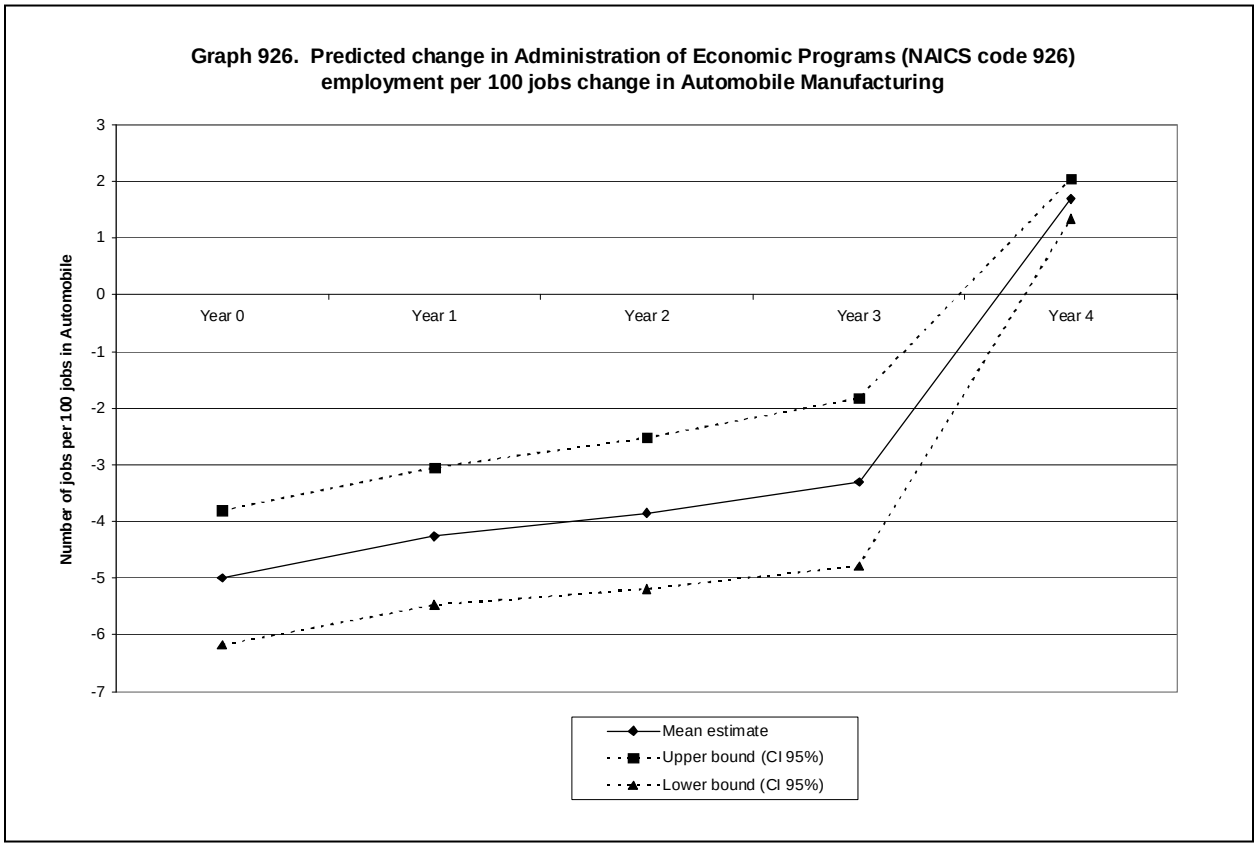
There are eight 3-digit subcategories within Public Administration (NAICS 92): Executive, Legislative, and Other General Government Support (NAICS 921); Justice, Public Order, and Safety Activities (NAICS 922); Administration of Human Resource Programs (NAICS 923); Administration of Environmental Quality Programs (924); Administration of Housing Programs, Urban Planning, and Community Development (925); Administration of Economic Programs (926); Space Research and Technology (927); and National Security and International Affairs (928). Job changes in these categories vary in direction and magnitude.

The findings indicate no association between motor vehicle job loss and change in Administration of Environmental Quality Programs (924), Administration of Housing Programs, Urban Planning, and Community Development (925), and Space Research and Technology (927). Due to the expectation that an economic downturn would create a demand for housing and community development assistance, the null finding for this particular sector was unanticipated.

The 3-digit subcategory showing the most significant change was Executive, Legislative, and Other General Government Support (921). The findings indicate a loss of 58 jobs in this subcategory for every 100 in the motor vehicle industry over the time period. Graph 921 suggests a lagged effect that is steady after four years.

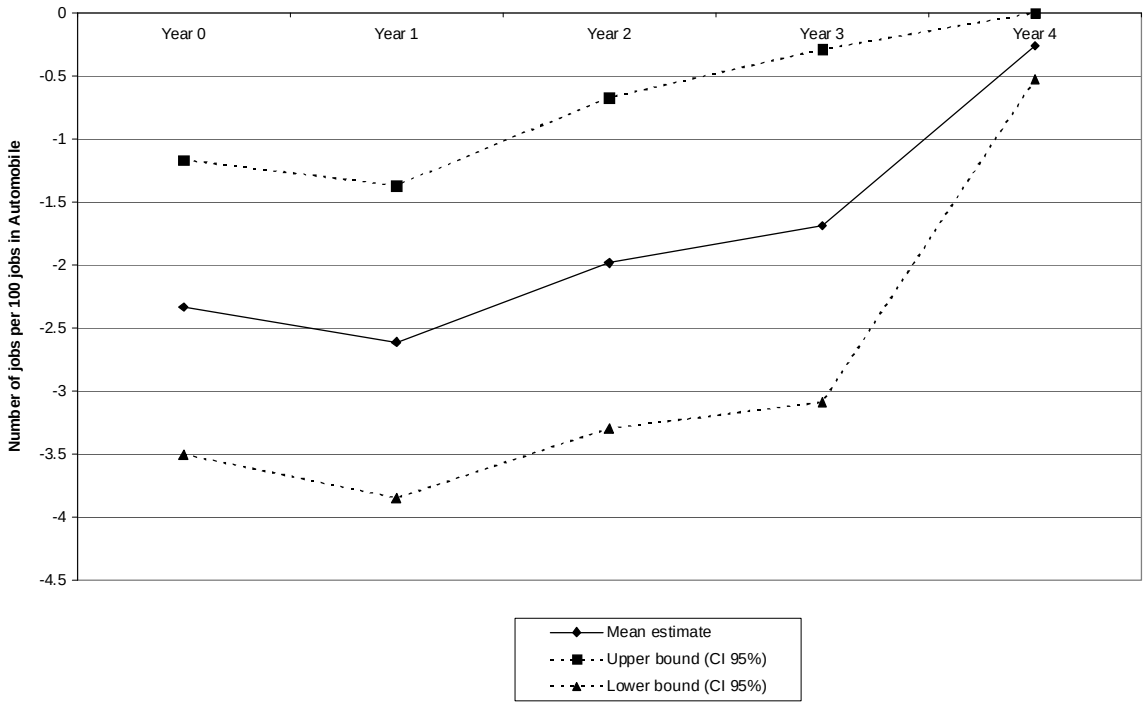


Four remaining subcategories indicate an increase in jobs as motor vehicle employment declines, although at different rates and patterns. Administration of Economic Programs (926) includes jobs related to economic development, such as the administration and regulation of transportation, communications, and utilities. As Graph 926 illustrates, job growth in this subcategory occurs early and tapers off in later years for a total of about 14 positions for every 100 positions in motor vehicles.

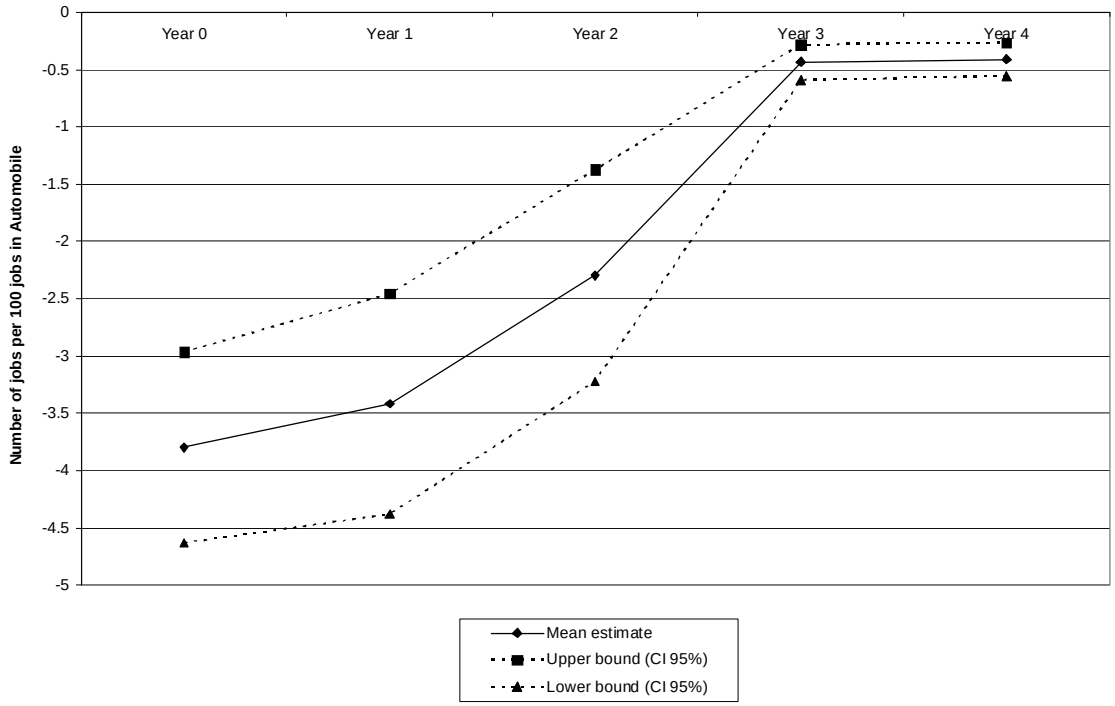


Subcategories Justice, Public Order, and Safety Activities (922) and National Security and International Affairs (928) each grow by an estimated 9 jobs per 100 jobs lost in motor vehicles, and they exhibit a similar pattern. Graphs 922 and 928 illustrate that the jobs increase early, trending toward zero in later years.

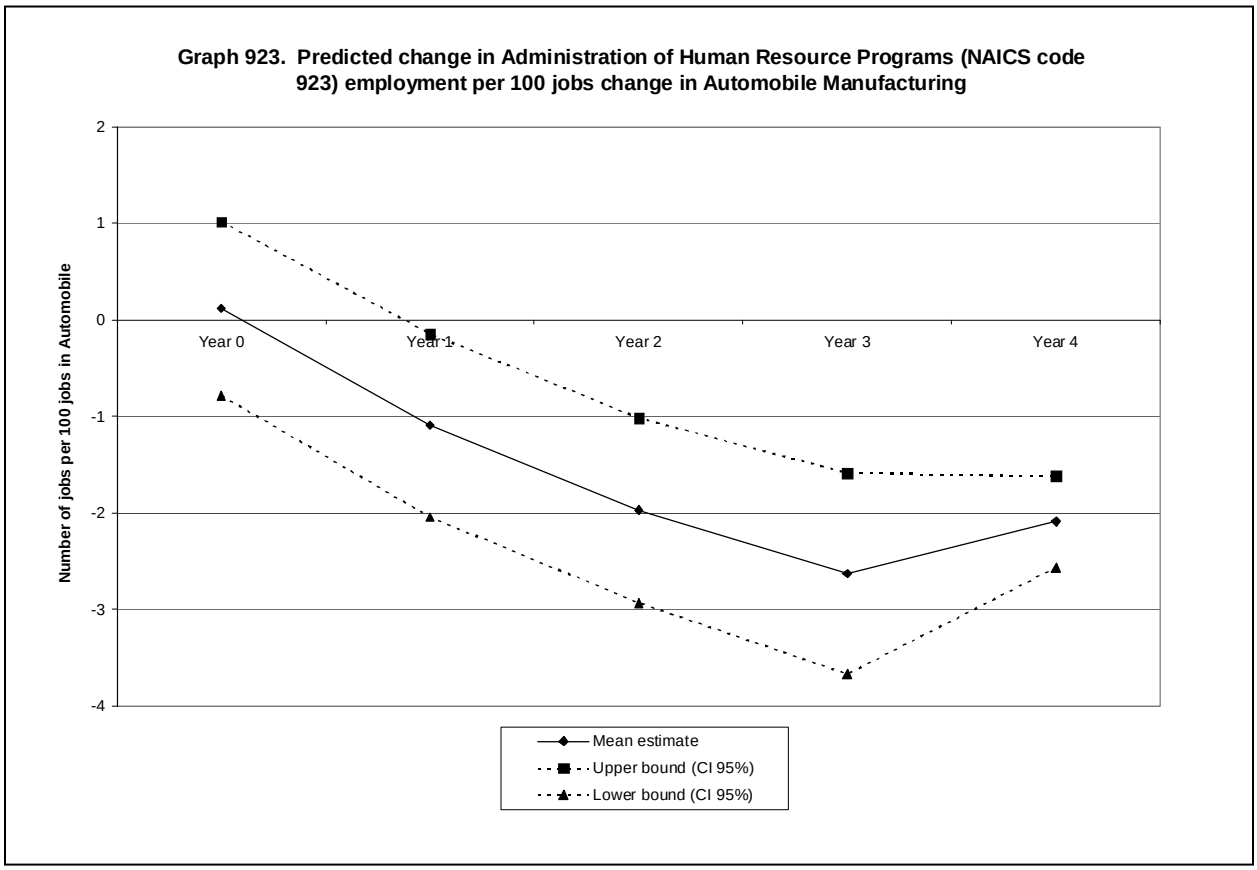
Graph 922. Predicted change in Justice, Public Order, and Safety Activities (NAICS code 922) employment per 100 jobs change in Automobile Manufacturing



Graph 928. Predicted change in National Security and International Affairs (NAICS code 928) employment per 100 jobs change in Automobile Manufacturing



Finally, subcategory Administration of Human Resource Programs (923), which includes occupations involved in social support programs, gains 8 positions per 100 positions lost in motor vehicles. The lagged effect is depicted in Graph 923.

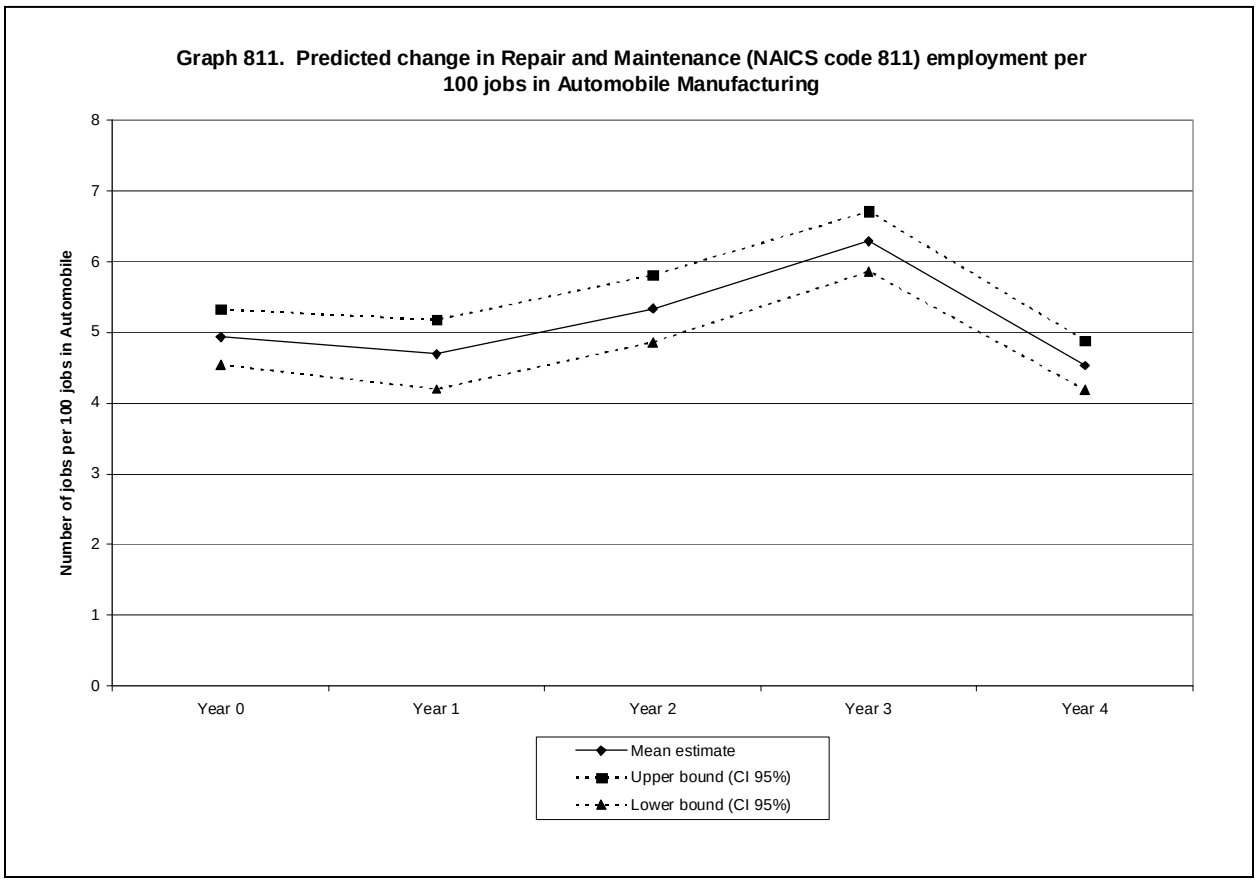


Summary: employment in Public Administration (NAICS 92) varies with changes in motor vehicle employment. Positions often pejoratively thought of as the bureaucracy: Executive, Legislative, and Other General Government Support (NAICS 921), are not immune to a decline in motor vehicles. Rather, the evidence suggests that 58 top-level positions are lost for every 100 jobs lost in motor vehicle manufacturing, but that these losses are partially offset by an estimated gain of 40 jobs in areas such as economic development, law enforcement, and social support. The net loss for Public Administration (NAICS 92) is 18 jobs per 100 lost in the motor vehicle industry.

Other Services except Public Administration (NAICS 81)

The NAICS category Other Services includes four 3-digit subcategories: Repair and Maintenance (811), Personal and Laundry Services (812), Religious, Grantmaking, Civic, Professional, and Similar Organizations (813) and Private Households (814). Of these, Repair and Maintenance is the most affected by motor vehicle employment, and includes repair services for motor vehicle, household, computer, and commercial machinery.

Our estimates indicate a loss of 26 jobs in Repair and Maintenance (811) for every 100 jobs lost in motor vehicles. The effect is steady over time, as Graph 811 illustrates.



Personal and Laundry Services (812) indicates a smaller loss of 9 jobs per 100 in motor vehicles. There is no measured relationship between motor vehicles and the other two subcategories.

Summary: Other Services (NAICS 81) loses an estimated 35 jobs per 100 lost in motor vehicles.

NAICS categories not yet mentioned

Several of the 2-digit NAICS categories demonstrate a small yet statistically significant association with changes in employment in the motor vehicle industry. Information (NAICS 51), which includes six subcategories, appears to lose 12 positions in Publishing Industries (511) and 10 positions in Data Processing, Hosting, and Related Service (518) for every 100 job decline in motor vehicles. Untouched are Motion Picture and Sound Recording (512), Broadcasting and Telecommunications (513), Information Services and Data Processing Servicess (514), and Other Information Services (519). Thus, it seems that local newspapers take a hit, as well as firms that specialize in data processing.

Real Estate and Rental and Leasing (NAICS 53), which includes positions involving building, storage, auto, and consumer goods rental, as well as property management and brokers, lose a total of 13 positions per 100 lost in motor vehicles. Subcategory Real Estate (531) has an estimated reduction of 6 positions; subcategory Rental and Leasing Services (532) has an estimated loss of 7 positions.

Accommodation and Food Services (NAICS 72) actually gains 2 positions in the subcategory Food Services and Drinking Places (722). The gain is immediate and short-term, however, as job losses appear by year 4. Job levels in subcategory Accommodation (721) appear to be unaffected by the change in motor vehicle employment.

Finally, we find no relationship between job loss in motor vehicles and four of the 2-digit NAICS industries: Agriculture, Forestry, Fishing, and Hunting (11); Mining, Quarrying, and Oil and Gas Extraction (21), Utilities (22) and Arts, Entertainment, and Recreation (71).

Conclusions

Consistent with prior research, we generally find a strong positive relationship between regional jobs and the existence of motor vehicle industry jobs. However, we emphasize that the effect varies markedly by sector, and have endeavored to present this diversity. Estimates by NAICS 3-digit job category are summarized in Table 1 below. To provide a sense of the timing of the change in jobs for each category, Table 1 includes the peak year of the estimated job loss or gain.

Table 1. Estimated Employment Loss per 100 Motor Vehicle Jobs by NAICS 3-Digit Category, 2001 to 2008

NAICS Categories and Subcategories	Jobs lost (gained) per 100 in motor vehicles	Peak year of job loss or gain
Construction (NAICS 23)		
Construction of Buildings (236)	31	4
Heavy and Civil Engineering Construction (237)	5	4
Specialty Trade Contractors (238)	100	3
Manufacturing (NAICS 31–33)		
Printing and Related Support Activities (323)	7	0
Chemical Manufacturing (325)	11	1
Plastics and Rubber Products Manufacturing (326)	19	4
Nonmetallic Mineral Product Manufacturing (327)	10	4
Primary Metal Manufacturing (331)	12	0
Fabricated Metal Product Manufacturing(332)	33	4
Machinery Manufacturing (333)	40	1
Computer and Electronic Product Manufacturing (334)	6	0
Electrical Equipment, Appliance, and Component Mfg. (335)	8	2
Miscellaneous Manufacturing (339)	6	0
Wholesale Trade (NAICS 42)		
Durable Goods Merchant Wholesalers (423)	21	0
Nondurable Goods Merchant Wholesalers (424)	17	1
Wholesale Electronic Markets and Agents and Brokers (425)	11	0
Retail Trade (NAICS 44–45)		
Motor Vehicle and Parts Dealers (441)	29	3

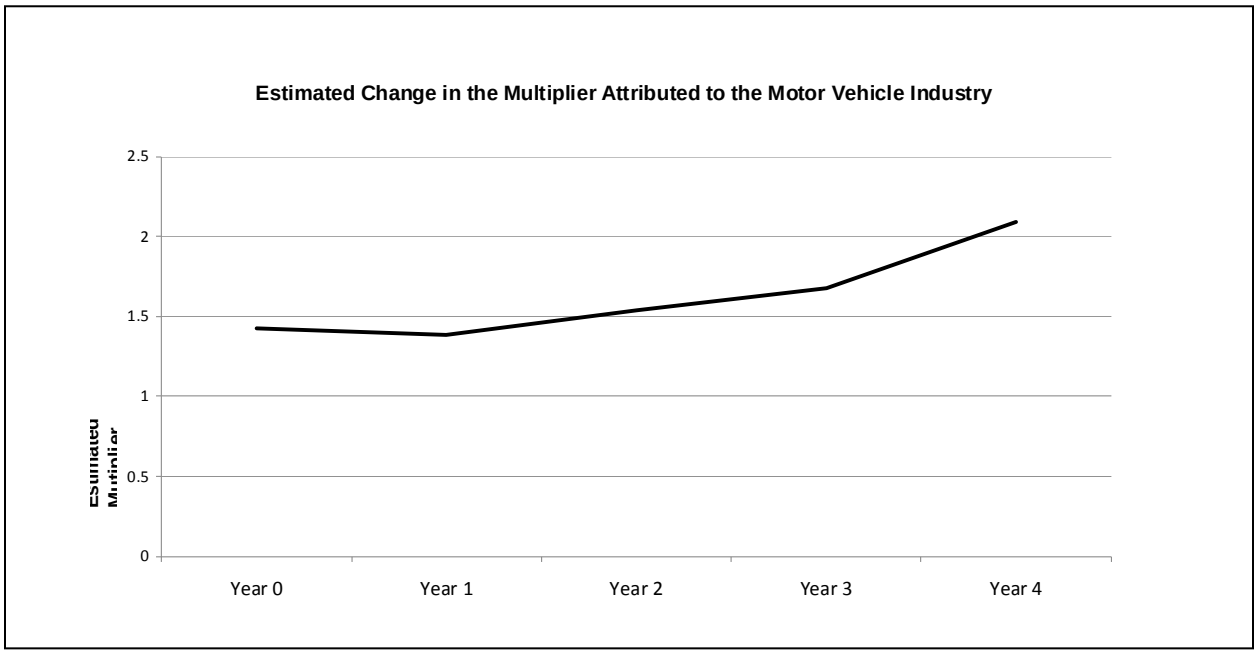
Table 1 continued. Estimated Employment Loss per 100 Motor Vehicle Jobs by NAICS 3-Digit Category, 2001 to 2008

NAICS Categories and Subcategories	Jobs lost (gained) per 100 in motor vehicles	Peak year of job loss or gain
Retail Trade (NAICS 44–45) continued		
Furniture and Home Furnishings Stores (442)	10	3
Food and Beverage Stores (445)	34	2
Clothing and Clothing Accessories Stores (448)	8	4
Sporting Goods, Hobby, Books, and Music Stores (451)	8	0
General Merchandise Stores (452)	26	0
Miscellaneous Store Retailers (453)	12	0
Transportation and Warehousing (NAICS 48–49)		
Air Transportation (481)	19	0
Truck Transportation (484)	(12)	0
Postal Service (491)	16	0
Couriers and Messengers (492)	7	0
Warehousing and Storage (493)	20	3
Information (NAICS 51)		
Publishing Industries, except Internet (511)	12	3
Data Processing, Hosting, and Related services (518)	10	4
Finance and Insurance (NAICS 52)		
Credit Intermediation and Related Activities (522)	30	4
Insurance Carriers and Related Activities (524)	25	2
Real Estate and Rental and Leasing (NAICS 53)		
Real Estate (531)	6	4
Rental and Leasing Services (532)	7	4
Professional, Scientific and Technical (NAICS 54)		
Professional, Scientific, and Technical Services (541)	66	4
Management of Companies and Enterprises (NAICS 55)		
Management of Companies and Enterprises (551)	46	4
Administrative and Support Services (NAICS 56)		
Administrative and Support Services (561)	110	4
Educational Services (NAICS 61)		
Educational Services (611)	64	4
Health Care and Social Assistance (NAICS 62)		
Ambulatory Health Care Services (621)	(72)	1
Hospitals (622)	(34)	4
Nursing and Residential Care Facilities (623)	(15)	3
Social Assistance (624)	(17)	1

Table 1 continued. Estimated Employment Loss per 100 Motor Vehicle Jobs by NAICS 3-Digit Category, 2001 to 2008

NAICS Categories and Subcategories	Jobs lost (gained) per 100 in motor vehicles	Peak year of job loss or gain
Accommodation and Food Services (NAICS 72)		
Food Services and Drinking Places (722)	(2)	4
Other Services except Public Administration (NAICS 81)		
Repair and Maintenance (811)	29	3
Personal and Laundry Services (812)	9	0
Public Administration (NAICS 92)		
Executive, Legislative, and Other General Govt. Support (921)	58	1
Justice, Public Order, and Safety Activities (922)	(9)	1
Administration of Human Resource Programs (923)	(8)	3
Administration of Economic Programs (926)	(14)	0
National Security and International Affairs (928)	(9)	0

A second contribution involved calculating the multiplier across several years in order to capture the temporal depth of the relationship between motor vehicle and regional jobs. We unexpectedly found that the multiplier effect grows over time. Our anticipation was that local employment would be negatively affected by losses in motor vehicle industry jobs, but that the effect would be strong initially and then decline. Instead, the results suggest that the multiplier effect accelerates, at least as far as four years out. The graph below illustrates the upward trajectory of the multiplier.



Our short-term multiplier, combining only years 0 and 1, is estimated at 2.8. This figure is comparable to estimates by CAR, as well as reports from the 1980s. Adding year 2 raises the multiplier to 4.4, adding year 3 raises it to 6.0, and finally with year 4 the multiplier is 8.1. We do not report beyond year 4 due to concerns about the accuracy of the estimates. Still, the findings imply that prior work may have understated the multiplier effect.

More important, the lingering associations between employment in motor vehicles and in other regional industries raise doubts that the decade-long contraction in motor vehicle industry employment can be corrected by growing industries that have local product or service markets. Regional industries, such as construction and retail, show a long-run dependency on the import of wealth from manufacturing. Thus, these findings challenge the view that local, small businesses can reignite employment for Michigan. Our evidence suggests that Michigan would benefit from a neo-mercantile policy that develops industries with national and international markets, and that success in this regard will produce positive economic effects for local businesses.

We were impressed by the dependence of technical and professional jobs on motor vehicle industry employment. The results suggest that technical and professional positions tend to follow manufacturing; the belief that skilled technicians will remain in Michigan as hourly wage positions exit is not supported by these results. Technical and professional positions locate either close to the industries they serve or near to the regional wealth created by manufacturing. The same appears to hold for managers and professionals in finance and insurance.

The analyses also provide some insight into the public sector response to the motor vehicle industry contraction. We learn that services that are primarily public, such as education, are not immune to the downward effects of job loss in motor vehicles. The employment effects are usually not immediate, however, but often occur several years after a contraction in motor vehicles. We speculate that this is due to the lag in population shifts. Second, we did find evidence that the State responds to a contraction in motor vehicles by deploying professionals in areas such as public safety, economic development, and social welfare. Job growth in these areas, however, is often short-term.

Finally, we note an increase in employment in the health fields as the motor vehicle industry declines. We have no ready explanation for why employment in health would increase in regions that have suffered a severe contraction in motor vehicle employment. The demand for health care might increase, or the depressed local labor market may make it easier for health centers to hire, or both.

Limitations

In closing, we emphasize that the report findings are limited by the data and the analytical methodology. Some aspects of this study will tend to understate the estimated job effects, while others may overstate the job effects.

For instance, we stress that all estimates are based on the correlation between a change in jobs for NAICS 336 and change in jobs in other 3-digit NAICS subcategories. We have proceeded throughout with the assumption that job change in motor vehicles (NAICS 336) is the cause of employment change in other sectors. Although we believe this assumption to be essentially correct, it may not hold for all sectors. The national economic fallout has

reduced the demand for motor vehicles, and our method does not take into consideration the possibility of reverse causality. To the extent that we failed to control for the decline in motor vehicle jobs due to the decline in regional sectors, our results may have spuriously inflated the estimated multiplier effect of the motor vehicle contraction.

What might understate the effect of the motor vehicle contraction is the use of a county-level analysis. This method limits the correlation to within-county effects, ignoring the job dislocation effects elsewhere. So for example, a producer of office furniture in Kent County might suffer layoffs due to a motor vehicle plant closure in Genesee County, but our analysis will not pick up this effect. Sectors in interstate or international markets, such as furniture or agriculture, are unlikely to register a localized (i.e., county-level) effect. We suspect that the residual job loss from the motor vehicle contraction extends beyond the boundaries of counties, but the method we use will not capture such effects.

Another limitation that may lead to understated estimates for the multiplier is that for some industries the employment effects appear to extend longer than the four-year time period we investigated. One way to gain an appreciation for this limitation is to examine the graphs for NAICS subcategories: an upward trend in employment effects in later years would imply a time-horizon that is longer than four years.

Finally, as mentioned in the introduction, the ES-202 data do not include self-employed or contract workers. Persons in these less-formal employment arrangements may expand or contract as the motor vehicle industry declines. We do not have the data to address this issue.