THE ECONOMIC AND DEMOGRAPHIC OUTLOOK FOR MICHIGAN THROUGH 2045

Prepared for

Bureau of Transportation Planning
Michigan Department of Transportation

Prepared by

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Introduction

Since the early 1990s, we have produced six sets of long-term economic and demographic forecasts (1994, 1998, 2003, 2008, 2012, and 2017) for the Michigan Department of Transportation (MDOT), the Metropolitan Planning Organizations (MPOs), and the State Regional Planning Organizations. In this report, we summarize the methods used and the broad results for the most recent outlook.

A consistent set of forecasts has been developed for the state as a whole and for each of Michigan's counties. County results can be summed to form any region. The last year of historical data in the model is 2013; the forecast period runs through 2045. Forecasts are provided for each year through 2020 and in five-year intervals from 2020 through 2045; they include population, employment, the labor force participation rate, personal income, households, and Gross Domestic Product for each county and for the state as a whole. The forecasts were developed using a version of the Regional Economic Models, Inc. (REMI) TranSight model, together with a methodology for developing household forecasts designed by the University of Michigan in cooperation with MDOT.

The forecasts are very detailed. The population forecasts are subdivided into eleven age cohorts for both males and females. The major components of population change are also isolated (natural change, net domestic migration, and net international migration). The employment forecasts are based on the Bureau of Economic Analysis series and are broken out into seventy-one divisions consistent with the North American Industrial Classification System (NAICS) for defining industry categories. Included is a detailed breakout of manufacturing industries, the better to accommodate MDOT's truck/commodity modeling activities. Personal income is partitioned into eight major

subcategories, total shipments (sales) are categorized into seventy industries (state and local government activity is combined into one industry). Gross Domestic Product is distributed among four final demand categories. The labor force participation rate is calculated for thirteen age categories. The household forecasts cover the number of households as well as the population in households and group quarters. Included are projections of the distribution of households by size of household, age of household head, category of income, number of vehicles, and with/without children status.

The forecasts can be requested, including individual counties, from the Bureau of Transportation Planning at MDOT. Because of the density of these forecasts, in number of regions, number of years, and number of indicators per region, it is not possible to present the detailed results in this summary report. Instead, we summarize here the general process and trends that characterize these forecasts, with a primary focus on the state as a whole.

In the next section, we discuss our use of models to generate the forecasts for the counties. Following that, we look at two of the major influences on our state outlook: recent economic conditions, and the future path of the national economy and population. We then present our economic and demographic forecasts for Michigan, followed by a summary county breakout of these forecasts. We close with a brief concluding section.

Method

The Economic/Demographic Model

The forecasts, except for the household forecasts, were developed using an economic/demographic model constructed by Regional Economic Models, Inc. (REMI) of Amherst, Massachusetts [2], and adapted by the research team at the University of

Michigan. The REMI model has been fully documented and peer-reviewed in the professional literature and is arguably the most widely applied regional economic forecasting and policy analysis tool in the nation. We have been using evolving versions of the REMI model since 1983 to assess projects for several state government agencies in Michigan.

For this study, we were guided by the University of Michigan's near-term economic forecast for the state, which is used by the administration of the State of Michigan, the House Fiscal Agency, and the Senate Fiscal Agency [1]. We updated economic and demographic information for periods not in the model when it was delivered but that subsequently have been released prior to finalizing our forecasts. We also made numerous adjustments to the model based on both our expertise and the comments and insights of a number of local MPOs and regional planning organizations. Specifically, since no model is able to include all local knowledge about a regional economy, we generated a preliminary set of forecasts and solicited input from these local organizations. Their comments guided several of the adjustments that contributed to the final set of forecasts summarized in this report.

The REMI model used in this study is a multi-region model that includes all of Michigan's eighty-three counties. An economic model was chosen to produce the forecasts for a number of reasons:

- A model imposes a logical consistency and objectivity across counties.
- Its success patterns can be replicated, and forecast errors can be systematically analyzed and corrections introduced.
- The forecasts can be very comprehensive in coverage.

- The forecasts can be generated frequently.
- The model can capture the interactions between demographic and economic forces.
- Sophisticated models can capture trade flows among regions, and thus a county's responsiveness to activities outside of the county.
- A model does not assume that trends continue indefinitely; unlike extrapolation techniques, a model allows the economy to adjust over time.

Among economic models, the REMI model was selected because of several of its features and credentials:

- It is a state-of-the-art model that has been extensively peer-reviewed in the professional literature.
- It has been field-tested for over thirty-five years.
- The model is sufficiently comprehensive to incorporate both an economic and a demographic module that interact.
- The model accounts for trade flows among counties.
- It is a very detailed model that captures the dynamic interactions among economic sectors.
- It is used by other government agencies in Michigan.

The Household Model

The REMI model in isolation does not generate household forecasts. Thus, our research team at the University of Michigan, in cooperation with MDOT, developed an interface model to produce such forecasts. The interface model uses data from the 2013

American Community Survey five-year PUMS and a spreadsheet program to apportion households by age category (i.e., the age of the household head) at the county level.

The changing age structure of the population is what drives all of the household forecasts. If, for example, we know from the Census that in county X there were 4,000 people aged 45 to 54 in 2000, with 1,500 households headed by someone in that age group, then the household/population ratio for this age group is 0.375 (1,500/4,000). These 1,500 households are then allocated to the other household categories included in the forecast (income, household size, number of motor vehicles available, presence or absence of children) based on the distribution from the PUMS data. All of these ratios are held constant over the forecast period. The variable that moves the forecast forward is the population in each age category, which changes over time. The resulting apportionment contains seven categories for age, five for household size, three for income, four for vehicle availability, and two for presence or absence of children, for a total of 840 cells for each county.[1]

Recent Economic Conditions

The structure of the models, with its embedded mapping of the dynamic movements of the economy and underlying response rates, is a key determinant of the forecast results presented in this study. The results are also influenced by two additional elements. The first is recent and current conditions in the regional economy, which establishes the jumping-off point for the forecast. Obviously, where the economy is headed over the next few years is influenced by how it is performing currently. In this regard, the news is steadily improving.

[1]The total of 840 cells is arrived at as follows: 7 (age) × 5 (household size) × 3 (income) × 4 (number of vehicles available) × 2 (presence or absence of children) = 840 cells.

The good news at this juncture is that Michigan has nearly regained the jobs lost in the worst economic crisis in our lifetime. From 2000 to 2010, Michigan lost a shocking 579,837 jobs,[2] but since 2010 it has regained 475,491 of those jobs, leaving the state 104,346 or 18 percent short of the historical peak achieved in the year 2000. The lingering bad news, at least in terms of jobs, is that in 2015 the state is still 452,020 short of year 2000 levels in *wage and salary* jobs. The reason total employment is only about 104,000 jobs short of 2000 levels is that Michigan has added 347,674 *self-employed/proprietor's* jobs.

The average wage and salary job, where the employer pays one-half of the social security tax, tends to pay much better than the average self-employment job. In 2015, the average wage and salary job paid $49,590 plus an additional $11,308 in employer-paid benefits, including the employer's share of social security taxes. Thus, the total compensation for an average wage and salary worker was $60,898 in 2015. In contrast, the average earnings for a proprietor in 2015 were only $23,876. As workers in Michigan have shifted from wage and salary jobs to self-employment, they have suffered a substantial drop in their income.[3]

Now for the better news: Michigan is approaching full employment, and while that will make it difficult to achieve substantial additional job gains, inflation-adjusted earnings are beginning to increase. Adjusted for inflation, the average wage in Michigan

[2]Throughout this report, the employment data are based on the measure published by the U.S. Bureau of Economic Analysis [4], and as such, include the self-employed, farm workers, and military personnel.

[3]Some example occupations that include a large share of self-employed workers include real estate agents, barbers, truck drivers, and farmers, as well as taxi and uber drivers. After deduction of expenses, some of these jobs report negative income on their business tax return, which lowers the overall average.

increased by 3.0 percent in 2015, and now slightly exceeds its 2003 peak.[4] How employment and real income are projected to grow over the next 30 years is a primary focus the rest of this report.

Inputs to the Forecast

The other key element influencing the forecast outcomes is the series of assumptions that serve as inputs to the model. Even if we accurately capture the workings of the economy, it is also the case that all forecasts are conditional on the assumptions that guide the results. In the case of regional forecasts, many or most of the inputs take the form of assumptions involving the future path of the national economy and population. In the REMI model, some of the features of the U.S. forecast are fixed in the program; consequently, in some instances we have made direct adjustments to the local-area forecasts.

In the rest of this section, we touch on several of the overarching assumptions on the national demography and economy.

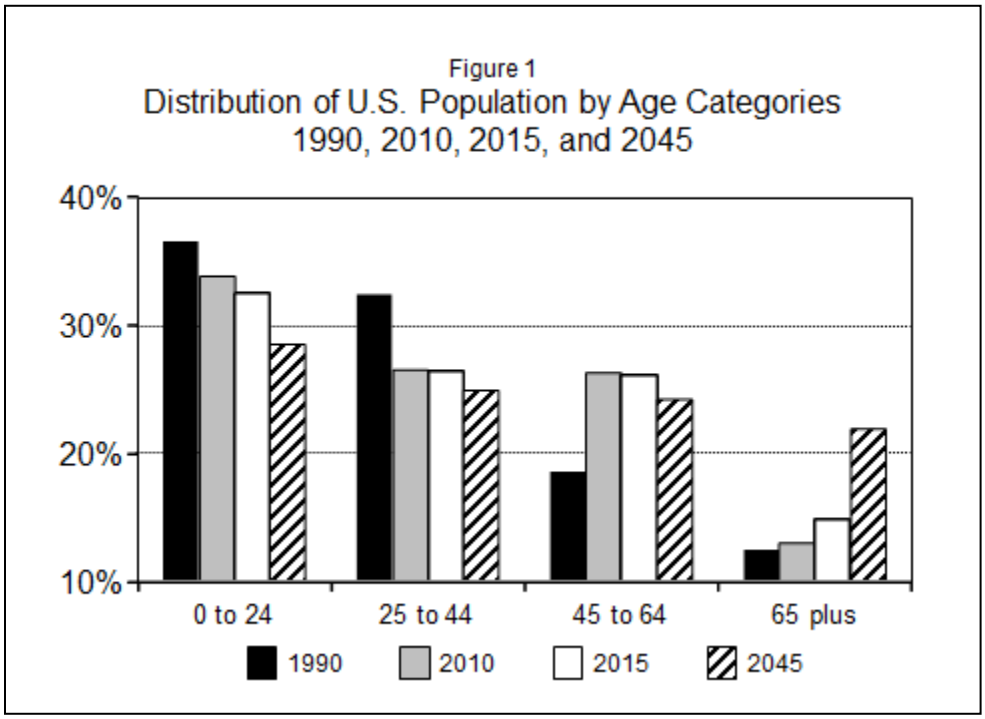
Inputs Related to the Demographics

First, we consider the demographic profile, starting with the age structure of the population. One of the factors influencing the growth of the labor force in the long term is changes in the working-age population.

The current age structure of the U.S. population, as well as the past and projected future age distribution, is shown in figure 1. Between 1990 and 2010, there was a very sharp increase nationally in the older working-age population, those aged 45 to 64. This age group's share of the population increased from 18.6 percent to 26.4 percent, while the

[4]Average real compensation increased by 2.8 percent in 2015. Average inflation-adjusted earnings per proprietor increased by 0.5 percent. These data are adjusted for inflation using the U.S. Personal Consumption Expenditure Deflator.

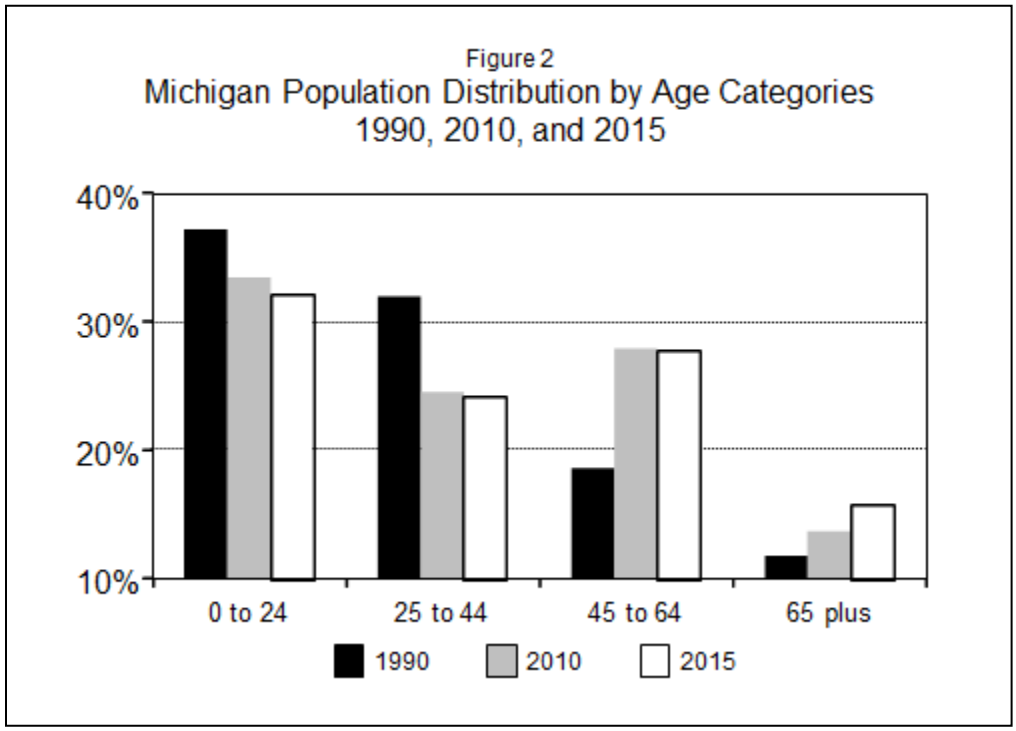
younger population groups saw a significant decline in their population share. During that same period, the share of the population aged 65 and older remained relatively stable, rising from 12.5 percent to 13.1 percent. That is beginning to change.



The impact of the aging of the baby boomer generation is already beginning to be felt, as the first of the post-World War II babies reached the Social Security Administration's full retirement age in mid-2011. The share of the population aged 65 and older rose to 14.9 percent in 2015 and is forecast to jump to 22.0 percent in 2045. To put this in perspective, people 65 and older currently account for 19.4 percent of the population in Florida, the state known for its concentration of retirees. The share of the other age cohorts will decline, with the greatest decline occurring in the 0 to 24 age group.

How does the age distribution of the U.S. population compare in 2015 with that of Michigan? That can be seen by comparing the United States in figure 1 with Michigan in

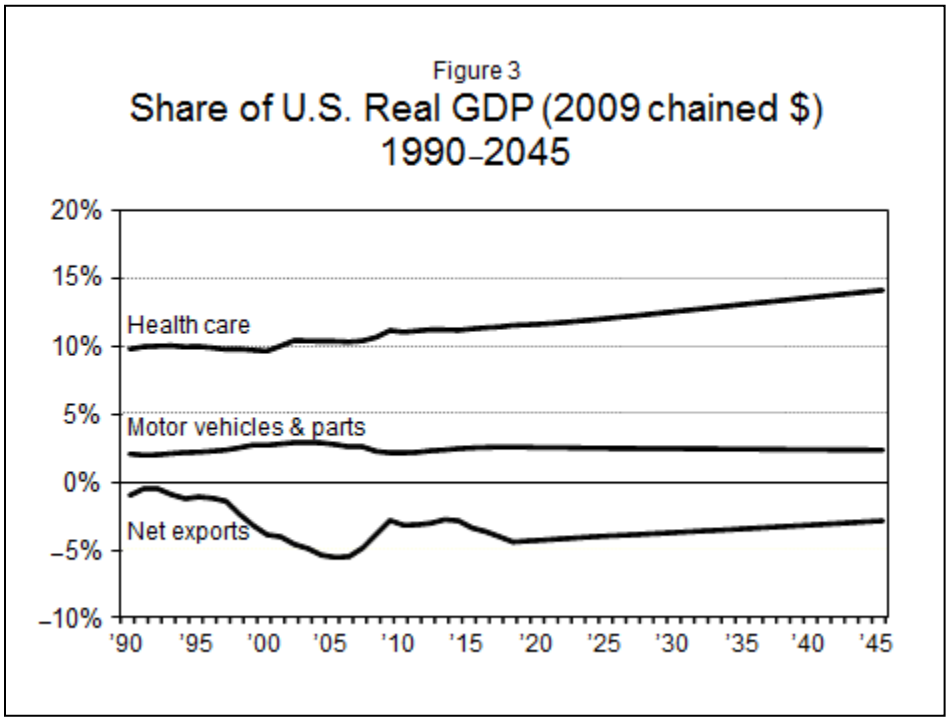
figure 2. Michigan currently has a disproportionately large share of baby boomers, as can be seen in figure 2. People aged 45 to 64 account for 27.8 percent of Michigan's population, compared with 26.2 percent nationally. The share of the population 65 and older is also larger than in the nation, 15.8 percent and 14.9 percent, respectively. In comparison, the younger age cohorts, that is, those under 45, constitute a smaller share in the state than in the nation. Those aged 25 to 44 account for only 24.2 percent of the state's population compared with 26.4 percent nationally; and those under 25 make up 32.2 percent of Michigan's population compared with 32.6 percent nationally.



Note that while the state's population is now older than the nation's, in 1990 Michigan was younger. In 1990, the 65-and-older population accounted for only 11.9 percent of the state's population compared with 12.5 percent in the nation overall, while the under 25 age group accounted for 37.3 percent of the state's population compared with 36.5 percent in the United States.

Inputs Related to the Economy

The most comprehensive measure of output for the U.S. economy is inflation-adjusted (real) Gross Domestic Product (GDP), that is, the value of all goods, services, and structures produced in the economy. Real GDP can be broken out into subcomponents, which are expected to grow at different rates over the forecast period. The changing shares of these subcomponents over time have direct implications for the Michigan forecast. We will focus on three of these subcomponents, which are shown in figure 3.



The consumer services share of national output increases steadily over the forecast horizon, reflecting a movement toward a more service-oriented, information-based economy. The dramatic aging of the U.S. population accelerates this trend, especially the increase in the population aged 75 and older, particularly with an increasing diversion of spending toward health care services: The proportion of real

GDP accounted for by consumer expenditures on health care services declined between 1990 and 2000, from 9.9 percent to 9.7 percent. The share of GDP going to health care then began increasing, reaching 11.4 percent in 2015. We are forecasting that the share will increase by 2.9 percentage points between 2015 and 2045, reaching 14.3 percent of real GDP. The expanding demand for services is less subject to global competition in much of the service-producing economy compared with the goods-producing economy. The increase in demand for services supports growth in service employment; this is dampened somewhat by an increase in productivity, but less so than what occurs in the goods-producing economy.

America's trade deficit (the excess of imports over exports) deteriorated sharply between 1995 and 2005, as the reduction in real GDP from net exports went from 1.0 percent to 5.5 percent. American consumers went on a spending spree that drove the saving rate to nearly zero. As these excesses began to correct, helped along by the Great Recession,[5] the saving rate was sent back up and the trade deficit retreated, reducing real GDP by a smaller 2.7 percent by 2013. As the economy recovers from the recession, the trade deficit increases once again, reducing real GDP by 4.3 percent in 2018. The trade deficit then begins to improve slowly, reducing real GDP by 2.8 percent by 2045. This improvement in the trade account will be favorable for Michigan and its exporting activities.

The auto industry benefited greatly from the consumer spending boom. Consumer spending on motor vehicles and parts grew from 2.1 percent of real GDP in

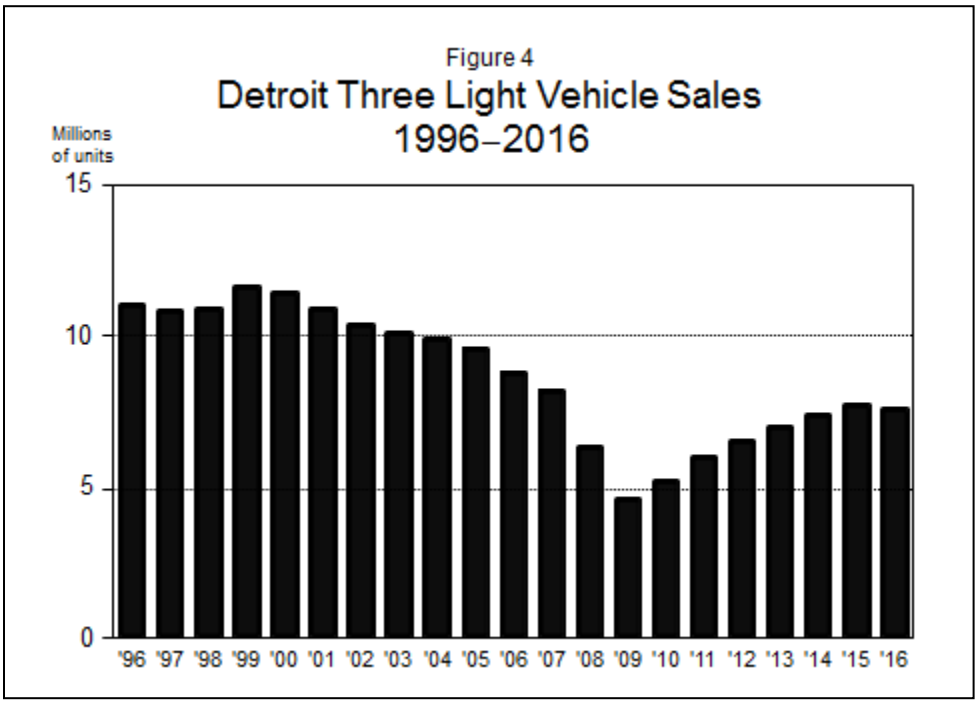
[5]The Great Recession was a severe global economic downturn sparked by the late-2000s financial crisis. In the United States, the recession began officially in December 2007, with the trough month for business activity pegged as June 2009. Peak to trough, output fell 4.2 percent, and the subsequent pace of recovery was atypically slow.

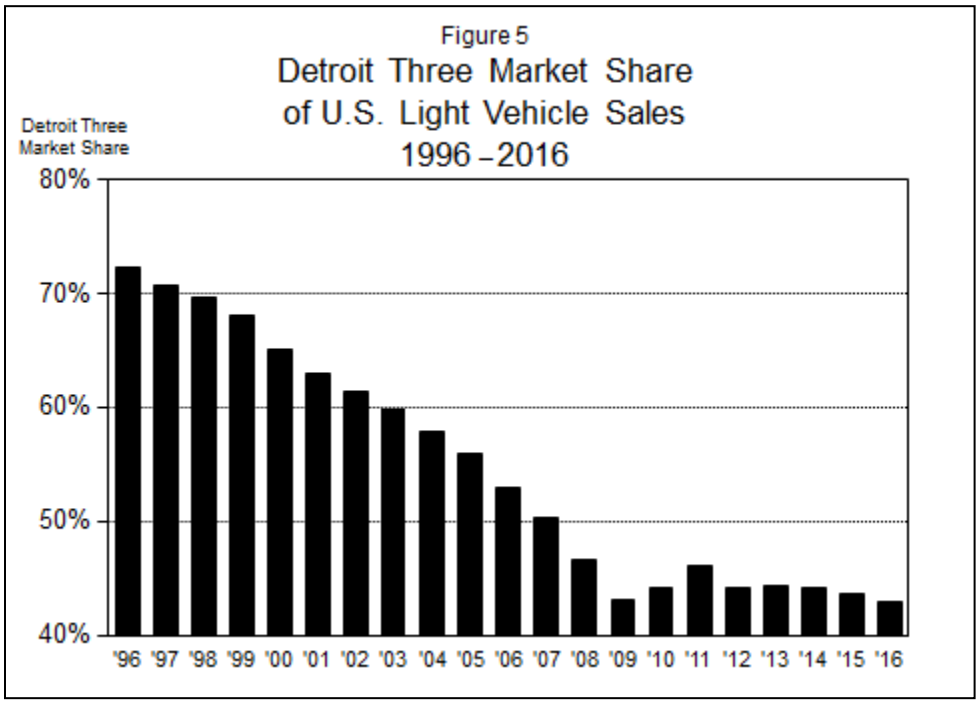
1990 to 3.0 percent in 2003. Its share then slipped to 2.6 percent of real GDP in 2007, and collapsed to 2.2 percent in 2009–11. Consumer spending on motor vehicles and parts recovered to around 2.6 percent of real GDP by 2015, where we expect it to remain through 2023. We are forecasting consumer spending on autos as a share of real GDP to decline slowly after that, reaching 2.4 percent in 2045. Given Michigan's heavy dependence on the manufacture of motor vehicles, any shift away from spending on the state's dominant product would have adverse consequences for the local economy.

This forecast is based upon motor vehicle production and consumer purchasing of motor vehicles continuing to behave as they have throughout history, accounting for the business cycle and the trend shift toward consumers purchasing more services, such as health care. The advent of autonomous vehicles, however, could have a dramatic effect on the level of sales. Auto sales could well increase as vehicles become more technologically advanced and embody even more consumer activities. Then again, consumers could stop buying vehicles altogether, opting instead to rent an autonomous vehicle whenever they need to travel by land. As shown in figure 4, U.S. sales of light vehicles[6] by the Detroit Three peaked in 1999 at 11.5 million units, and then declined systematically thereafter until 2009, when sales hit bottom at 4.5 million units. Total employment in Michigan, highly correlated with Detroit Three sales, followed suit with a collapse of its own. Through 2005, the plummet in Detroit Three sales was almost solely due to a rapid decline in market share, which shrank from 68.2 percent in 1999 to 56.1 percent in 2005, as shown in figure 5. By the second half of the decade of the 2000s,

[6]Light vehicles include cars, minivans, sport utility vehicles (SUVs), crossovers (CUVs), and pickup trucks.

total sales were in decline as well, and that augmented the negative effects of a still-declining market share, which fell to 43.2 percent by 2009.





Possibly the best single statistic to answer the "why" question on the retrenchment of the Michigan economy is found in the market share numbers, along with data on the concentration of the auto industry in the state, which remains off the charts. The rebound in Detroit Three sales following the low point of 4.5 million units in 2009 to 7.5–7.6 million units in 2015–16 coincides with record annual sales of total U.S. light vehicles and with an improving state economy. We see the Detroit Three sustaining sales in the range of 7.5–7.6 million units for most of the rest of this decade.

The revival in Detroit Three sales bodes well for the state's near-term outlook. In the longer term, we don't view autos as a growth industry, but past evidence shows that the local economy can expand so long as there is stability in the auto sector, at least in an output sense. The prospects for employment in the auto industry, and in manufacturing in general, are less favorable in our view, as we expect fairly robust long-term productivity growth over time.

We now turn to a detailed analysis of our economic and demographic forecast for Michigan.

Forecast for Michigan through 2045

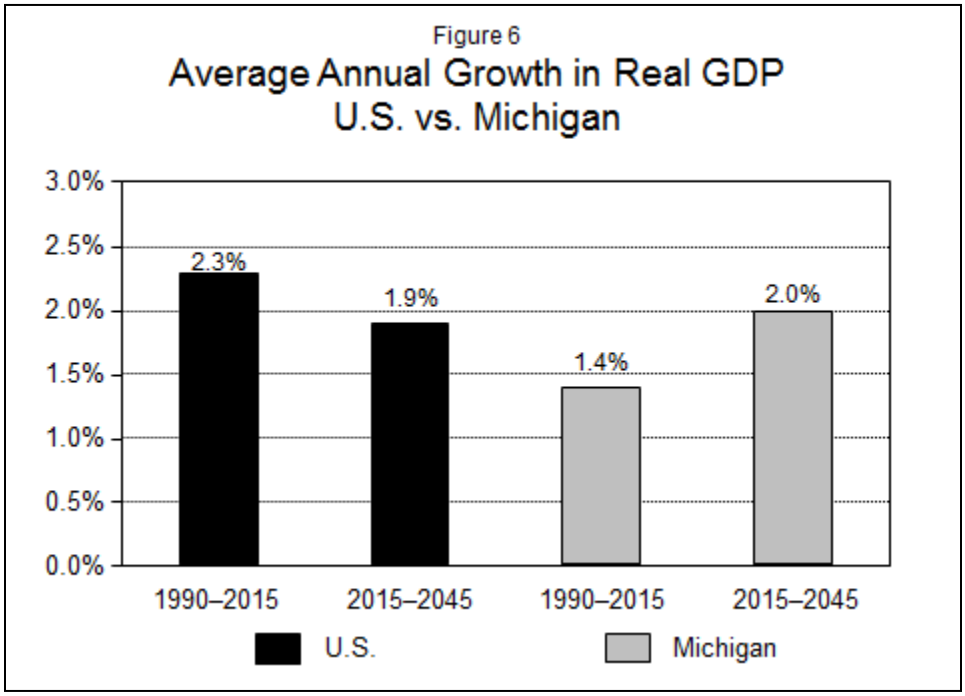
Current conditions locally as well as anticipated future trends nationally portend moderate growth for Michigan's population and labor market over the next thirty years. We should recognize from the outset that long-term forecasts are intended to identify economic trends, not to predict movements in the business cycle. These forecasts are also unable to capture major one-time events for which there is no prior knowledge, such as a terrorist attack or an oil embargo.

With these caveats in mind, we now review the headline items for our Michigan forecast.

U.S. and Michigan Real GDP

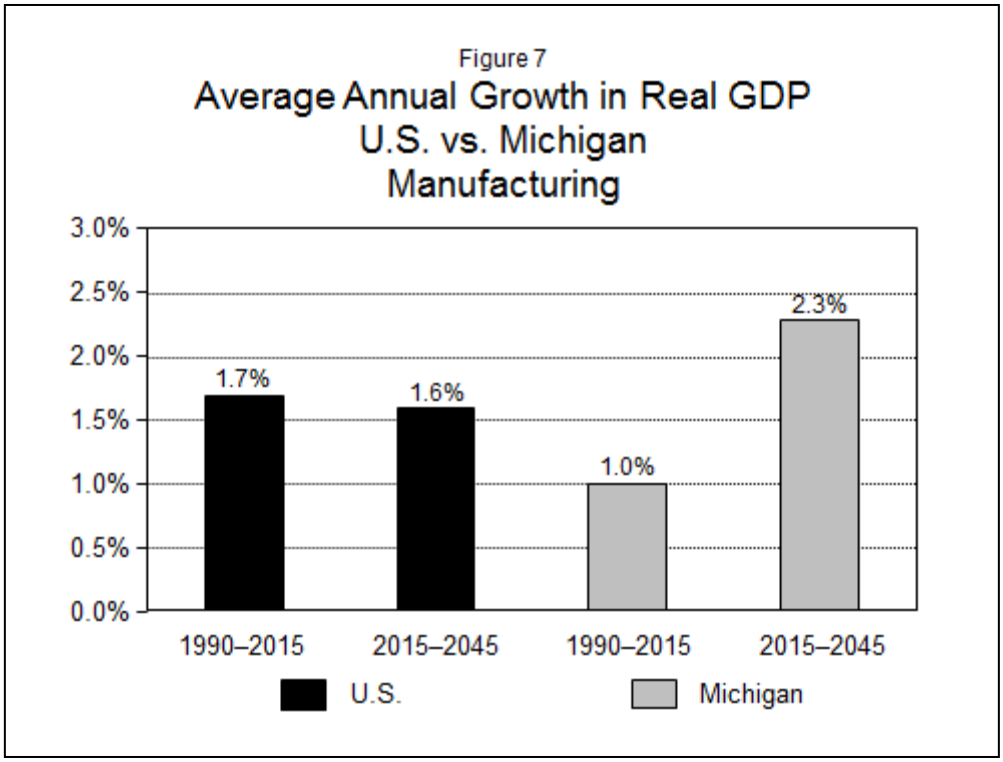
The most comprehensive measure of economic activity for the nation is inflation-adjusted (real) Gross Domestic Product (GDP). It is a measure of the value of all goods, services, and structures produced in the economy.

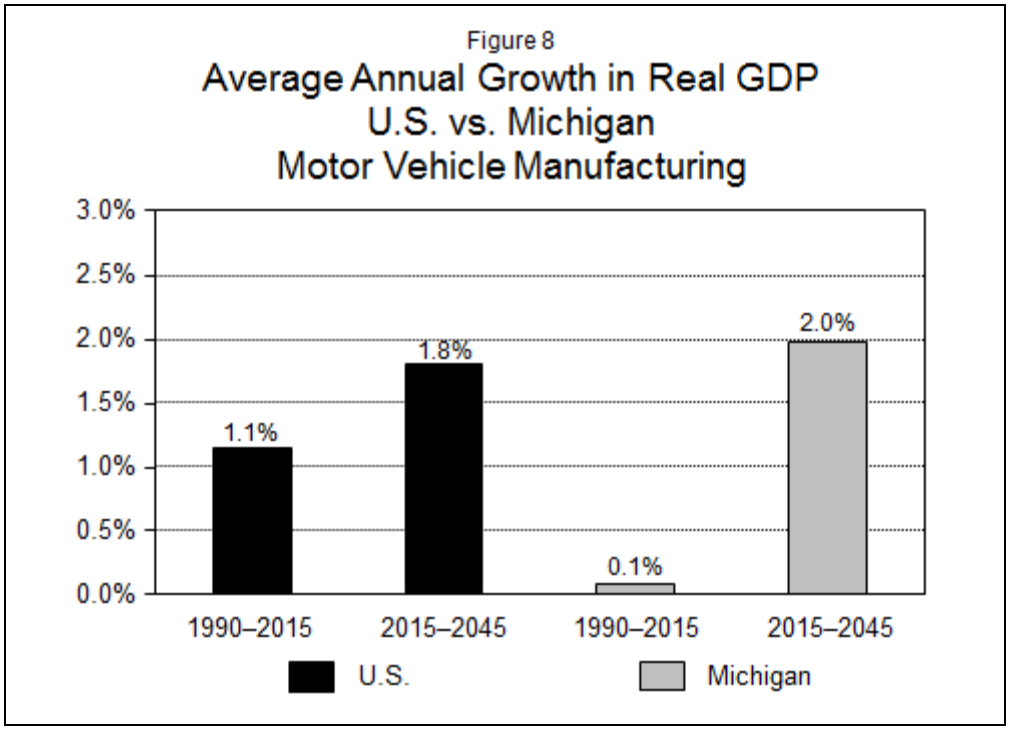
In the United States as a whole the average annual growth in real GDP is forecast to slow from 2.3 percent between 1990 and 2015 to 1.9 percent between 2015 and 2045, as shown in figure 6. In contrast, Michigan's real GDP accelerates from 1.4 percent per year between 1990 and 2015 to 2.0 percent per year between 2015 and 2045. This



acceleration in growth reflects the bounce-back from the weak performance of the local manufacturing sector, and especially motor vehicle manufacturing, during the first decade of the 2000s, as Michigan then gains an increasing share of U.S. manufacturing output.

In Michigan, manufacturing real GDP is forecast to grow by 2.3 percent per year between 2015 and 2045 (figure 7), while real GDP in motor vehicle manufacturing grows by 2.0 percent per year (figure 8). Output in both of these sectors is expected to grow faster in Michigan than it does nationally over the next 30 years, a significant reversal from the prior quarter-century when Michigan's manufacturing sector and auto industry lost ground to the rest of the United States.

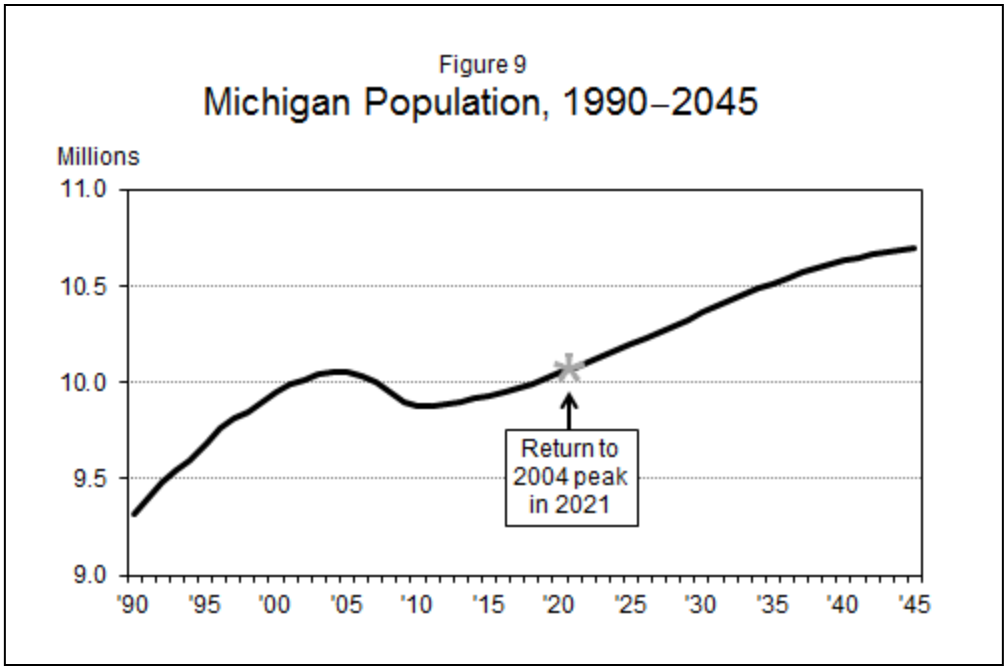




Population

We consider first our forecast of the state's total population trajectory, which is central to the speed limits imposed on Michigan's employment growth in the long run. The path of total population in Michigan from 1990 to 2045 is shown in figure 9. Data from 1990 to 2015 are provided by the U.S. Bureau of the Census [3], and the extension through 2045 is generated by our forecast.

The state's population grew between 1990 and 2004 at an average rate of 0.6 percent per year. Between 2004 and 2011 it declined 0.3 percent per year. The population started growing again in 2012, and this growth is expected to continue through 2045. In 2021, the state's population is forecast to exceed its 2004 peak of 10.06 million, and by 2045 it reaches almost 10.7 million.



Population growth in the United States after 2015 will be only about half its rate between 1990 and 2000, as shown in figure 10. Population growth in Michigan post-2015 will be weaker than that, growing about 0.25 percent per year over the next 30 years.

So, what underlies this slow growth in Michigan's population post-2015? The impetus behind these movements in population is shown in figure 11, which breaks out the total change in population per year into its primary components: natural change (births minus deaths) and net migration (the number of in-migrants minus the number of out-migrants). Total migration consists of domestic migration (movements to or from locations in the United States outside of Michigan) and international migration (movements to or from foreign countries).

Figure 10

Average Annual Change in Population United States and Michigan, 1990–2045

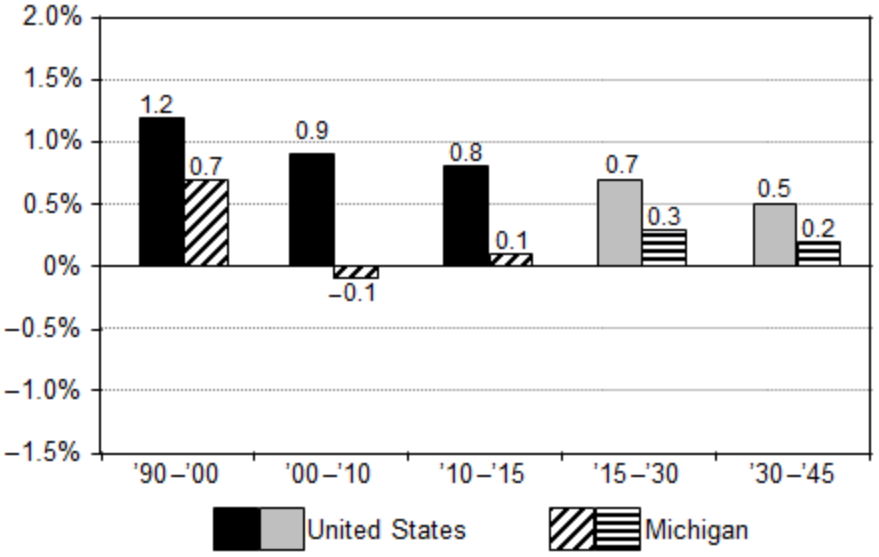
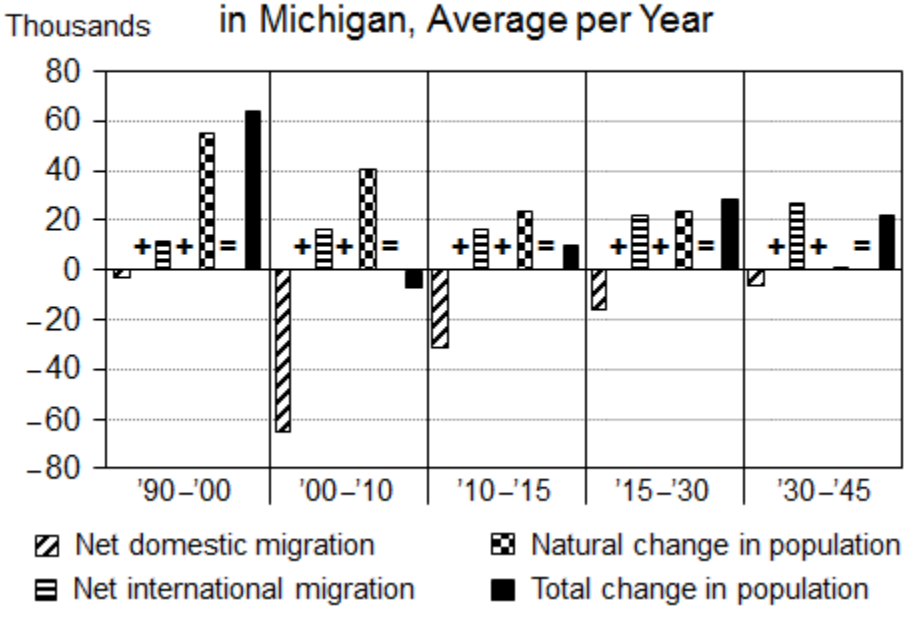


Figure 11

Components of Population Change in Michigan, Average per Year



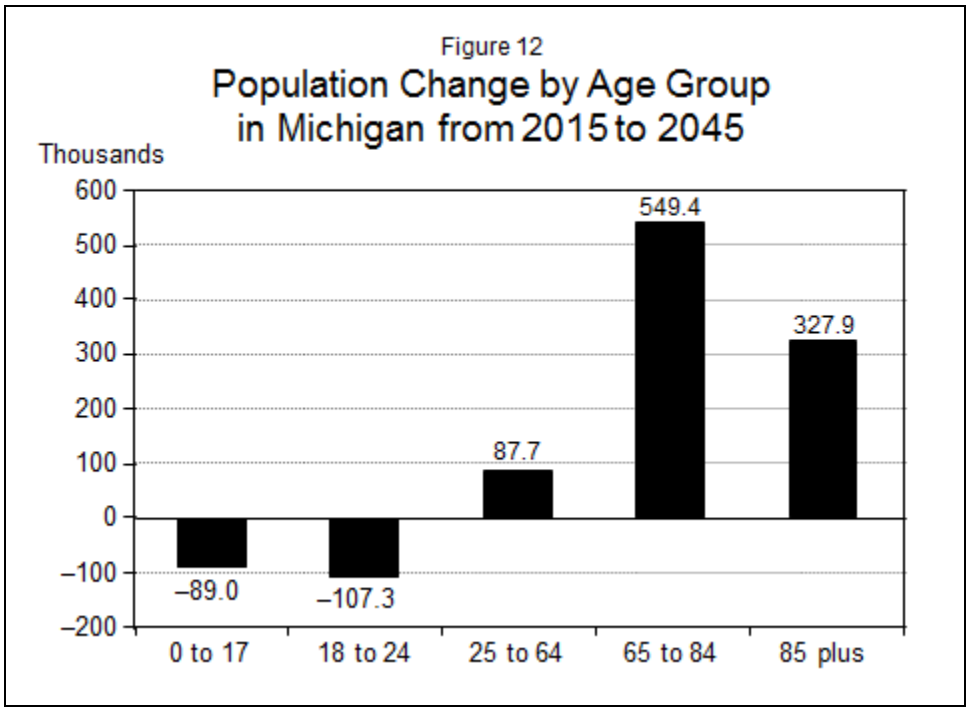
During the prosperous 1990s, Michigan's population increased by 64,113 residents per year, as the annual excess of births over deaths (55,248) and net gains in international migrants (11,889) more than made up for a net loss in domestic migrants (3,024). Between 2000 and 2010, however, the state lost 7,630 people per year, reflecting a combination of large domestic out-migration (64,910), reflecting the dismal economy; a slightly higher net international migration (16,633); and smaller natural increases (40,647).

With the economic recovery after 2010, population growth turns positive with a small annual gain from 2010 to 2015 (9,481), due to less domestic out-migration (31,817 per year). Domestic out-migration continues during the forecast period, but at a declining rate, and the rate of international in-migration continues to increase moderately. These improvements are offset by consistently shrinking additions in natural growth as the population ages, resulting in the relatively modest growth in total population that we are forecasting. In fact, by 2039 the number of deaths each year exceeds the number of births.

Without international migration, Michigan's population would be shrinking at an accelerating pace after 2035, which would lead to a weaker employment profile as well.

Underlying many of the population trends overall is the dramatic aging of the population over the next 30 years. This is the case for the United States as a whole, but Michigan also has a greater proportion of baby boomers today. As shown in figure 12, the number of Michigan residents aged 24 and younger is expected to decline by 196,290 between 2015 and 2045, and the population aged 25 to 64 increases by only 87,696. In contrast, the state's population aged 65 and older grows by 877,305 over this period.

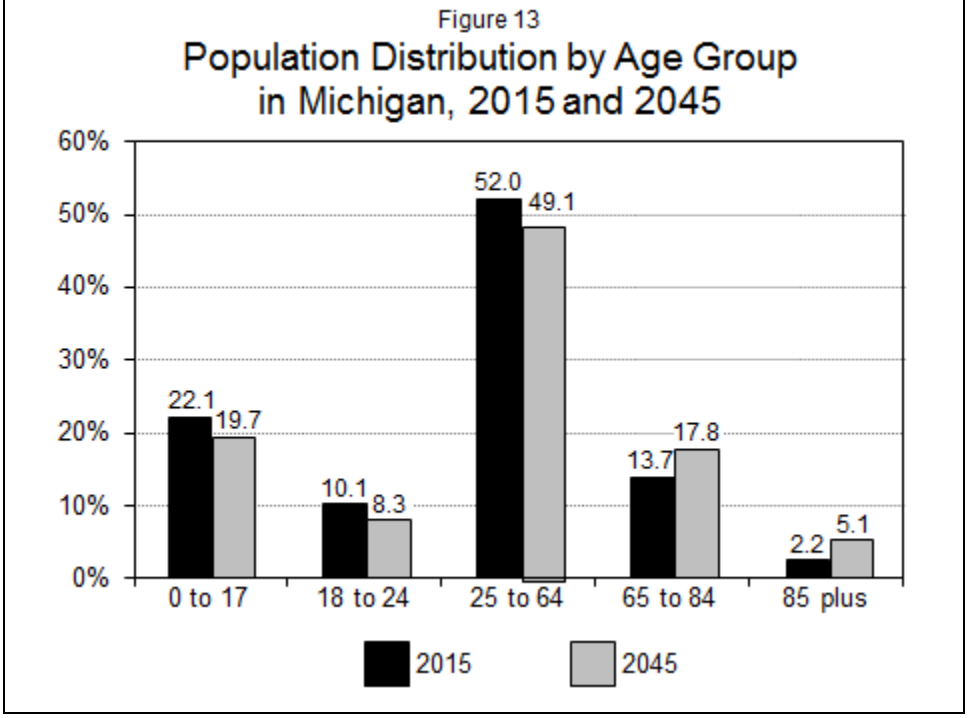
And much of this growth occurs in the population aged 85 and older, which increases by 153 percent.



Another cut of the data is shown in figure 13. The share of the population aged 65 to 84 is forecast to increase from 13.7 percent in 2015 to 17.8 percent in 2045, and the population 85 or older increases from 2.2 percent in 2015 to 5.1 percent over the same period. Correspondingly, the share of the population in cohorts under 65 shrinks. For example, the prime-working-age population cohort, those aged 25 to 64, is expected to shrink from 52.0 percent of the state's population to 49.1 percent between 2015 and 2045. For a statistic where a one-percentage-point change is notable, this represents a dramatic transformation in the age distribution of the state's population. The components contributing to sluggish population growth among the working-age population—the relatively low rate of in-migration of young adults and the aging of a disproportionately

large share of the population into the typical retirement years—will put an increasing strain on the supply of available labor in Michigan.

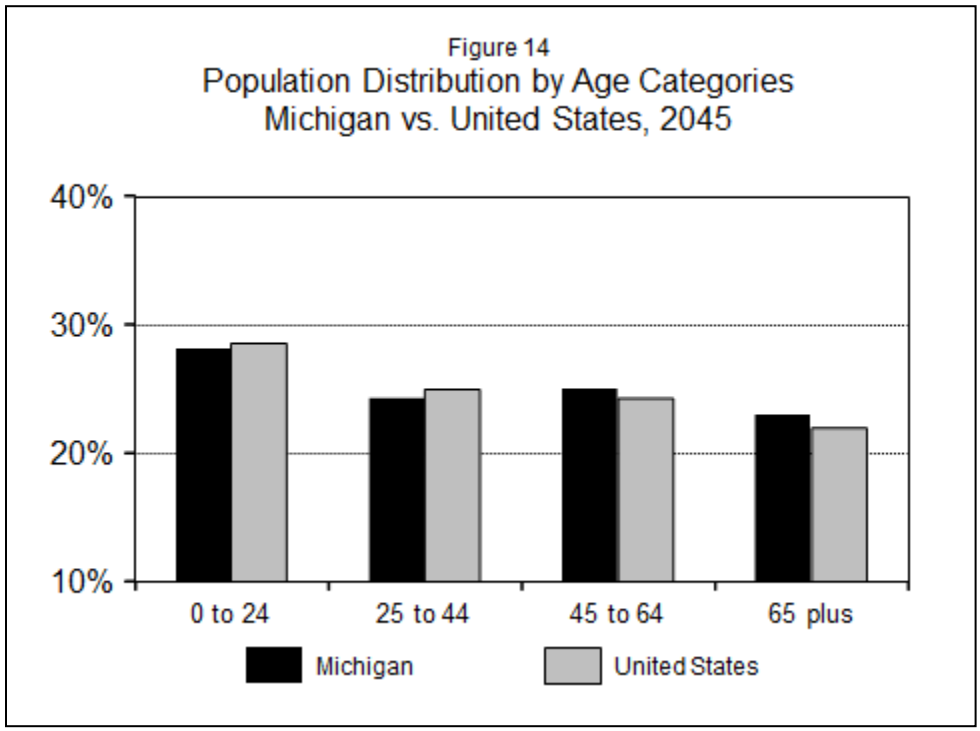
Figure 13



The strain on the supply of labor in Michigan will be particularly acute during the next thirteen years. Between 2017 and 2030, the population in Michigan aged 25 to 64 is forecast to decline by about 110,000, making it increasingly difficult for employers to find workers.

As noted previously (see figure 2), Michigan currently has a disproportionately large share of baby boomers, and this cohort is moving into senior citizen status. Along with the expected continuation of net domestic out-migration, this means that Michigan will remain much older than the nation as a whole. By 2045, 22.9 percent of Michigan's population will be 65 or older, compared with 22.0 percent nationwide (figure 14). Furthermore, only 24.2 percent of Michigan's population will be young, working-aged

adults (those aged 25 to 44) compared with 25.0 percent nationally. These demographic trends have an important influence on economic trends, as we'll now see.

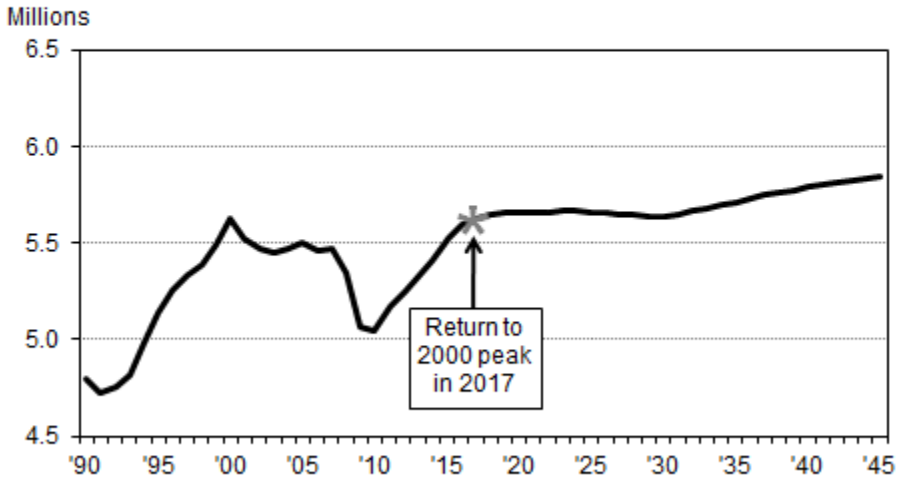


Employment

Our forecast of total employment for Michigan through 2045 is shown in figure 15. Data from 1990 to 2015 are from the U.S. Bureau of Economic Analysis [4], and the extension through 2045 is our forecast. Between 1990 and 2000, Michigan lost 580,000 jobs; between 2010 and 2015, the state regained 82 percent of that loss. We expect that strong employment growth will continue through 2017, when the state slightly exceeds 2000 employment levels. Employment then remains virtually flat though 2030, adding less than 10,000 jobs between 2017 and 2030. As noted previously, this corresponds with an absolute decline in the prime-working-age population. After 2030, employment

in the state slowly increases, at about one-quarter of a percentage point per year, as the prime-working-age population begins growing again.

Figure 15
Michigan Employment, 1990–2045

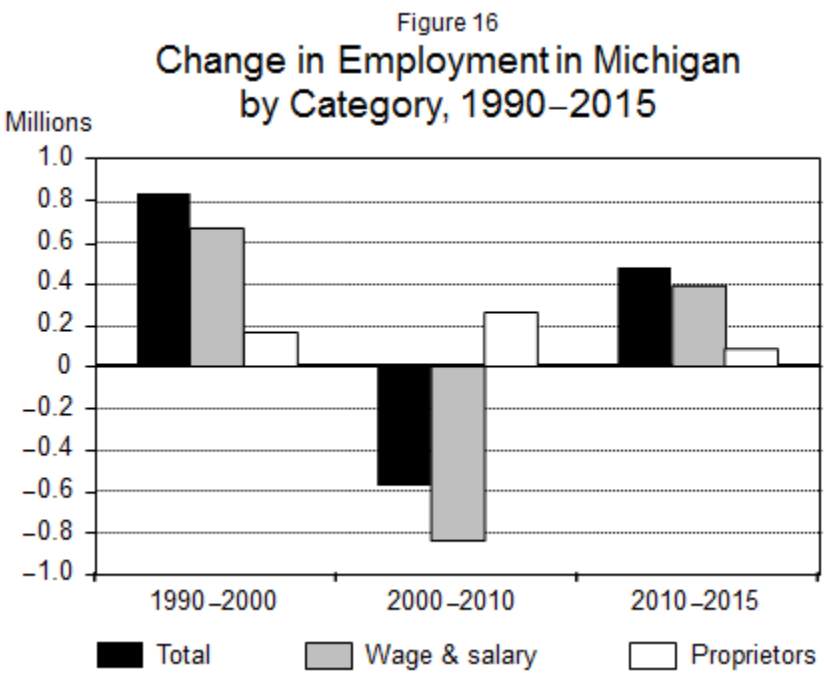


As mentioned, we measure employment using the BEA employment statistic, which includes self-employed, farm, and military employees who are excluded from the much better known BLS wage and salary measures [5]. Because of these extra categories of employees, the BEA total employment measure tends to be higher than the wage and salary employment measures. In 2015, total state employment measured by the BEA was 5,517,824 and wage and salary employment was 4,329,598; non-farm wage and salary employment measured by the BLS CES data series was 4,288,600, and the BLS QCEW data series reported 4,161,461. The availability of all of these different measures of employment can be confusing, but what is most important is that they generally tend to move in the same direction and in the same order of magnitude. For example, between 1990 and 2000, BEA showed total employment in Michigan increasing by 17.4 percent,

and wage and salary employment by 16.2 percent. At the same time, non-farm wage and salary employment increased by 18.5 percent as measured by BLS CES, and by 18.4 percent in the BLS QCEW measure.

From 2000 to 2010, however, there was a notable difference in employment change as measured by different statistics, as can be seen in figure 16 where the BEA data are shown. In this time interval, employment in Michigan declined by 10.3 percent according to the BEA total employment measure compared with a decline of 17.6 percent in the BEA wage and salary measure, 17.4 percent in the BLS CES non-farm wage and salary measure, and 17.8 percent in the BLS QCEW wage and salary employment measure. The reason for this discrepancy is that the number of self-employed or

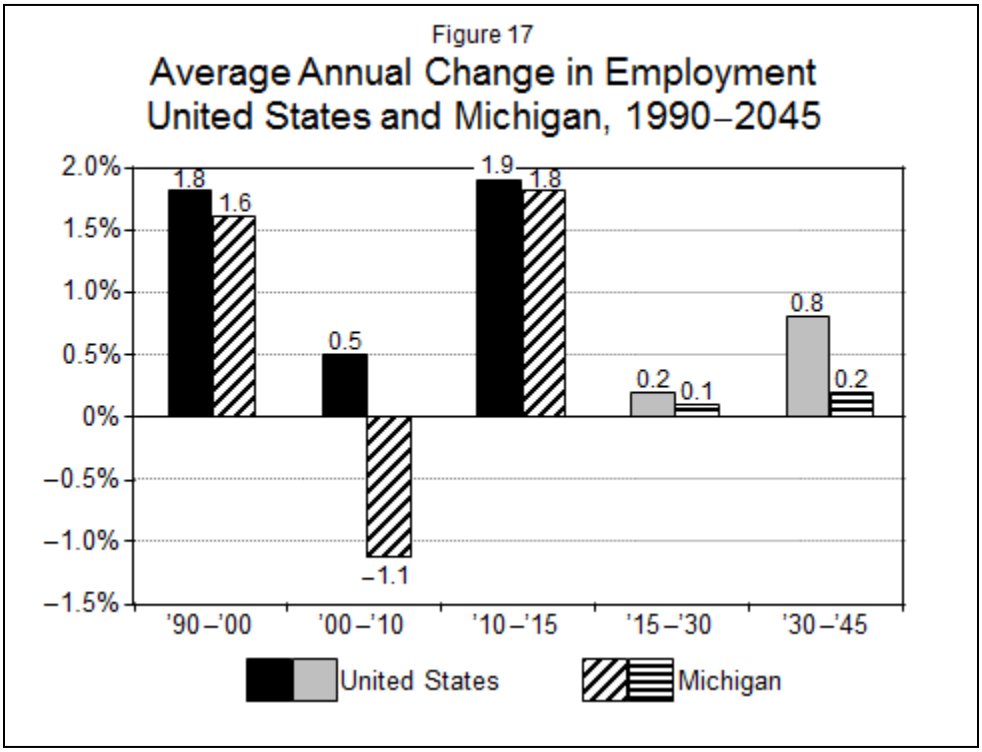
Figure 16



proprietors actually grew by 261,057, or 31.1 percent.[7] Consequently, the ensuing job gains between 2010 and 2015 leave total BEA employment in 2015 in Michigan only about 100,000 jobs short of its 2000 peak, whereas wage and salary employment measured by any of these series was about 440,000 jobs short of its 2000 peak.

As shown in figure 17, BEA total employment in Michigan is forecast to grow, on average, only 0.1 percent per year between 2015 and 2030, and many of the gains occur between 2015 and 2017. Note that the United States overall is forecast to see very modest employment gains over this period, averaging only 0.2 percent per year.

Figure 17

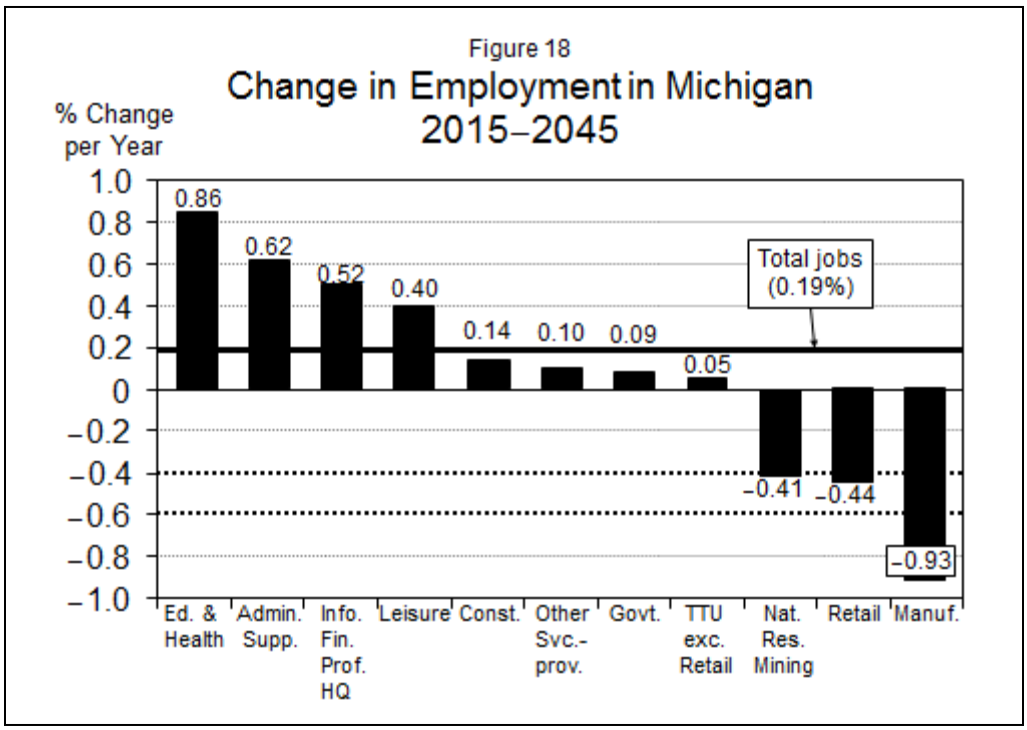


Employment growth accelerates after 2030 in both the state and the nation, by 0.8 percent per year in the United States between 2030 and 2045, and by 0.2 percent per year

[7]The number of self-employed (proprietors) in the United States also increased sharply between 2000 and 2010 (35.1 percent) even as the number of wage and salary workers in the United States declined, although much less so than in Michigan. The BEA count of proprietors is based upon the IRS count of individuals filing business tax returns.

in Michigan. With respect to the United States, these employment gains are more typical of what the country saw between 2000 and 2010 than what has occurred since the end of the Great Recession or during the 1990s. In Michigan, employment change will be positive, unlike during the 2000 to 2010 period, but much weaker than in the 2010 to 2015 period or during the 1990s. Statewide employment growth is slower than in the nation because of slower population growth.

The future path of employment in the region is, of course, the net result of the outlooks for the industries that make up the state economy. Over the entire period 2015 to 2045, total state employment is forecast to grow by an average of 0.19 percent per year, as shown in figure 18, but there is a wide variation in the performance of the constituent industries. The strongest growth is in the private education and health services industry category, dominated by the health care segment and expected to expand at a rate of 0.86 percent per year. This industry has been the most robust over the past difficult decade, and since we are on the threshold of a surge in the number of people reaching retirement age, the longer-term prospects are very favorable as well. The major knowledge economy service industries (information, finance and insurance, professional services, and company management) also have comparatively rapid employment growth of 0.52 percent per year. Administrative support services, which includes the very rapidly growing temporary help services industry, is expected to expand at an even faster 0.62 percent per year. A rapidly growing senior population will propel relatively rapid employment growth over the next 30 years in leisure and hospitality services, which includes arts and recreation, accommodations, and eating and drinking places.



At the other end of the spectrum is manufacturing, where employment is forecast to decline on average by 0.93 percent per year. This does not mean that the output of local manufacturing firms will decline; indeed, we are forecasting an increase in manufacturing output averaging 2.3 percent per year from 2015 to 2045. But because productivity growth in manufacturing is relatively high, employment declines despite the expansion of output.[8]

Employment is also declines in retail trade over the next 30 years. We expect that brick-and-mortar jobs will continue to be negatively affected by the growth in Internet shopping, along with evolving labor-saving technology (for example, self-service

[8] The manufacturing industry only includes jobs at production facilities. White-collar jobs in pre-production, including research, development, design, and other engineering functions, are classified as professional services in our data from the federal government. Likewise, those at corporate headquarters are designated as headquarters employees. This is the case even if the employer is a manufacturing firm such as General Motors or Ford.

checkouts), and the trend away from labor-intensive stores and toward discount stores and warehouse clubs.

Natural resources, which includes farming, forestry, fishing, and mining, is forecast to lose jobs over the next 30 years.

Employment in government grows over that same period, but at a slower-than-average rate of 0.09 percent per year.

Income

Income is another important dimension of Michigan's economic profile. Inflation-adjusted (real) personal income per capita is generally regarded by economists as the best single measure of economic well-being for a region. The standard of living for a region can rise even with sluggish employment growth if the incomes of residents are rising sufficiently. Growth in real personal income per capita (2016$) for Michigan and the United States is shown in figure 19.

Growth in real income per capita in the United States is forecast to slow from 1.7 percent per year recorded between 1990 and 2015, to 1.3 percent per year between 2015 and 2045, as shown in figure 19.[9] In Michigan, however, real income per capita grows at a faster pace between 2015 and 2045 (1.5 percent per year) than it did between 1990 and 2015 (1.3 percent per year).

Average real earnings per worker in Michigan grow by 1.4 percent per year between 2015 and 2045, as shown in figure 20. This represents a substantial improvement in earnings growth compared with the 1990 to 2015 period, when earnings were growing at only one-half this rate. As with real income per capita, real earnings per

[9]The measure is adjusted for inflation using the Personal Consumption Expenditure Deflator for the United States and the local version of this measure for states and counties, which is embodied in the REMI model.

worker grow at a slightly faster pace in Michigan than in the United States overall from 2015 to 2045.

Figure 19
Average Annual Growth in
Real Personal Income Per Capita
U.S. vs. Michigan

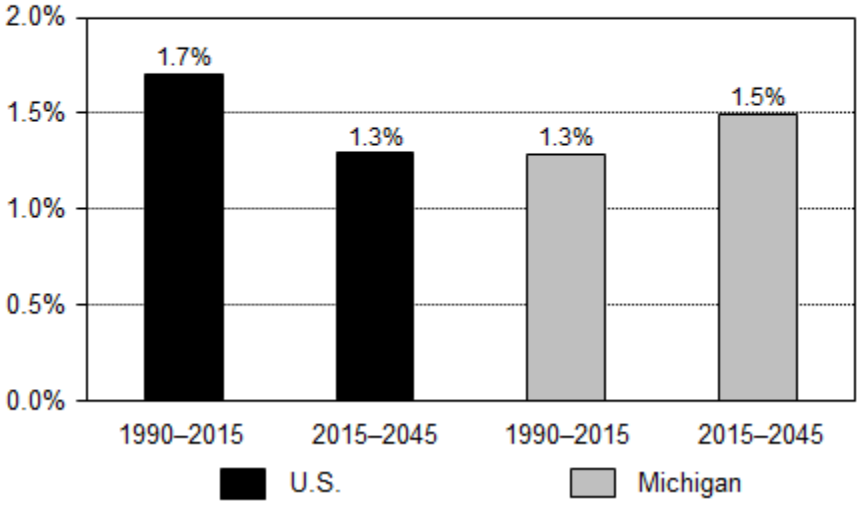
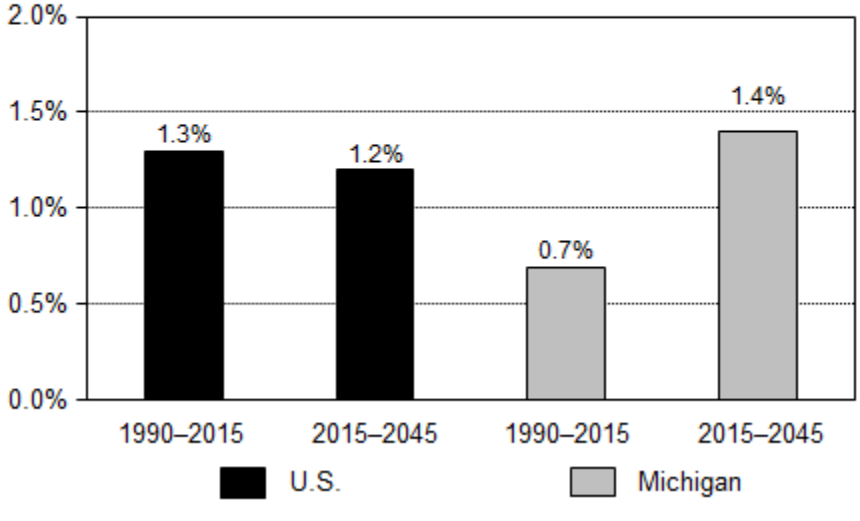
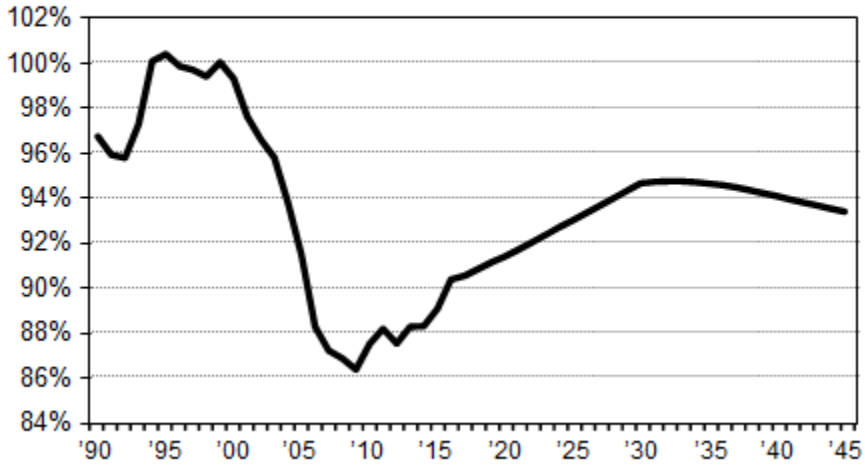


Figure 20
Average Annual Growth in
Real Earnings Per Worker
U.S. vs. Michigan



Despite the relatively rapid growth of real income in Michigan, the state continues to lag the nation in the level of personal income per capita. In 1999, personal income per capita in Michigan slightly exceeded the national level (figure 21). Michigan's relative position then began to deteriorate sharply. By 2009, personal income per capita in Michigan was only 86.3 percent of the U.S. average. The state then began to recover, but at least through 2045, we are forecasting that its personal income per capita will remain at least five percentage points below the U.S. average.

Figure 21
Michigan Personal Income Per Capita Compared with U.S., 1990–2045



Households

Another dimension of Michigan's demographic and economic profile is the future growth and composition of the number of households in the state. Although total population in Michigan is forecast to increase by 7.8 percent between 2015 and 2045, the population residing in group quarters expands by a much more robust 17.6 percent over this period, as shown in table 1. This is largely due to an aging population entering

assisted-living facilities, including nursing homes. The rest of the population—those living in households—grows by 7.5 percent between 2015 and 2045. In contrast to this population growth in households, the *number* of households increases by a more vigorous 15.4 percent. This implies that the average household size declines over the period, and as shown in table 1, it does, motivated by a proclivity for smaller-sized households among older residents.

Table 1
Number of Households in Michigan
2015–2045

	2015	2045	Change 2015–2045	% Change 2015–2045
Total population	9,922,576	10,692,268	769,692	7.8%
Group quarters population	233,427	274,615	41,188	17.6%
Population in households	9,689,149	10,417,653	728,504	7.5%
Households	3,987,153	4,599,280	612,127	15.4%
Average household size	2.43	2.27	–0.17	–6.8%

Indeed, the *share* of one-person households is anticipated to increase over the next thirty years. The share for most categories of larger-size households (three, four, and five-plus residents) declines, while the share of two-person households is about the same. Except as related to age, we have not made any other assumptions about household size preferences. If preferences unrelated to age for living in smaller households continue to change in the same direction as they have over the past fifty

years, growth in the number of households in Michigan will be even greater than we are forecasting.

One of the key questions for Michigan, especially with respect to the roads and highways in the state, is how many vehicles will be using them. We estimate that Michigan households will own 7,627,905 vehicles in 2045, an increase of almost 800,000, or 11.3 percent, compared with 2015. This estimate is based on the number of households in the state containing 0, 1, 2, or 3+ vehicles, as shown in table 2.[10] This forecast is based solely on changes in the age distribution of Michigan's population

Table 2

Number of Vehicles in Michigan Households 2015 vs. 2045

	Number of Households		Estimated Number of Vehicles		Change '15-'45	
	2015	2045	2015	2045	No.	%
0 vehicles	316,281	415,815	0	0	0	NA
1 vehicle	1,395,910	1,699,400	1,395,910	1,699,400	303,490	21.7%
2 vehicles	1,548,190	1,715,766	3,096,380	3,431,531	335,152	10.8%
3+ vehicles	726,772	768,300	2,362,009	2,496,973	134,965	5.7%
Total vehicles			6,854,298	7,627,905	773,606	11.3%

between 2015 and 2045 (and the number of people living in the state). If, as is likely, most households choose to own more vehicles per household than they did in 2015, controlling for the age of the head of household, the number of vehicles on Michigan

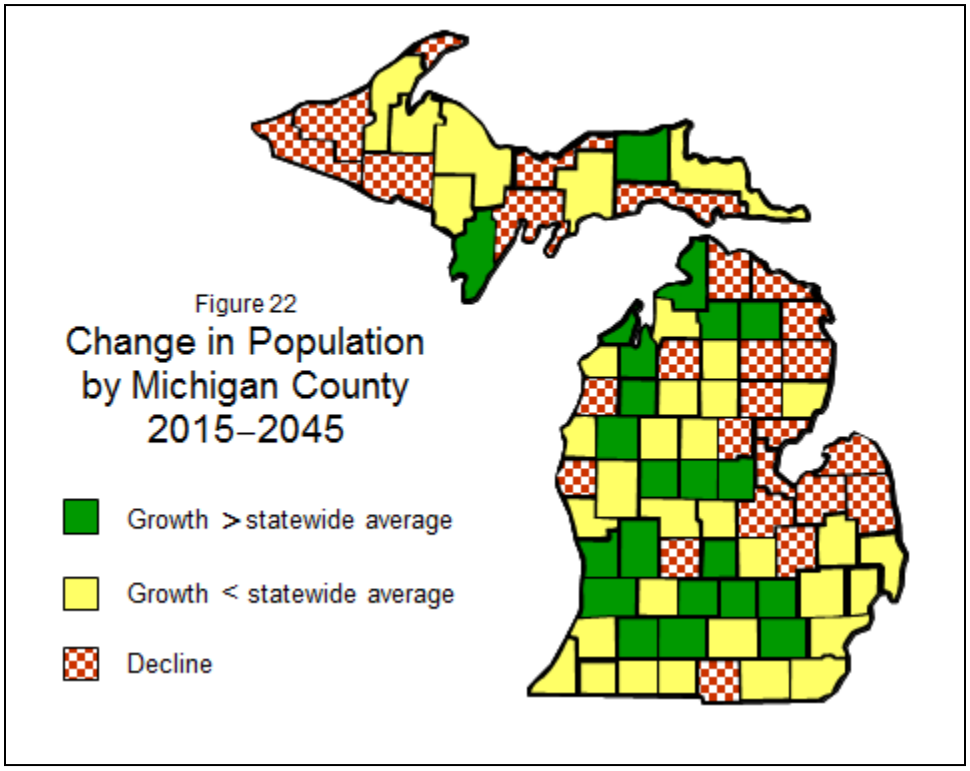
[10]These estimates do not include commercial vehicles.

roads will increase even more, and Michigan roads will become more crowded over the next 30 years.

Forecast for Michigan Counties through 2045

County Population

The population outlook for regions of Michigan can best be summarized by the map in figure 22, which shows the state broken out into its eighty-three counties. The map represents the forecast change in population from 2015 to 2045 for each of the counties, where change is subdivided into three categories: growth greater than the statewide average, growth less than the statewide average, and population decline. Much of the variation reflects the differing age structures of the local population, as well as disparate economic trends.



The fastest-growing counties in population are clustered in:

- Counties with a major college or university relative to their total population (These would include Washtenaw, Kalamazoo, Ingham, Ottawa, Isabella, and Mecosta counties.)
- The tourist-oriented and retiree-friendly northwestern Lower Peninsula, including the Traverse City area
- Kent, Livingston, Eaton, and Luce counties

Twenty-six counties in the state will see declines in population from 2015 to 2045. Although they are scattered throughout the state, there are a few areas of greater concentration:

- The rural western Upper Peninsula
- The area along the shores of Lake Huron
- Bay, Saginaw, and Genesee counties

County Employment

The employment outlook for the counties of Michigan is summarized by the maps in figures 23 and 24. The first map, figure 23, represents the change in employment forecast from 2015 to 2045 for each of the counties, where the layout is the same as for population in figure 22. Fifty-one of Michigan's counties gain jobs over the next 30 years, but at a relatively modest pace. None of them will grow faster than the United States overall. Thirty-two counties are forecast to lose jobs.

The second map, figure 24, shows the counties where job growth is expected to be the strongest over the next thirty years—specifically, county job growth greater than 150 percent of the statewide average. The most rapid job growth will occur in the high-

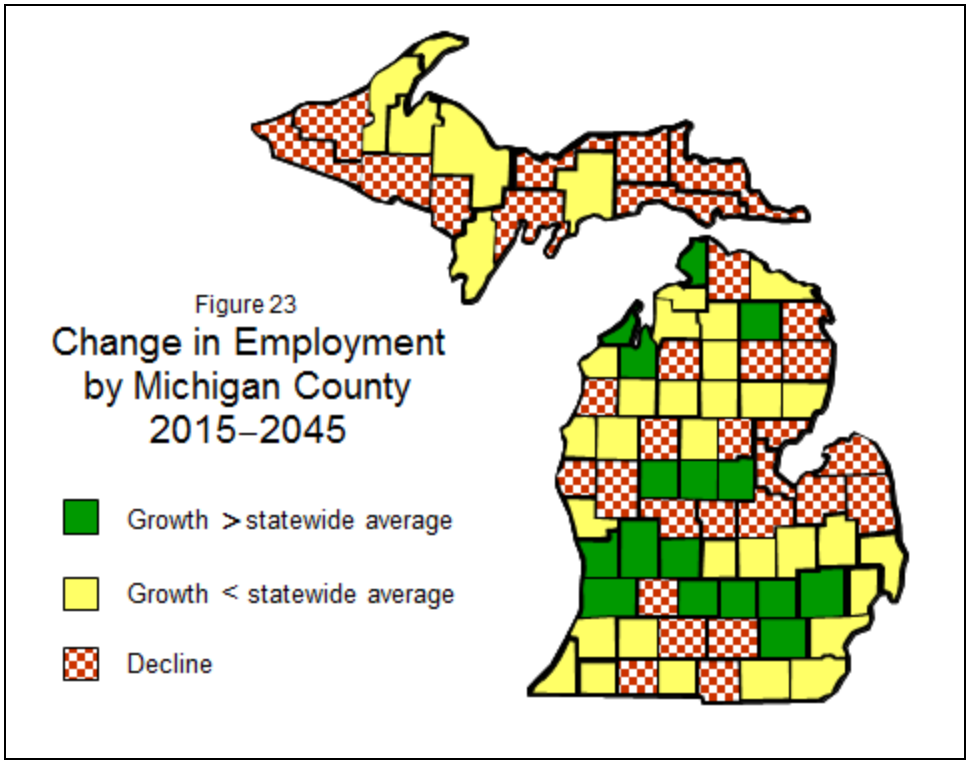


Figure 23
Change in Employment
by Michigan County
2015–2045
Growth > statewide average
Growth < statewide average
Decline

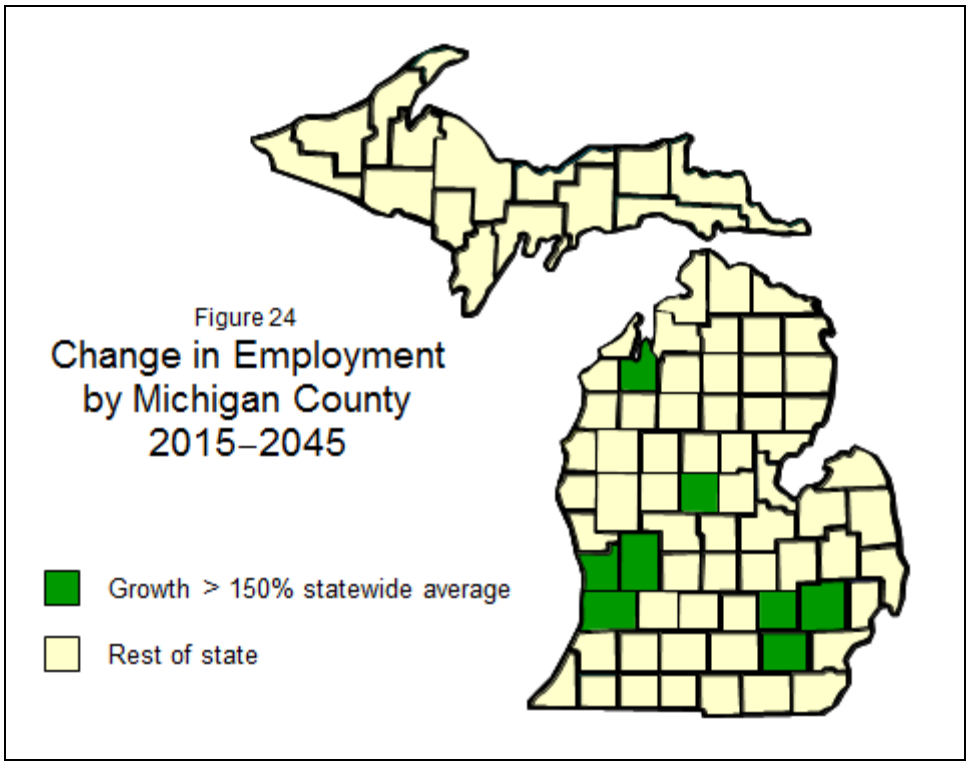


Figure 24
Change in Employment
by Michigan County
2015–2045
Growth > 150% statewide average
Rest of state

educational-attainment suburban Detroit counties (Washtenaw, Livingston, and Oakland); Kent, Ottawa, and Allegan counties in western Michigan; Grand Traverse County in the northwest; and Isabella County in central Michigan.

Much of the variation among counties reflects the differing age structures of the local population, as well as disparate economic trends. In general, the most favorable outlook is for counties with a large share of employment in industries with the best growth prospects, accompanied by supporting growth in their working-age population.

To consolidate the information in the three maps, we include here the geographic comparisons in tabular form (table 3). The rows of the table show for each county the population or employment growth category it falls into; the columns indicate how the growth categories are distributed across counties.

Table 3
Michigan Population and Employment Growth by County, 2015–2045

	Population Growth			Employment Growth				
	> State	< State		> State	< State		>150% St. Avg.	
County	Average	Average	Decline	Average	Average	Decline	Yes	No
Alcona			X			X		X
Alger			X			X		X
Allegan	X			X			X	
Alpena			X			X		X
Antrim		X			X			X
Arenac			X			X		X
Baraga		X			X			X
Barry		X				X		X
Bay			X			X		X
Benzie		X			X			X
Berrien		X			X			X
Branch		X			X			X
Calhoun	X					X		X
Cass		X			X			X
Charlevoix	X				X			X
Cheboygan			X			X		X
Chippewa		X				X		X
Clare		X			X			X
Clinton	X				X			X
Crawford		X			X			X
Delta			X			X		X
Dickinson		X				X		X
Eaton	X			X				X
Emmet	X			X				X
Genesee			X		X			X
Gladwin			X			X		X
Gogebic			X			X		X
Grand Traverse	X			X			X	
Gratiot		X				X		X
Hillsdale			X			X		X
Houghton		X			X			X
Huron			X			X		X
Ingham	X			X				X
Ionia			X	X				X
Iosco		X			X			X
Iron			X			X		X
Isabella	X			X			X	
Jackson		X				X		X
Kalamazoo	X				X			X
Kalkaska			X			X		X
Kent	X			X			X	
Keweenaw			X		X			X

Table 3 continued
Michigan Population and Employment Growth by County, 2015–2045 (cont'd.)

	Population Growth			Employment Growth				
	> State	< State		> State	< State		>150% St. Avg.	
County	Average	Average	Decline	Average	Average	Decline	Yes	No
Lake	X				X			X
Lapeer		X			X			X
Leelanau	X			X				X
Lenawee		X			X			X
Livingston	X			X			X	
Luce	X					X		X
Mackinac			X			X		X
Macomb		X			X			X
Manistee			X			X		X
Marquette		X			X			X
Mason		X			X			X
Mecosta	X			X				X
Menominee	X				X			X
Midland	X			X				X
Missaukee		X			X			X
Monroe		X			X			X
Montcalm		X				X		X
Montmorency	X			X				X
Muskegon		X			X			X
Newaygo		X				X		X
Oakland		X		X			X	
Oceana			X			X		X
Ogemaw			X		X			X
Ontonagon			X			X		X
Osceola		X				X		X
Oscoda			X			X		X
Otsego	X				X			X
Ottawa	X			X			X	
Presque Isle			X		X			X
Roscommon		X			X			X
Saginaw			X			X		X
St. Clair		X			X			X
St. Joseph		X				X		X
Sanilac			X			X		X
Schoolcraft		X			X			X
Shiawassee		X			X			X
Tuscola			X			X		X
Van Buren		X			X			X
Washtenaw	X			X			X	
Wexford	X				X			X
Wayne		X			X			X

Conclusion

Application of the Forecasts

MDOT, the MPOs, and the regional planning agencies will use the forecasts for Michigan and its eighty-three counties to develop estimates and forecasts of travel. Specifically, the forecasts will be used to develop the Statewide Transportation Plan, Regional Plans, and Urbanized Area Plans, as well as to provide input into MDOT's State Transportation Improvement Program (STIP) and the Urbanized Areas' Transportation Improvement Programs (TIPs). The projections are the basis of the Statewide Model's trip generation file updating (county control totals), the Statewide Goods Movement/Truck Model Program, and development of the Border Crossing model. The current forecasts now supersede those released in January 2012 to support these planning, development, and data-updating activities.

Summing Up

We have emerged from the tunnel that was the most catastrophic period for the Michigan economy in our lifetime. The economy suffered some permanent damage in terms of lost income and population, but the state has made a good recovery, and we see growth, especially income growth, being sustained.

We won't be traveling the same route as before, however. We see long-term growth, to be sure, but only at a modest pace for Michigan's population and labor market over the next 30 years, much more subdued than what transpired in the 1990s prior to the extended downturn. The biggest issue facing Michigan in the future is on the supply side.

Population is central to the speed limits imposed on local employment growth in the long run. If, over the longer term, unemployment and labor force participation[11] settle in at fairly stable rates, work force gains would largely need to come from increases in the working-age population, which in turn would derive from young residents becoming of working age, or from net in-migration. But because Michigan has a disproportionately large share of baby boomers, it is aging much more dramatically than the nation as a whole. That leaves net in-migration, which has typically been low for young adults and who to date have not altered the region's profile in a meaningful way.[12] The looming problem down the road will be labor shortages, particularly of workers with skills that mesh with the evolving knowledge- and information-based economy. A policy prescription: investment in a more highly skilled and educated work force, and retention of greater numbers of our high-income retirees.

[11]The labor force participation rate is the proportion of the population who are either working or actively seeking work. Examples of people not participating would be those who do not work outside of the home, retirees, full-time students, or those on welfare.

[12]Employment opportunities are the strongest magnet for these people, but educational opportunities, quality of life, and family ties also matter.

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