Moving Off the Road

A State-by-State Analysis of the National Decline in Driving

MASSPIRG Education Fund

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Executive Summary

After sixty years of almost constant increases in the annual number of miles Americans drive, since 2004 Americans have decreased their driving per-capita for eight years in a row. Driving miles per person are down especially sharply among Millennials, America's largest generation that will increasingly dominate national transportation trends.

Massachusetts residents drive fewer miles per year on average than in all but eight states and the District of Columbia. But Bay Staters have been reducing per person driving miles slower than the rest of the country. In 2011 residents of Massachusetts drove 8,318 miles on average while, nationally, the average per-capita miles was 9,455. Massachusetts driving miles per person peaked in the middle of last decade – like the rest of the country – but fell only 4.0 percent since 2005, compared to 6.5 percent for the country as a whole.

Some skeptics have suggested that the apparent end of the Driving Boom might be just a temporary hiccup in the trend toward more driving for Americans. By the time Americans took notice of the decline in driving, the economy was in deep recession. Would economic growth bring back rapid increases in driving? Doubts about whether the Driving Boom has ended make it easier to postpone choices about transforming our transportation system or enacting reforms that disrupt well-established interest groups.

Massachusetts and the other 49 states plus the District of Columbia, offer a useful natural experiment to examine different factors behind America's reduction in driving since 2004. Examining the commonalities and differences in driving trends among states can provide insight into the potential causes behind the downturn in driving and the direction of future trends. While a number of factors will influence the amount of driving in any given state, to the extent that differences in driving trends among the fifty states correlate with differences in the severity of the economic downturn, then the economy could be seen as the dominant factor and future driving trends could be expected to follow the economy as well. In that case, a return to faster economic growth might likely lead to a rapid increase in driving. If instead the extent that differences between states' trends in the amount of driving reflect other kinds of persistent factors or can't be easily explained, then we can expect the slowdown in driving to persist even if the economy speeds up.

This study finds that declining rates of driving do not correspond with how badly states suffered economically in recent years. On the contrary:

- Among the 23 states in which driving miles per person declined faster than the national average, only six saw unemployment increase faster than the nation as a whole.

- Among the 10 states with the largest declines in driving per person, only two rank among the ten with largest increases in unemployment.

- Among the 23 states where driving declined faster than the national average, only 11 saw faster-than-average declines in the employed share of their working-age population.

- Among the 10 states with the greatest reductions in the employed share of population, only two were also among the ten states with the largest reductions of driving (Georgia and the District of Columbia).

Looking at which states reduced driving most sharply after 2004, there are wide differences which are not easily explained by a single factor:

- Average vehicle miles declined in all regions, with large variation within each region. The smallest declines took place in the North Central region, mostly as a result of per person driving increases in North Dakota, and the Gulf South, perhaps influenced by Hurricane Katrina.

- Changes in the extent to which state populations live in urban areas do not seem to correspond with changes in driving miles.

- The degree to which telecommuting or other arrangements in each state have encouraged people to work more from home does not seem to correspond to changes in the average amount of driving per person.

The evidence suggests that the nation's per-capita decline in driving cannot be dismissed as a temporary side effect of the recession. While certainly a contributing factor and an economic rebound could be expected to have some upward lift on driving, the recession does not appear to be the prime cause of the fall off in driving over the past eight years. Nor is it clear that future economic growth would lead to a resumption of the postwar Driving Boom. Policy makers can stop wondering whether American driving trends are changing. They should focus carefully on these trends, and start adapting policies to match them.

Massachusetts prides itself in being a leader in national trends, from health care to education. When it comes to the national trend toward reduced driving, we have a head start but are being outpaced by most of the rest of the country. Bay Staters want to drive less, especially the young people we wish to retain for tomorrow's skilled workforce. Whether the Commonwealth succeeds in further reducing driving – and doing so at a faster pace than the rest of the nation – will depend more than anything on the kind of infrastructure investments we make. It will depend on whether the state and cities and towns invest across the state in more and better public transit, biking and walking infrastructure or whether we are content to merely struggle to maintain what we have.

Introduction

After a sixty-year "Driving Boom" of traveling more behind the wheel almost every year, Americans have reduced their average driving miles each of the last eight years. This trend is true of Massachusetts, where the average driving miles per-person has declined and stagnated similar to the national trend. This is a huge break from past trends that policy makers and researchers are still grappling to understand.

Nationally, per capita vehicle miles traveled peaked in 2004 and had fallen 7.4 percent by the end of 2012.[1] With the most recent statistics released for May 2013, cumulative miles driven for the previous 12 months were down a half billion miles compared to the same period a year earlier.[2] The average number of miles driven per person now matches the level way back in 1995, when Bill Clinton was in his first term at the White House, the Dow Jones surpassed 4,000 for the first time, and hit TV show Matlock was in its final season.[3]

The decline in driving is especially dramatic among light-duty vehicles (cars, SUVs, pickups and vans). As Michael Sivak at the University of Michigan has shown, national per person driving in light-duty vehicles peaked in 2004 and fell 8.8 percent by 2011, with even larger declines in driving per household or per registered vehicle. [4]

Per capita vehicle miles traveled also peaked for Massachusetts in 2004, or 2005 according the standardized Federal Highway Administration data that serves as the basis for comparative analysis in this report and is currently available up to 2011. By either measure, Massachusetts miles per-person decreased by approximately 4 percent up to 2011, below the 6.5 percent average national decline.

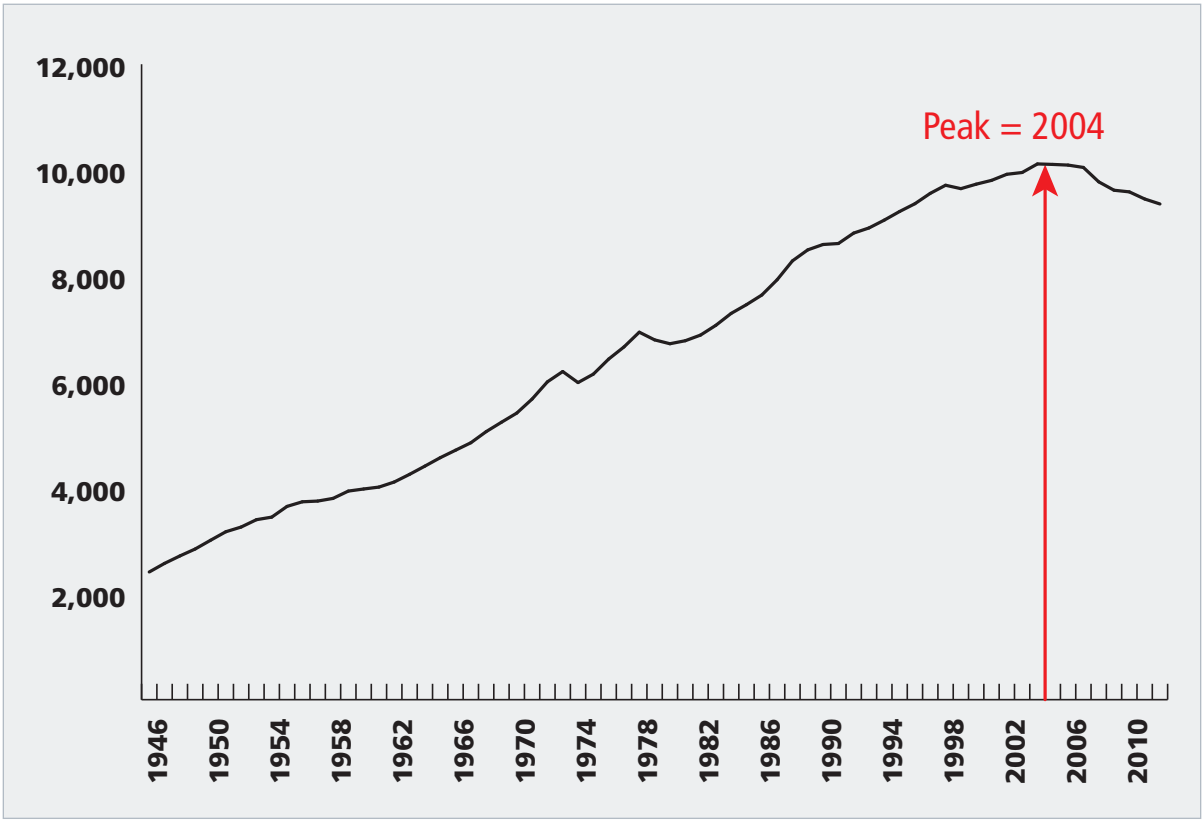
State data showed a very increase in driving miles in 2012 only 0.18 percent, despite the improving economy.

The national trend of a sustained decline in driving is both unprecedented and in other ways unsurprising. Transportation scholars had previously observed that the rapid growth in driving per person in the 1950s had slowed with each passing decade, from almost 5 percent average annual increases in the 1950s to about 2.5 percent in the 1990s and less than 1.5 percent in the early 2000s.[5]

The constellation of factors contributing to the decline in driving is fairly well understood – economic factors, gas prices, demographic shifts, saturation of demand, and changes in technology, attitudes and preferences. These factors influence transportation preferences both nationally and across Massachusetts. What we don't understand is the relative importance of each of these factors.

The decline in average vehicle miles traveled has been led by the Millennial generation. Average driving miles for Americans aged 16 to 34 fell sharply by 23 percent between 2001 and 2009.[6] This trend is matched by a long-time slide in the rates that youth obtain drivers' licenses. Whereas over 87 percent of 19 year olds held drivers licenses in 1983, only 69 percent did in 2011.[7] With Millennials the largest generation in America, their sharp decline in

Annual Vehicle Miles Traveled Per-Capita, 1946-2012



Source: Vehicle Miles Traveled (VMT) data from FHWA Highway Statistics (except for 2012, from Traffic Volume Trends); Population data from U.S. Census Bureau. Temporary VMT drops in 1970s corresponded to massive Organization of the Petroleum Exporting Countries (OPEC) oil price spikes.

driving is the strongest indication of a fundamental shift.

Some skeptics have suggested that the apparent end of the Driving Boom might be just a temporary interruption of the long-standing trend toward more driving for Americans. By the time Americans took notice of the decline in driving, the economy was in deep recession. Would vigorous economic growth bring a return to rapid increases in driving? Doubts about whether the Driving Boom has ended make it easier to postpone choices about transforming our transportation system or enacting reforms that disrupt well-established interest groups.

On the other hand, correctly identifying a long-term plateau or reduction in driving would provide enormous opportunities to avoid waste and invest in the future. Gas taxes are the chief source of transportation funding for the United States, but federal gas taxes have eroded as rates have been frozen for twenty years and improving gas mileage has more recently reduced the volume of gasoline subject to levy. Given the severe limitations in transportation funding, every dollar that could be saved by not investing in an unnecessary highway expansion is a dollar that could repair aging bridges or enhance other modes of travel with growing usage, such as public transit and biking.

To confront this stagnation in funding for transportation infrastructure, the recently passed Transportation Finance Bill in Massachusetts raised the state gas tax $0.03 from $0.21 to $0.24 per gallon while also tying the tax to inflation. This will allow the revenue to maintain its current value against inflation, but the gas tax might still lose value as a result of declining motor vehicle travel and improving fuel efficiency. Thus it is even more imperative that this new funding be spent wisely on projects which will allow the transportation systems of the Commonwealth to adapt to these new trends.

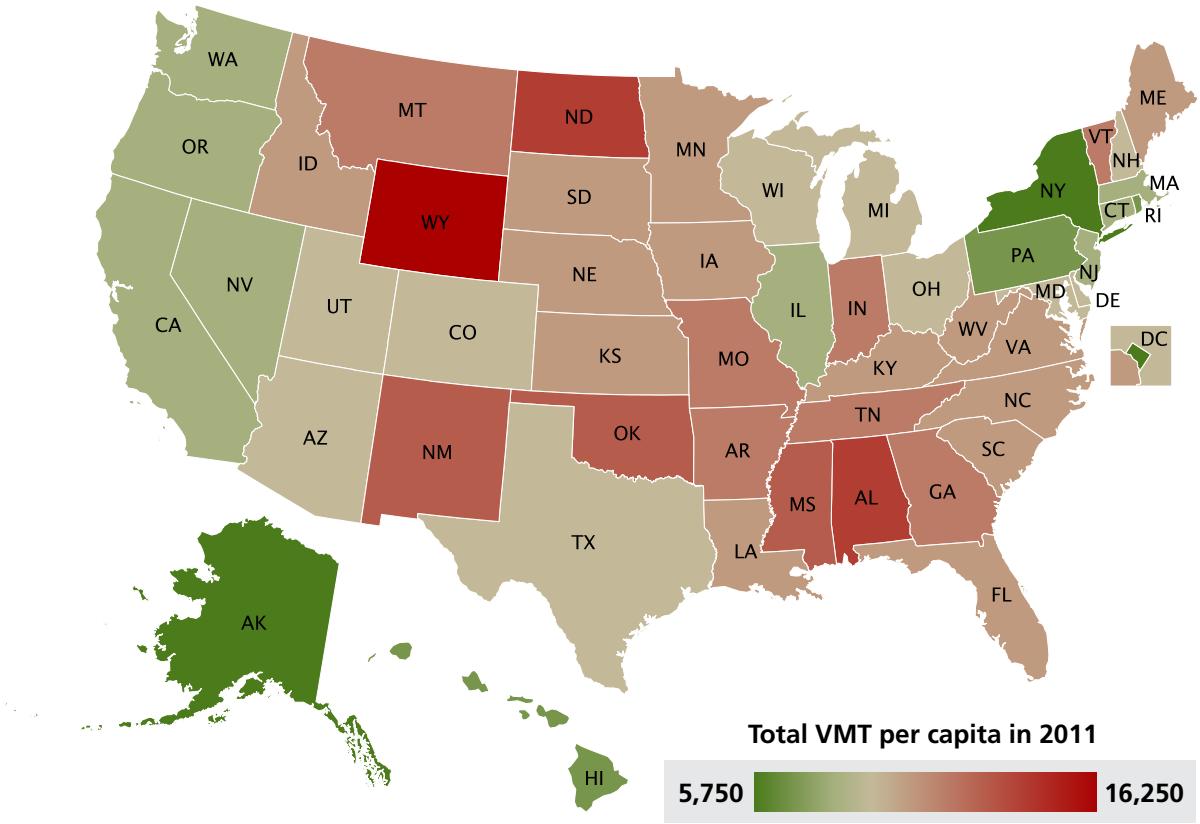
Examining differences among the fifty states and Washington D.C. presents a kind of natural experiment for understanding reductions in driving and how much they are determined by the economy. While the recession was felt in every state, its impact was much greater in some states than others. States also experienced big differences in how much people reduced their average driving miles.[8] If states that were hit hardest by the economy also reduced their driving the most, this would suggest that the economy is more responsible for the overall reduction in of driving. On the other hand, if states hit harder by the recession reduced their driving no more than in other states, this suggests that far more than the economy is at play.

Background: Significant Differences in Driving Among the States

Before examining potential causes of the decline of driving, it is helpful background to understand the big differences in how much people drive depending on which state they live in. Based on the most recently compiled and standardized driving data with state totals from the Federal Highway Administration, the average American drove a vehicle 9,455 miles in 2011. But many states were anything but average.

Wyoming tops the list with the average resident driving over 16,000 miles each year. That's the equivalent of every man, woman and child in the state getting behind the wheel and driving from one end of the large state to the other every other month. Residents in Alabama, Louisiana and North Dakota also drive the equivalent of over 13,000 miles annually. A large share of the driving miles may be commercial, especially in resource extraction-heavy states such as Wyoming.

Total Annual Vehicle Miles Traveled (VMT) Per-Capita, 2011



On the other end of the spectrum, residents of the District of Columbia drive the least, an average of 5,774 miles annually, followed by Alaska, Hawaii, New York, Rhode Island and Pennsylvania – all with less than 8,000 miles annually. Massachusetts ranks below the national average in per capita vehicle miles traveled with the average person driving 8,318 miles in 2011, fewer than 42 other states. The only states where fewer average annual vehicle miles are driven each year are (in descending order of annual miles) New Jersey, Illinois, Pennsylvania, Rhode Island, Hawaii, New York, Alaska and the District of Columbia.

Regional differences

Regionally, there are also differences in how much a typical resident drives. Grouping states into the regions defined by the U.S. Department of Transportation, we see that people drive the fewest number of miles in the Northeast. Massachusetts residents still drive more than in New Jersey, New York, Pennsylvania or Rhode Island.

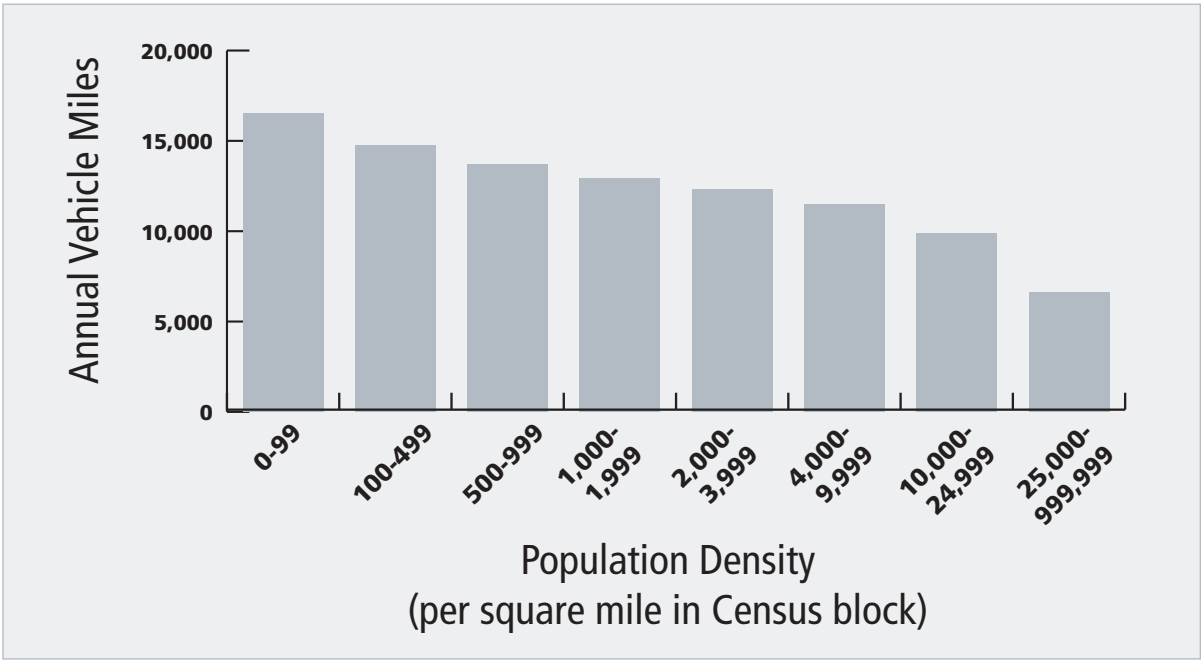
After the Northeast, the fewest number of average driving miles are driven in the West and the South Atlantic. People drove most in the Gulf South, followed by the North Central region.[9]

Annual Vehicle Miles Traveled Per Capita (2011) by Region and State

Northeast	8,773
Connecticut	8,713
Maine	10,727
Massachusetts	8,318
New Hampshire	9,650
New Jersey	8,286
New York	6,562
Pennsylvania	7,785
Rhode Island	7,515
Vermont	11,399
South Atlantic	9,763
Delaware	9,952
District of Columbia	5,774
Florida	10,067
Georgia	11,050
Maryland	9,646
North Carolina	10,746
South Carolina	10,414
Virginia	10,001
West Virginia	10,221
South Gulf	11,470
Alabama	13,516
Arkansas	11,216
Kentucky	11,000
Louisiana	10,167
Mississippi	13,044
Oklahoma	12,519
Tennessee	11,049
Texas	9,248

North Central	10,494
Illinois	8,022
Indiana	11,736
Iowa	10,213
Kansas	10,456
Michigan	9,594
Minnesota	10,606
Missouri	11,444
Nebraska	10,362
North Dakota	13,351
Ohio	9,700
South Dakota	10,924
Wisconsin (FHWA)	9,525
West	9,685
Alaska	6,355
Arizona	9,190
California	8511
Colorado	9,108
Hawaii	7,322
Idaho	10,055
Montana	11,681
Nevada	8,882
New Mexico	12,262
Oregon	8,619
Utah	9,308
Washington	8,339
Wyoming	16,272

Population Density and Vehicle Miles Traveled



Source: Federal Highway Administration, 2009 National Household Travel Survey (NHTS)

Percent of Urban Population and Vehicle Miles Traveled by State

Population density

People tend to drive more or less depending on how urban or rural the state. In more urban places, housing and other development tends to be more closely located, reducing the distances that people need to drive for work, errands and recreation. More urban areas are also more likely to be convenient for walking, biking or taking public transit.

These patterns are clear in national surveys of individuals and households. According to the National Household Travel Survey, drivers in "urban" places drive an average of 9,930 miles annually, whereas drivers who live in the more rural "town and country" drive an average of 14,856 miles. In the middle, suburban drivers travel an average of 12,114 miles and drivers in secondary cities travel 11,701 miles annually. The effect is similarly apparent when examining the population density in the neighborhoods in which people live. As the figure below shows, people drive fewer miles on average in more densely populated Census block groups. Does the same pattern between density and driving hold when comparing states?

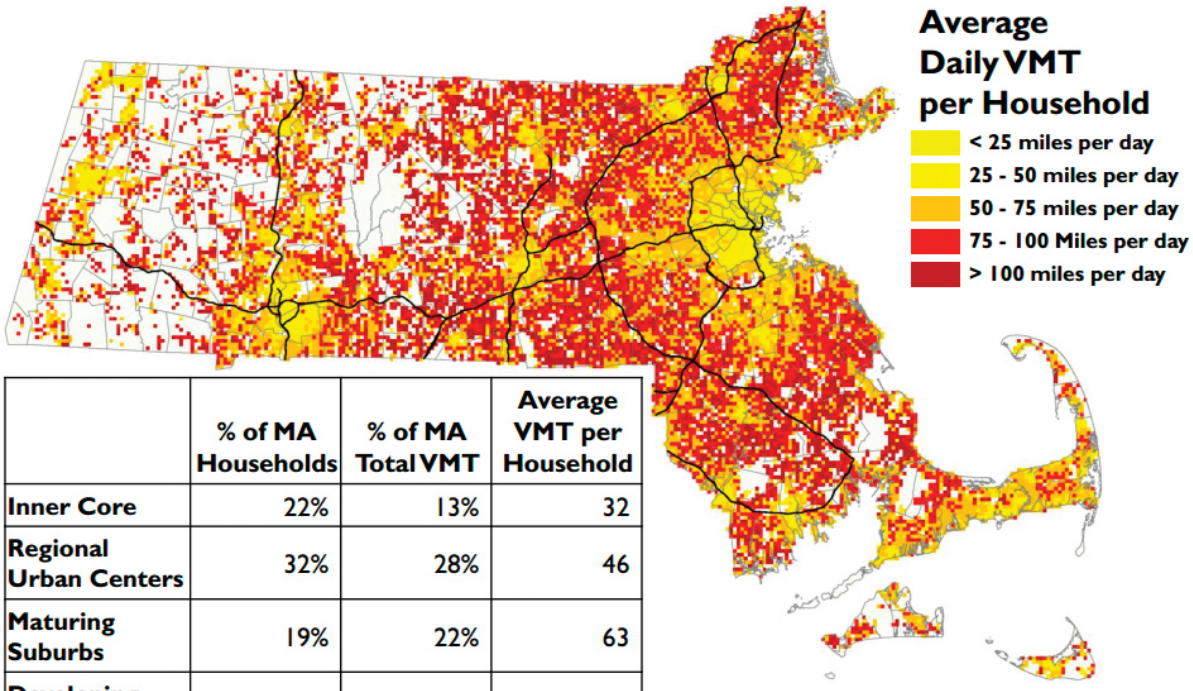
Among more rural states, people drive an average of over 11,046 miles annually or almost 17 percent more than the national average, according to the NHTS. In the remaining 23 states and District of Columbia the average number of vehicle miles per person is only 9,225 annually or 2.4 percent less than the national average (We define rural states as those 27 states in which at least a quarter of the population lived in rural areas in the 2010 decennial census). Looking at the ten most rural states (where less than 40 percent of the population lives in urban areas) the average vehicle miles per-capita is 11,708 annually, or 24 percent above the national average. Conversely, across the eight most urban states (plus the District of Columbia) where over 90 percent of the population lives in an urban area, vehicle miles per person averages only 8,220 miles annually, or 13 percent below the national average.[10]

This rough correlation between more urban populations and less driving is apparent in the figure below. There is a clear pattern of less driving in more urban states, and none of the states with the most driving are among the most urban.[11]

Likewise, within Massachusetts, rural and suburban residents also tend to drive more than their more urban counterparts. An MAPC analysis looked at five different types of communities to compare their annual vehicle miles traveled. People in rural towns and developing suburbs drove more than those in urban areas and maturing suburbs. The accompanying map and table displays this fairly consistent trend.[12]

Income

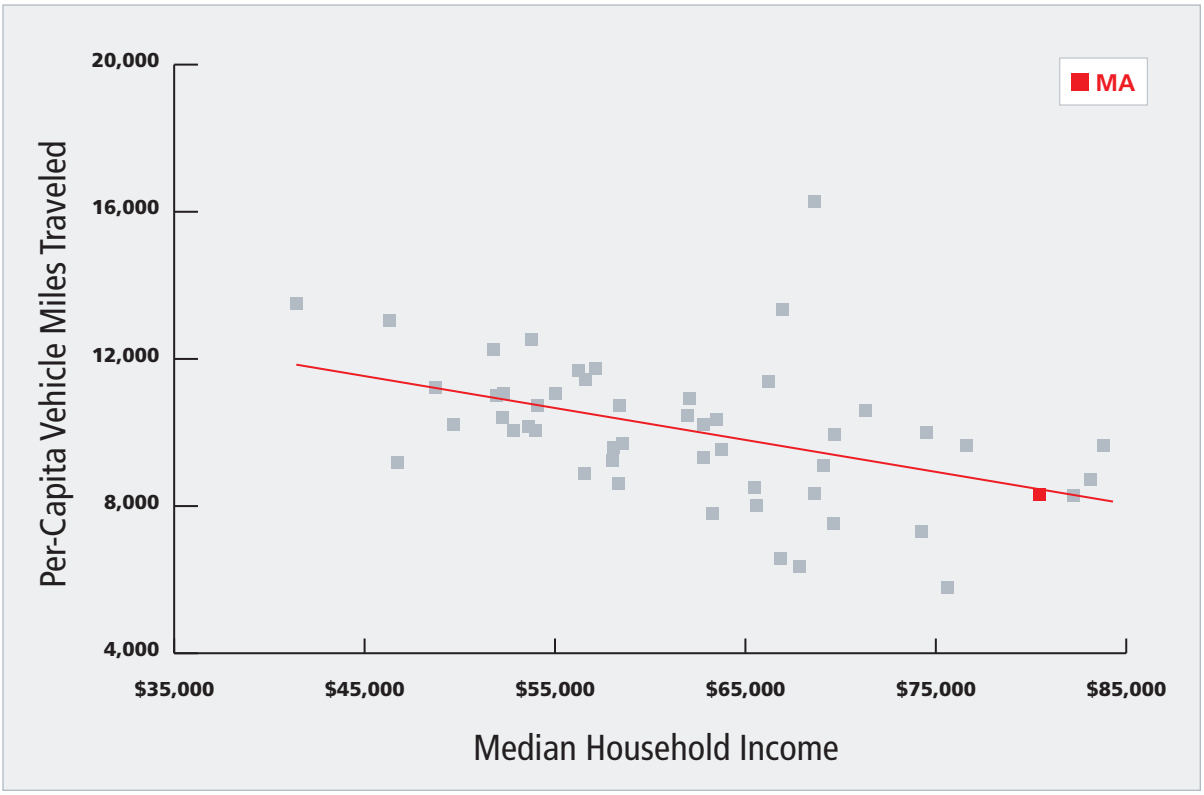
Another factor that corresponds to less driving is income. People in states with higher median household incomes average fewer annual driving miles than in lower-income states, as represented by the accompanying scatterplot.[13] By this measure, the lower-income 25 states average 10,744 miles per-capita, 14 percent above the national average. The 25 higher-income states plus (relatively high-income) Washington D.C. average 9,301 miles, or 2 percent below the national average. Among the half-dozen highest-income states, not one averages more than 10,000 miles per-capita. The biggest exception to this general pattern is Wyoming, where incomes are somewhat above average and driving miles greatly exceed all other states.



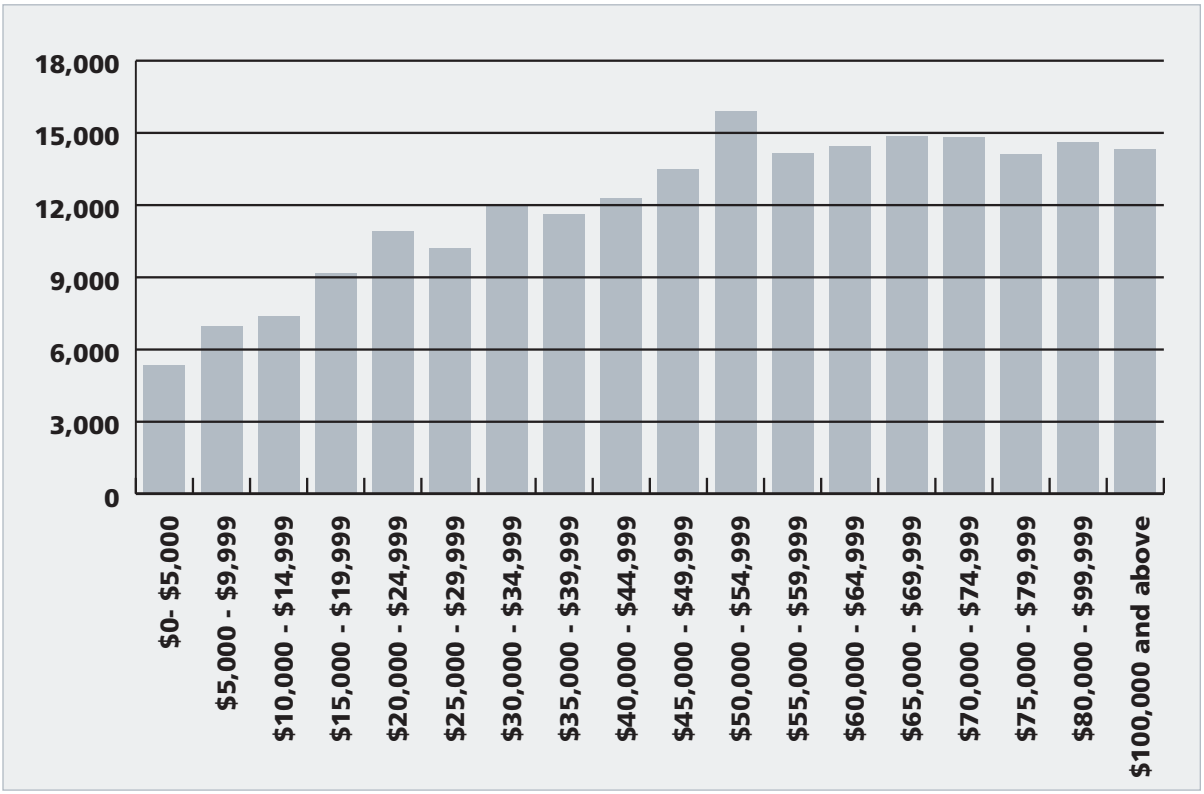
	% of MA Households	% of MA Total VMT	Average VMT per Household
Inner Core	22%	13%	32
Regional Urban Centers	32%	28%	46
Maturing Suburbs	19%	22%	63
Developing Suburbs	25%	34%	75
Rural Towns	2%	2%	79

Source: US Census, MA RMV, MassGIS, MAPC analysis

Median Household Income and Vehicle Miles Traveled by State



Average Annual Vehicle Miles Traveled per Driver and Household Income



Household income in Massachusetts is one of the highest in the nationat $80,425, or fourth among states.

It is somewhat curious that higher-incomes states average *fewer* driving miles because at the household level this relationship is somewhat reversed.[14] According to the last National Household Travel Survey (2009), lower-income households tend to drive fewer miles. Households drive consistently more miles at higher incomes until annual miles peak at the $50,000 to $54,999 range, then settle at slightly fewer miles for all higher-income categories.[15] Beyond a certain threshold, income does not appear to have a discernible effect on the volume of household driving. In the vast majority of states, median household incomes were above that threshhold.

Working from home

Another possible explanation for how much people drive is how often people work from home instead of commuting. The internet and other communications technologies have enabled many people to perform work from home that could only be done in an office previously. Email, conference calls, videoconferencing, and shared digital files have made it far easier for people to "telecommute" from home. In this way, telework might reduce household driving by eliminating commuting trips.[16]

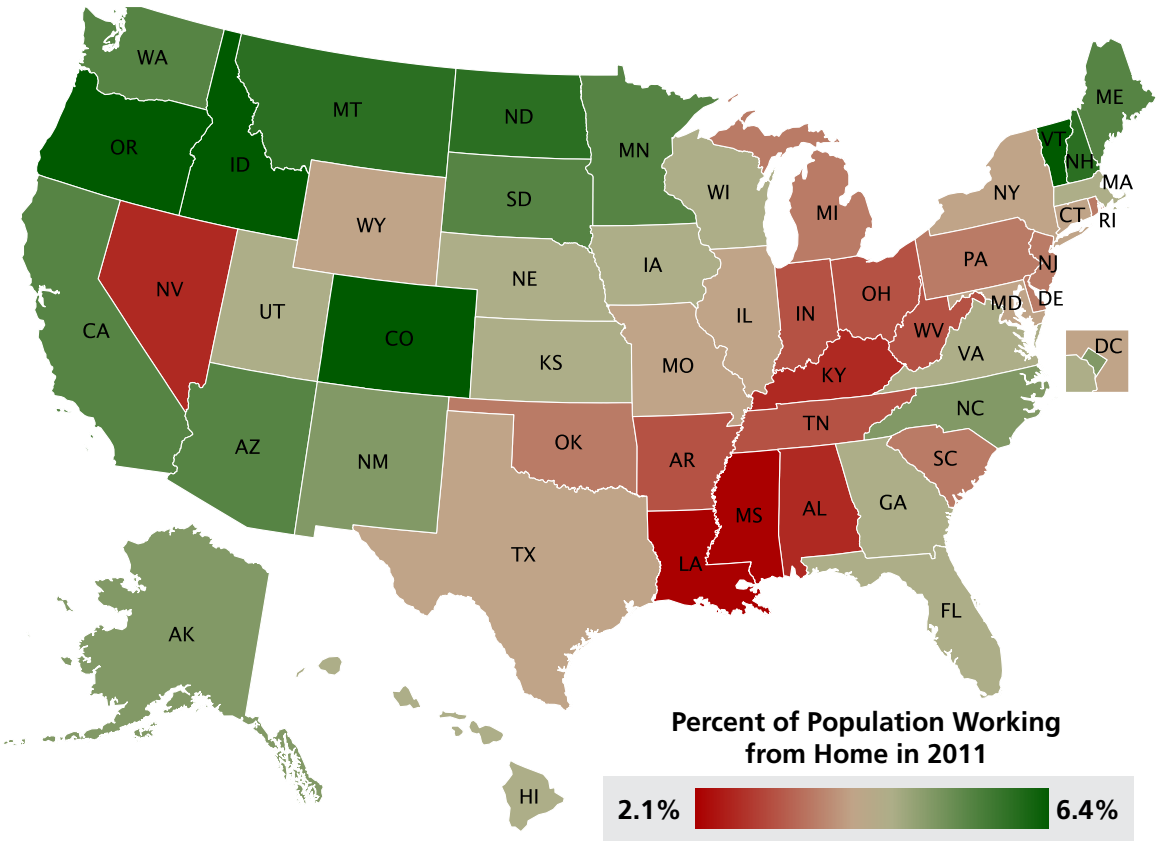
A significant and growing number of Americans work from home. The number of people who work from home a majority of the time stood at 4.3 percent in 2011.[17] Counting a broader measure of all workers who report that they perform some of their job from home

at least one day a week, 9.5 percent did so by 2010, up from 7 percent in 1999.[18]

On the other hand, home-based arrangements – and particularly telework – may encourage people to live in more rural settings further away from their place of employment, which could increase how much they drive. The most recent National Household Travel Survey indicates that 9 percent of city commuters telecommute even once per month, compared to 14 percent of suburban commuters and 10 percent of rural and town commuters.[19] For rural telecommuters especially, their occasional "face time" meetings in the office may require long distance travel and simple errands are more likely to require driving long distances. Sure enough, the nearby map shows that in Massachusetts, households where people must drive further to commute end up driving more miles. And since most driving trips are for non-commuting purposes, the overall effect of increased telecommuting could be to increase vehicle miles traveled.[20]

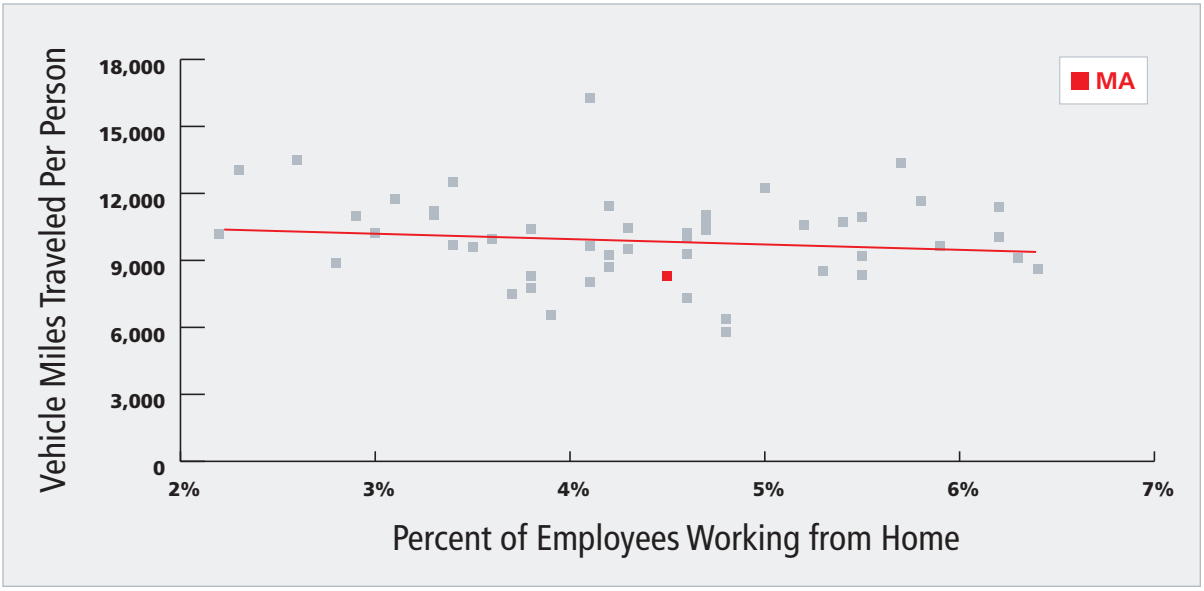
The states in which the smallest percentage of people who work from home a majority of the time are Louisiana, Mississippi and Alabama. People work most from home in Oregon, Col-

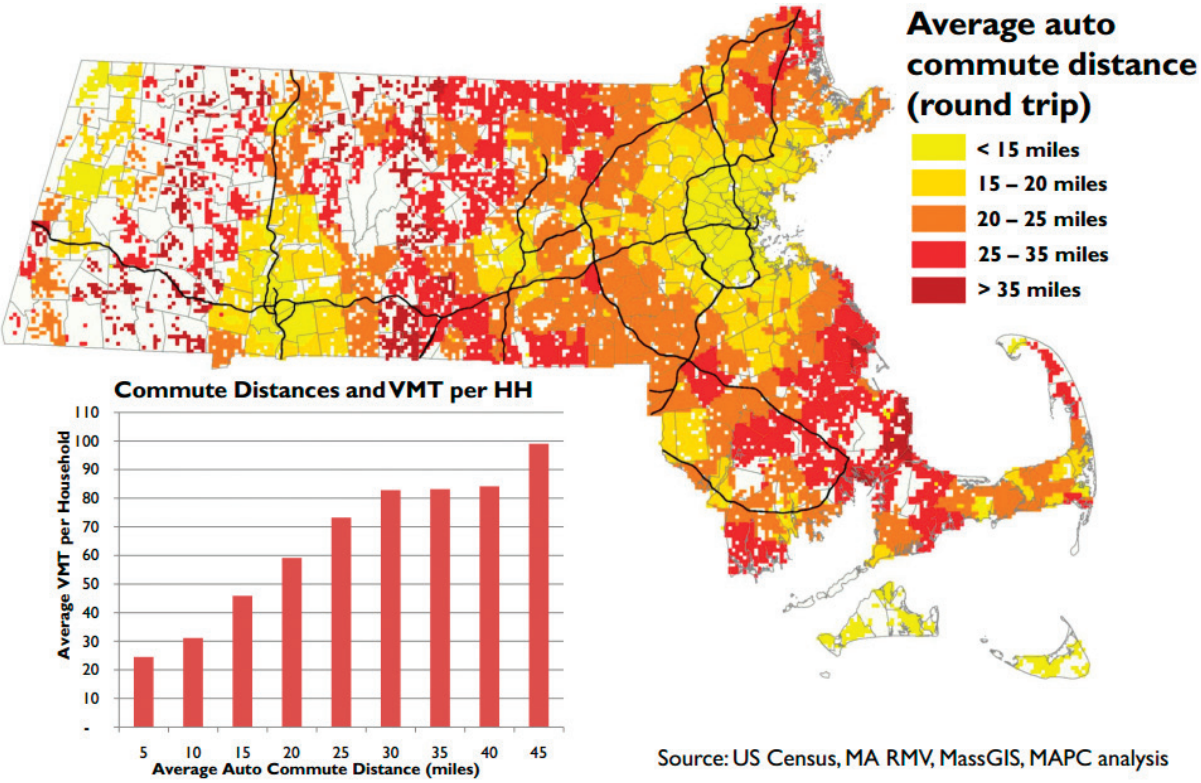
Percent of Workers 16+ Years Working From Home, 2011



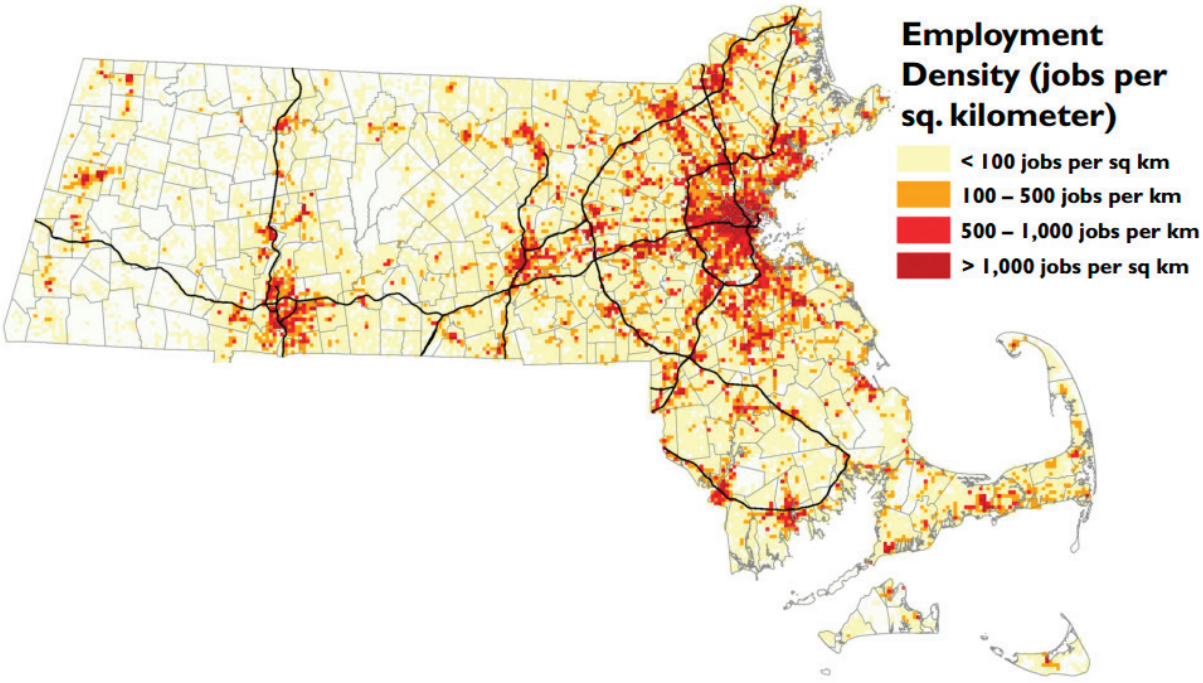
Source: U.S. Census Bureau, 2011 American Community Survey

Percent of Employees Working From Home and Vehicle Miles Traveled Per Person by State (2011)





Source: US Census, MA RMV, MassGIS, MAPC analysis



Source: Dunn & Bradstreet, MassGIS, MAPC analysis

orado, Vermont and Idaho. Lower percentages of home-based workers are concentrated in the Gulf, Midwest and Mid-Atlantic regions. It is more common for people to work from home in New England and the entire West, except Nevada. One reason for differences may be the industrial make up of states, since working from home is more feasible in some types of work than others.

Although New England is singled out as a leader in working from home, Massachusetts falls in the middle of the nation with only 4.49 percent of the workforce doing so in 2011.

The following figure bears out the ambiguous relationship between working from home and the volume of driving.[21] States with a relatively large portion of people working from home include high-driving North Dakota as well as lower-driving states like Oregon and Colorado. Most of the lowest-driving states have a middling portion of workers who work from home.

All in all, there appears to be no single factor behind the average amount of driving for residents in any given state. Urbanization is clearly important though only can explain a fraction of the differences between states.

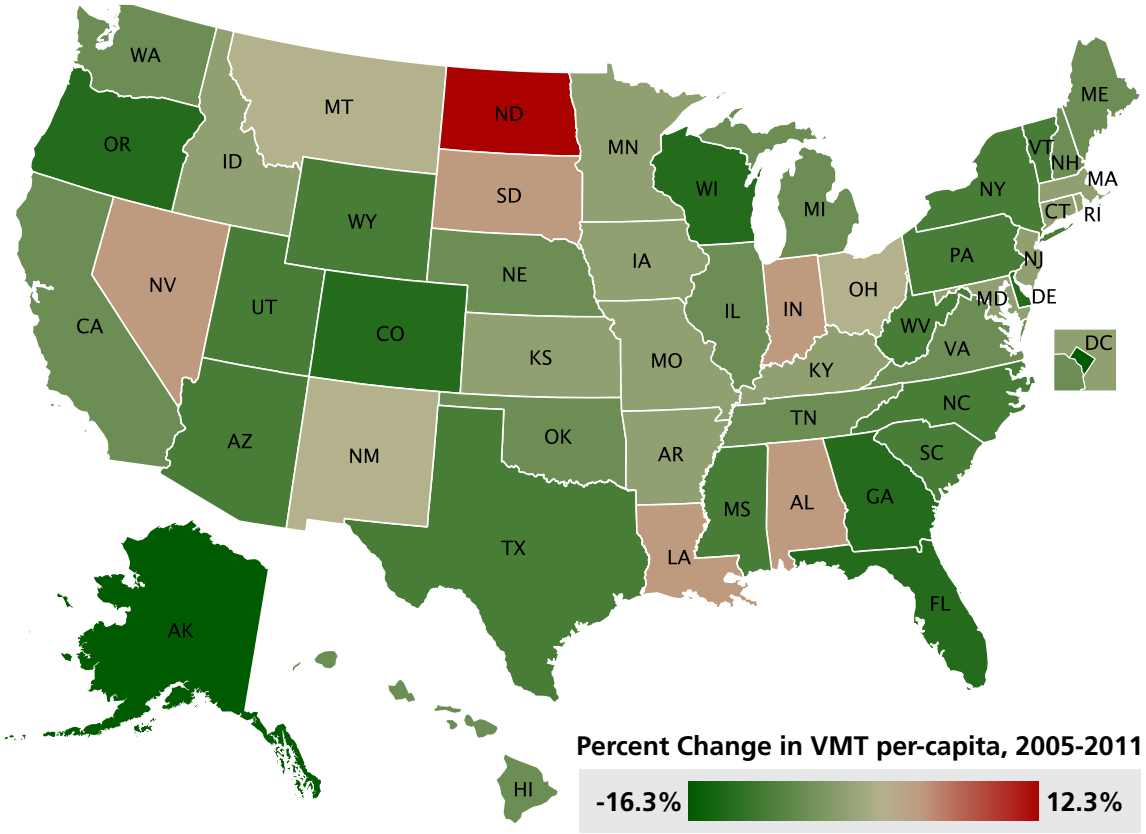
People are Driving Less in Almost Every State

Looking at individual states, the most striking thing is how broad-based the trend is. From 2005 through 2011 – the last year for which the Federal Highway Administration currently provides confirmed state-by-state data on the volume of driving – vehicle-miles traveled per capita declined 6.5 percent for the nation as a whole. Driving per person fell by double digits in a diverse array of states including: Alaska, Delaware, Oregon, Georgia, Wyoming, South Carolina, the District of Columbia, Pennsylvania, Indiana and Florida during this period.[22]

These deep declines took place in a mixture of high and low per-capita driving rates.

The closer one looks at the state data, the broader the trend appears. In 43 states and Washington, D.C., driving per person declined between 2005 and 2011. In three additional states – Indiana, Ohio and South Dakota – driving has increased slightly but still remains below its earlier 2004 peak. **Thus, in 46 states driving per person has declined since its peak at the end of the Driving Boom.**

Percent Change in Vehicle Miles Traveled, 2005-2011



That leaves only four outlier states that have increased driving miles per person since the mid-2000s. The group is led by North Dakota, where a huge expansion of the energy sector from fracking may have led to a trend-defying 12.3 percent increase in miles traveled per person. The other three states — Alabama, Nevada, and , Louisiana— experienced much smaller increases of 2 to 3 percent over this six-year period, which would be a strikingly low increase for past decades. In Alabama and especially Louisiana the results may be influenced by Hurricane Katrina and its aftermath. Nevada's increase in per person driving over the period might be partly explained by the blistering pace at which sprawling housing was built over the previous decade; or by the bizarrely large 13.6 percent increase in per person driving between 2010 and 2011 that seems most likely to be a statistical anomaly or data error.

All regions saw reductions in vehicle miles traveled per person, although there were significant differences within each region and different regions saw different rates of decline. Looking at average state changes in driving per-capita for each region, we see the largest reductions in the South Atlantic (9.6 percent), followed by the West (6.7 percent) and the Northeast (5.5 percent). The slowest declines took place in the North Central region (2.2 percent), largely due to North Dakota, and the Gulf South (4.1 percent), which may partly reflect the reconstruction and displacement after Hurricane Katrina.

Why Have Some States Reduced Driving More Than Others?

The reasons behind the end of the Driving Boom after 2005 are fairly well understood, but we know much less about which factors were more important than others. The decades following the end of World War II were a time when people flocked to the new suburbs, gas was cheap, women newly entered the labor force as commuters, use of public transit was declining, and cars were at the center of American culture. More recently, these trends have leveled off or moved into reverse.[23]

State-level data can provide insight into these national trends if we examine how much driving declined (or increased) in particular states after 2004. Differences among the fifty states can serve as a natural experiment to "test" how closely driving is a byproduct of urbanization, changes in the organization of work, or a slowdown in the state economy. Looking at which states reduced their driving the most over this time, we can see whether those states shared certain characteristics or if the reduction in driving is part of a larger societal trend.

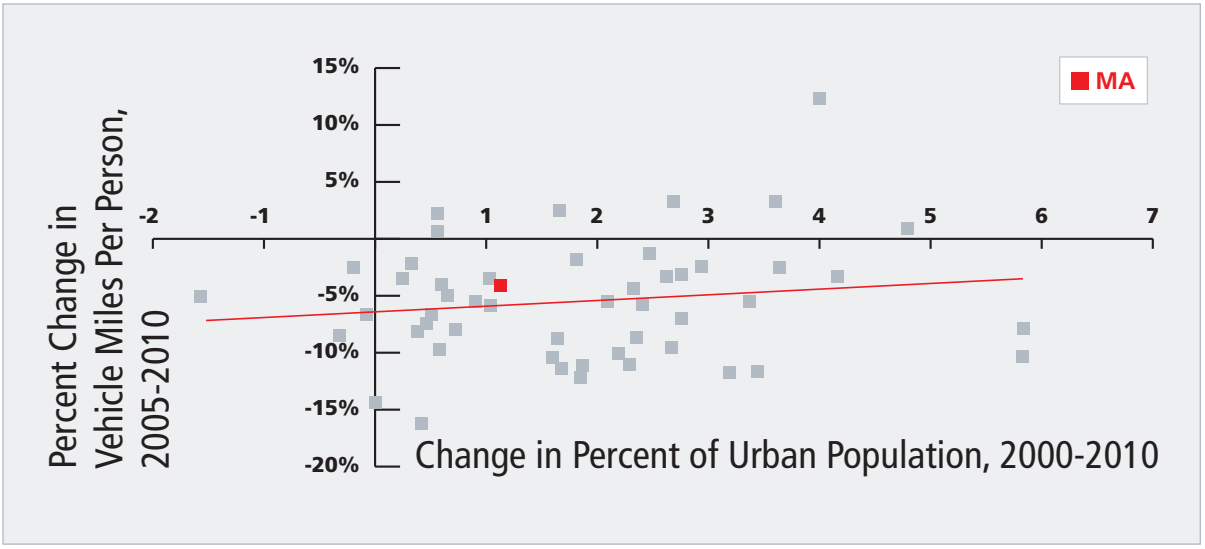
Although we noted that people in less rural states tend to drive less on average, the data nonetheless do not suggest that urbanization caused the end of the Driving Boom. To measure urbanization, we looked at decennial censuses for the portion of the population living in "urban areas" – which include cities and their surrounding suburbs. The urban population nationwide grew from 79.0 percent to 80.7 percent between 2000 and 2010. All but four states saw increases in the relative size of the urban population.[24] States with faster rates of urbanization, however, did not consistently reduce driving more. On the contrary, the four states in which the rural share of population increased during this period also reduced per-capita driving. The seven states that increased driving since 2005 also became more urbanized.

Massachusetts is slowly becoming more urbanized by these measures. The definition of an urban area is broad and as a smaller state much of the Commonwealth is considered urbanized. In 2000, 91.37 percent of the state lived within the boundaries of one of the state's extended metropolitan areas, and in 2010 this total had climbed to 91.97 percent. This relatively small shift is unlikely to have made much of a difference n Massachusetts.

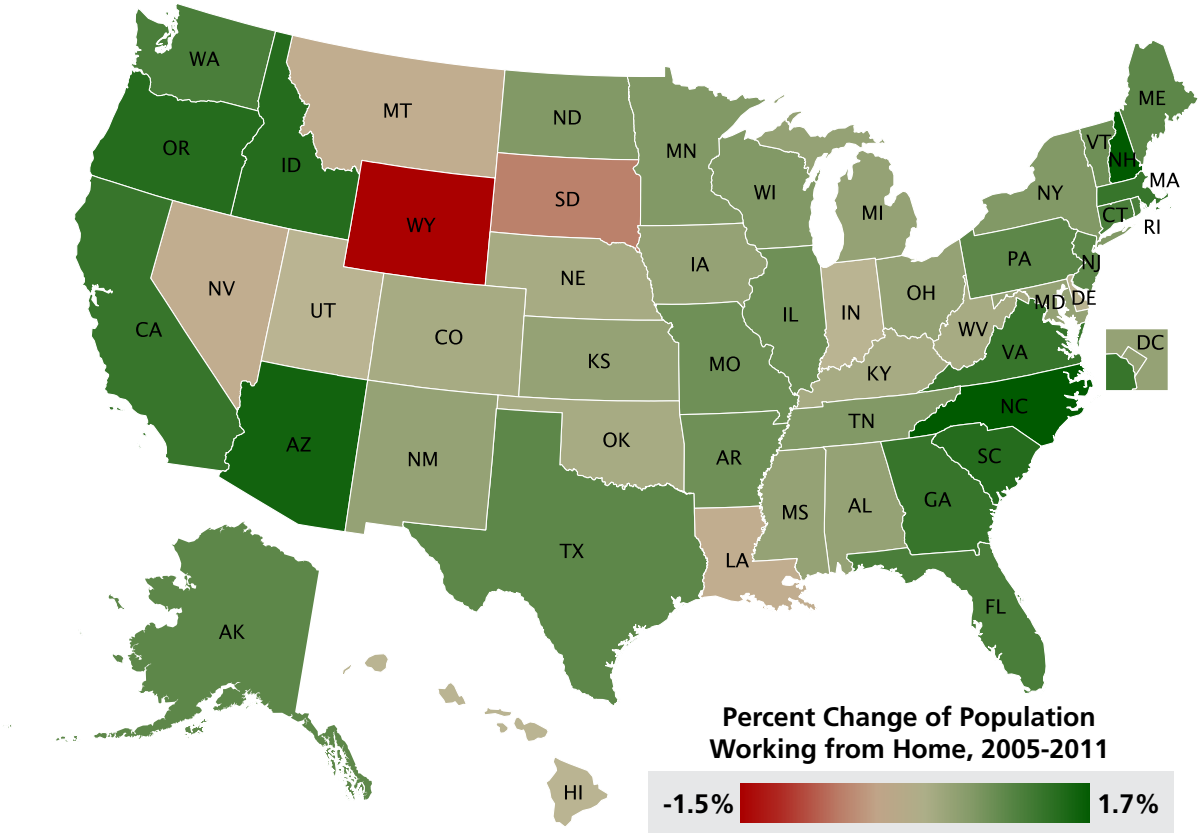
Likewise, the figure below illustrates very little correlation between statewide urbanization and driving decline. If driving decline was associated with urbanization during this period, we would expect to see a cluster of points in a line between the upper-left quadrant and lower right quadrant, but instead we see a largely random-looking cloud with a very weak tendency in the opposite direction.[25] None of the states that became less urbanized increased their driving per person, and none of the states where per-person driving increased became less urbanized.

This result may seem surprising. The lack of pattern might be that the more important population shifts are not between rural and non-rural areas but between suburbs and more densely populated cities. Between the 1920s and 2010

Percent Change in Urban Population and Change in Vehicle Miles Traveled Per-Person by State



Percent Change of Workers 16+ Years Working From Home, 2005-2011

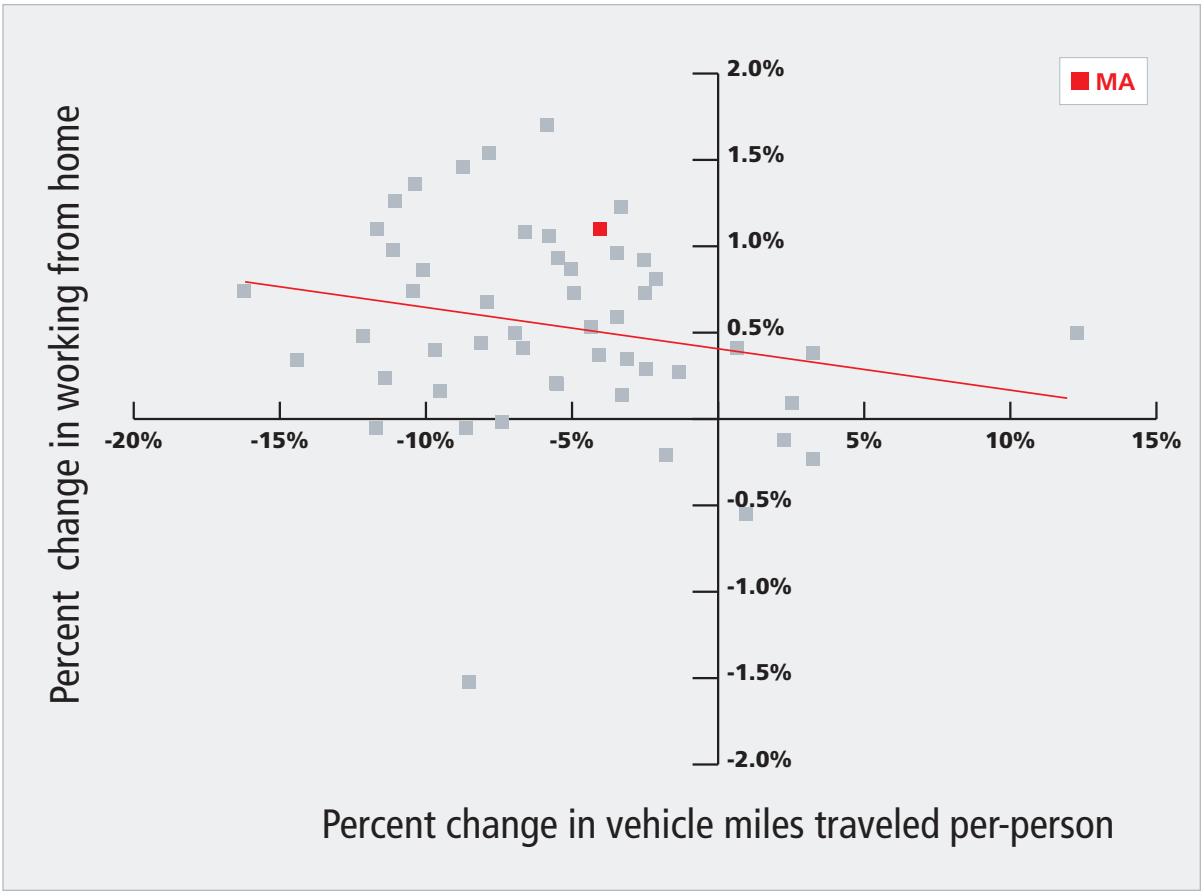


suburbs grew faster on average than the central cities they surrounded; but in the two years since then, big cities in large metro areas have grown faster.[26] While this trend is only two years old, it is also led by Millennials whose influence on overall travel patterns will continue to grow in coming years. If this trend continues, it would likely play a larger role in reducing driving.

Could increases in telework be partly responsible for the protracted reduction in driving? As previously mentioned, telework has increased significantly over the past decade. Technologically-enabled opportunities for telework could be one factor contributing to the reduction in driving.

But as the figure below illustrates, there is not a strong correlation between changes in a state's portion of home-based work and the changes in per-capita driving since the end of the Driving Boom.[27] From 2005 to 2011 the Commonwealth experienced a 1.1 percent growth in the number of people working from home making it one of the fastest growing states in this category. It may be that telework and the mobile technologies associated with it helps people lead a car-light lifestyle, but the impact of telework on decisions about where to live may counter that effect. The jury is still out on whether telecommuting overall reduces how much people drive.

Percent Change of Workers 16+ Years Working from Home and Change in Vehicle Miles Traveled by State (2005-2011)



How Much Does The Economy "Drive" Reductions in Driving?

It's easy to imagine that the volume of driving might simply be determined by the pace of economic growth. By itself, faster growth and more people working would logically translate into more driving. Slower growth would likewise hold back the volume of driving. Travel is both an input for economic production and an output that results from consumption. More economic activity should mean more people commuting to work, more trucks shipping materials to and from factories, and more people spending their salaries for recreation and leisure travel. When more people are unemployed, fewer of them commute. Employed people – especially men – drive far more miles than their jobless counterparts.

Four reasons to be skeptical

The economy has undoubtedly had a major impact on driving trends. But it is not the only factor and some of the economic changes that have contributed to the decline in driving, such as the rise in gasoline prices, are unlikely to be temporary. There are four reasons to be skeptical about dismissing the apparent end of the Driving Boom as merely a temporary byproduct of the recession.

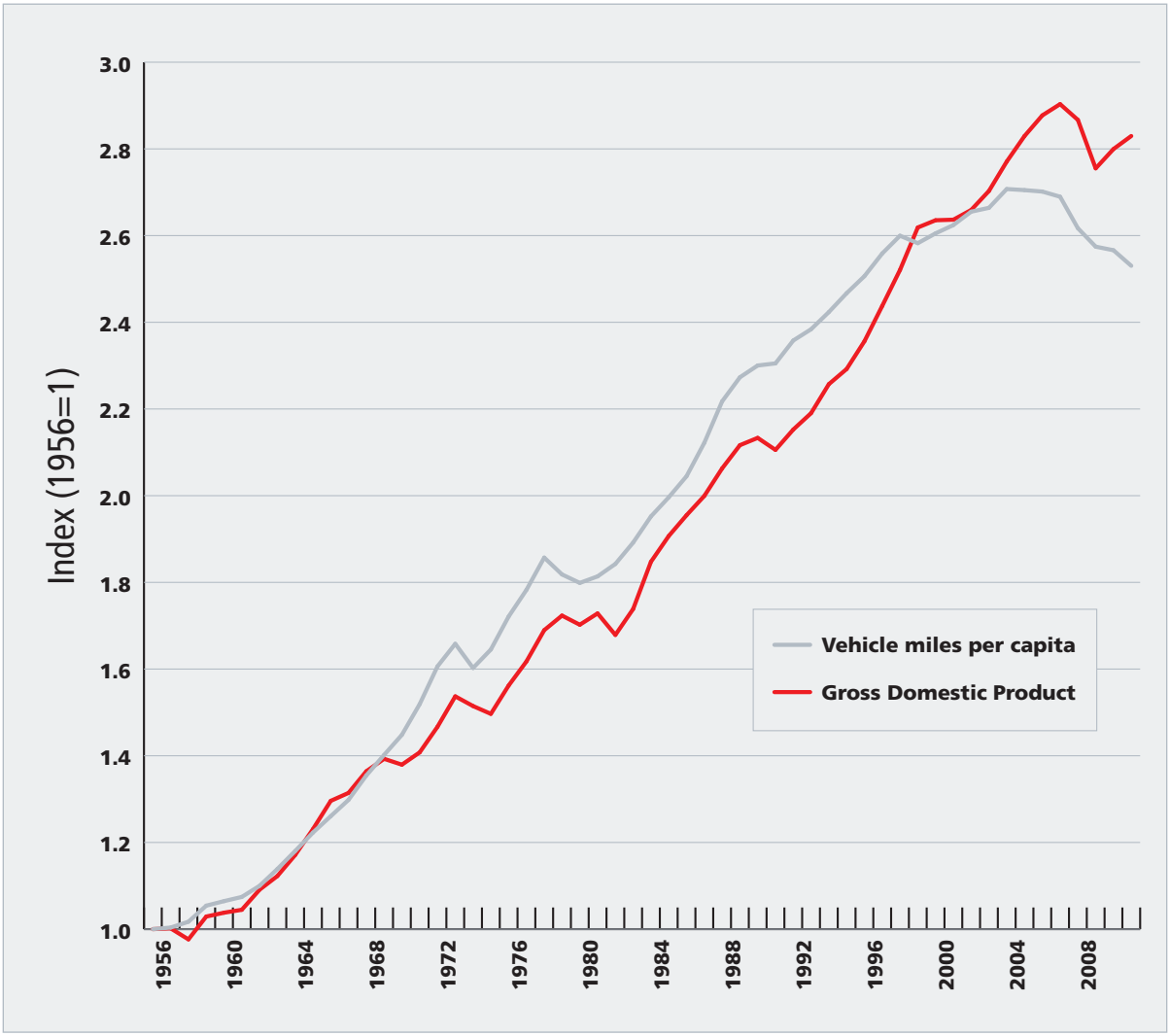
1. Per-capita driving had already begun to decline years *before* the recession and continues years after. The recession officially began in December 2007 and ended in June 2009.[28] Now in the fourth year after the recession has officially ended, driving has continued to stagnate or decline.[29] In past recessions driving either never fell below its pre-recession level or quickly recovered.[30]

2. Other indications of motorization also peaked and declined *before* the recession. Professor Michael Sivak at the University of Michigan has documented peaks between 2001 and 2006 for the number of vehicles per person, the number of vehicles per licensed driver, and the number of vehicles per household.[31] These complementary elements of "motorization" had contributed to the Driving Boom previously, but appear to have reached some saturation point. Related research shows that the percentage of young people with a driver's license peaked already by the 1980s and has declined considerably.[32]

3. Driving per person declined among both those with and those without jobs. Between 2001 and 2009, driving among employed youth (16 to 34 years of age) fell 16 percent.

4. Gross Domestic Product has ceased to move in tandem with the volume of driving since around the beginning of last decade. As the figure below illustrates, driving and national income were tightly connected during the Driving Boom, but in more recent decades the two indicators have uncoupled.[33] Driving per person stagnated during the mid-2000s while GDP climbed, and driving growth has remained flat or declined while economic growth picked up after the recession.[34]

Trends in GDP and Vehicle Miles Traveled 1956-2011



Source: FHWA, Bureau of Economic Analysis, Census Bureau. Values for 1956 are converted to 1.

What can we learn from comparisons between the states?

If the economy is the dominant factor determining the volume of driving, then we would expect the largest reductions in per-capita driving to occur in states that were hardest hit by the recession and its aftermath. We'd likewise expect that, all else equal, the states with the largest increases in unemployment since the Driving Boom would have the biggest declines in driving. After all, states with sharper increases in unemployment will have a steeper reduction of commuters and residents with greater fear of job loss will be less likely to drive to the shopping mall or the movies. Massachusetts was hit less severely by the economic downturn than most other states. Without looking at the general pattern among states, some people

might conclude that this is the reason the state did not reduce driving miles as much as most other states. But how closely are unemployment and driving connected among all states?

All states saw an increase in unemployment during this period. In Massachusetts, the 2.6 percent increase in the rate was less than its 3.3 percent increase nationally. But there is almost no apparent relationship between how much unemployment increased and how much driving declined. On the contrary:

- Among the 23 states in which driving per person declined faster than the national average, only six saw unemployment increase faster than the nation as a whole.[35]

- Among all states with above-average increases in the unemployment rate, a majority had below-average declines in driving.

- Among the ten states with the largest declines in driving per person, only two stood among the ten with largest increases in unemployment.

The scatterplot below illustrates the very weak connection between driving trends and unemployment. If economic effects associated with unemployment were the dominant factor behind the decline in driving, then we would expect to see the states clustered in a line or arc between the upper left corner and the lower right. That would indicate that bigger increases in unemployment correspond to larger decreases in driving. Instead the two factors appear to have no relationship. The trend line represents a very weak correlation and is almost completely flat.[36]

In some respects, it should not be surprising that unemployment does not closely correlate with VMT. After all the National Household Travel Survey in 2001 to 2009, indicates that the reduction in driving *to and from work* was just un-

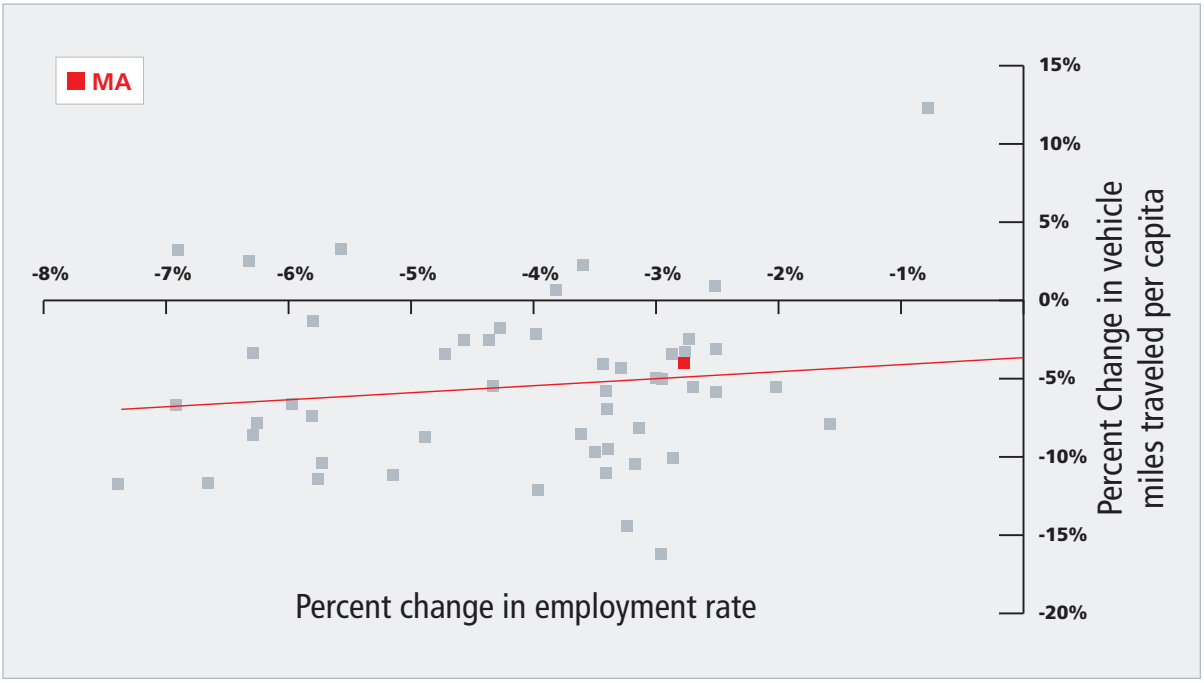
Percent Change in Unemployment and Vehicle Miles Traveled Per Capita, 2005-2011

der 16 percent of the total reduction, less than the reduction in miles for social/recreational and less than half as large as the reduction in miles for family and personal errands.[37]

Would we better discern the relationship to driving if we looked more directly at changes in *employment* rather than unemployment? Employment rates do not simply mirror the unemployment rates because non-employed people only get categorized as unemployed if their activities qualify them as actively searching for work and therefore part of the official labor force. The number of employed persons as a percent of the civilian labor force fell from 62.7 percent to 58.4 percent from 2005 to 2011, a 4.3 percent drop.[38] The employment rate fell in every state by amounts that varied between about 1 to 7 percent. Though not as clear a measure of economic distress, declines in employment might serve better than unemployment as a measure of each state's declining economic activity.

As evident in the figure below, there is very little apparent pattern between state-level changes in employment and per person rates of driving since the end of the Driving Boom. If bigger declines in employment corresponded to larger declines in driving, we would expect to see a clustering of states between the lower left and upper right of the scatterplot. Instead the relation appears very weak and the trend line is quite flat.[39] In fact, if not for North Dakota, the overall trend line would slope in the opposite direction.[40] Among states where driving declined faster than the national average, a majority actually saw declines in the employment rate that were below the national average. Likewise, among the ten states with the greatest reductions in the rate of employment, only two were also among the ten states with the largest reductions in driving (Georgia and the District of Columbia). Changes in the employment rate are not a strong predictors of changes in driving at the state level.

Change in Employment Rates and Vehicle Miles Traveled Per Capita, 2005-2011



Conclusion

America's six-decade Driving Boom lasted so long with such consistent increases in driving that it came to be seen like an immutable law of nature. The evidence suggests that there has been a long-term shift toward stagnant or even declining driving. It may be tempting to dismiss this shift as merely a temporary side effect of the recession, but the evidence does not support this view. Looking at state-level trends further confirms that the decline in driving is about more than an economic aftershock.

Accepting that the Driving Boom has ended presents an enormous opportunity. Our national transportation system remains oriented to the goals of the 1950s, focused on creating new highways and expanded mobility for a new era of expanding automobile ownership. To the extent that driving rates no longer climb, it makes it easier for America to shift priorities. Revising forecasts about future driving will make it easier to achieve billions of dollars in savings by not building new highways and expanding old ones. It will be easier to dedicate highway funds to repairing and maintaining bridges and roads that are in disrepair. And it makes it easier to prioritize investment in other modes of transportation that are expanding rapidly, such as public transit, biking, walking and intercity rail.

This report has shown that while there are many factors influencing the decline in driving, when taken by themselves, none of them are predictors of an individual state's performance. Massachusetts has been a good example of many of the national trends.

Bringing our transportation system finally into the 21st century will require doing things differently. It will be important to examine the evidence of ongoing trends and understand that getting past the recent recession does not mean returning to the needs and priorities of the 1950s.

In Massachusetts, the biggest determinant of future driving trends will be how well the state builds upon the opportunity of shifting travel preferences to provide better non-automotive choices for travel around the state. The new transportation finance system in Massachusetts presents an opportunity to reject the status quo and embrace transportation alternatives that make the Commonwealth a national leader in transportation. Expanding capacity of our public transportation systems, promoting walking and biking, and establishing more proactive development and transportation management strategies will make possible a greater shift away from motor vehicle travel.

Endnotes

1 Using U.S. Census population data and annual VMT from the Federal Highway Administration's *Highway Statistics* reports, except for 2012 for high Highway Statistics remains unpublished and data comes from the FHWA's *Traffic Volume Trends*. VMT stood at 10,108 miles per-capita in 2005 and 9,361 miles per-capita in 2012.

2 Federal Highway Administration Traffic Volume Trends May 2013, accessed at http://www.fhwa.dot.gov/policyinformation/travel_monitoring/13maytvt/index.cfm 20 July 2013.

3 Douglas Short, looking at rolling 12-month averages and dividing total miles by a population measure that (unlike ours) looks only at non-institutionalized people over 16 years and older finds VMT per capita to have peaked in June 2005 and has fell 8.9 percent by May 2013 to stand at the same level as January 1995. Information accessed at http://www.advisorperspectives.com/dshort/updates/DOT-Miles-Driven.php 23 July 2013.

4 Michael Sivak, "Has Motorization Peaked in the U.S.? Part II: Use of Light Duty Vehicles," July 23, 2013 accessed at deepblue.lib.umich.edu/bitstream/handle/2027.42/98982/102950.pdf July 23 2013.

5 Alan Pisarski and Cambridge Systematics, "Full Bottom Line Technical Report: Highway and Public Transportation Federal and State Investment Needs," Requested by the American Association of State Highway and Transportation Officials (AASHTO), accessed at . For the long view, see also Robert Puentes and Adie Tomer (2008), "*The road…less traveled: An analysis of vehicle miles traveled trends in the U.S.*" Washington, D.C: Brookings Institution (2008);

6 U.S. PIRG Education Fund, *A New Generation* (2013).

7 For 2011, see FHWA, Highway Statistics 2011 at http://www.fhwa.dot.gov/policyinformation/statistics/2011/dl20.cfm accessed 21 July 2013. See Michael Sivak and Brandon Schoettle, "Percentage of Young Persons With a Driver's License Continues to Drop," *Traffic Injury Prevention*, 2012, vol. 13 (2012), p. 341. See also Michael Sivak, "Has Motorization in the U.S. Peaked?" University of Michigan Transportation Research Initiative, June 2013.

8 Wisconsin's Department of Transportation lists on its own website a number of 2011 vehicle miles traveled that is substantially higher than the number reported by the Federal Highway Administration (FHWA). The Wisconsin Department of Transportation lists 58,554 million miles traveled on all roads for 2011. http://www.dot.wisconsin.gov/travel/counts/vmt.htm. The Federal Highway Administration lists 54,402 million miles. See http://www.fhwa.dot.gov/policyinformation/statistics/2011/vm2.cfm The FHWA has confirmed that there is a discrepancy, stemming from data on rural road use that is not merely a data entry error. We do not include Wisconsin as among the list of states with the largest reductions in driving miles in this report. For other charts, tables, and calculations we used the FHWA data to maintain broad consistency with FHWA data sources. The FHWA expects these data discrepancies to be resolved by this coming winter.

9 Regional averages are unweighted. Source: Federal Highway Administration, Highway Statistics 2011, as last revised November 2012 and viewed July 2013.

10 All averages presented in this paragraph are derived by averaging state totals rather than pooling population and VMT totals among subsamples to obtain weighted samples.

11 The R-squared value for the correlation illustrated by the trendline is 0.3938.

12 Reardon, Timothy. "Vehicle Milest Traveled in Masssachusetts: A Presentation to the House Committee on Global Warming and Climate Change". MAPC MassGIS Census Analysis. Accessed at http://willbrownsberger.com/wp-content/uploads/2010/04/MAPC_Reardon_Climate-Change-Committee-4_13_10.pdf. August 14th 2013.

13 The R-squared value for the correlation illustrated by the trendline is 0.2058.

14 This relationship is partly a function of the fact that more urban states also tend to have higher median household incomes.

15 Federal Highway Administration, 2009 National Household Travel Survey (NHTS), Tabulation created on the NHTS website at http://nhts.ornl.gov

16 Margaret Walls and Elena Safirova, Resources for the Future, *A Review of the Literature on Telecommuting and Its Implications for Vehicle Travel and Emissions*, December 2004. See also Andy Lake, "The Impacts of e-Work and e-Commerce on Transport, the Environment, and the Economy," In C. Jensen-Butler, B. Sloth, M. M. Larsen, B. Madsen, & O. A. Nielsen, *Road Pricing, the Economy and the Environment*, Berlin: Springer, 2008, pp 375-393. (As cited in http://www.telework.gov/Reports_and_Studies/Annual_Reports/2012teleworkreport.pdf). See also Pavel Andreeva, Ilan Salomonb and Nava Pliskin, "Review: State of Teleactivities," *Transportation Research Part C: Emerging Technologies* 18(1): Pages 3–20, February 2010. For a somewhat contrary view, see Patricia L. Mokhtarian, "Telecommunications and Travel: The Case for Complementarity," *Journal of Industrial Ecology*, 6(2): 43-57, April 2002.

17 Based on the U.S. Census Bureau, 2011 American Community Survey. A separate survey, the Census Bureau Survey of Income and Program Participation shows an increase from 4.9 percent in 1999 to 6.6 percent in 2010 based on different questions. A description of the reasons these data sources aren't comparable can be found at U.S. Census, "Home-Based Workers in the United States: 2010," Household Economic Studies (October 2012).

18 U.S. Census, "Home-Based Workers in the United States: 2010," Household Economic Studies (October 2012). Data is based on the Census Bureau Survey of Income and Program Participation.

19 Natural Resources Defense Council, *Driving Commuter Choice in America*, NRDC Issue Paper, July 2013, accessed at http://www.nrdc.org/transportation/driving-commuter-choices.asp, 19 July 2013.

20 Data from the National Household Travel Survey indicate that those answering that they have the option to work at home drive about 1,500 more miles annually than those who reply that they don't have the option. Curiously, those who say they "don't know" whether they have the option drive slightly more than half as much as those responding that they do have the option to work at home. Those who live longer distances from work are more likely to report that they have the option of working at home, although the effect is only pronounced beyond 75 miles. Tabulations created on NHTS website http://nhts.ornl.gov .

21 The R-squared value for the correlation represented in the trendline is 0.0204.

22 According to Federal Highway Administration data, but not Wisconsin Department of Transportation data, Wisconsin also saw double-digit reductions in driving between 2005 and 2011. The text box in the introduction of this paper explains how this discrepancy is in the 2011 data.

23 Tony Dutzik and Phineas Baxandall, *A New Direction: America's Changing Relationship To Driving and the Implications for our Future* (U.S. PIRG Education Fund and Frontier Group, May 2013).

24 The exceptions were small increases in Wyoming, Rhode Island and Michigan, plus a 1.6 percent decline in Maine.

25 The R-squared value for the trendline is 0.0235.

26 For central cities in metropolitan areas with more than a half-million people. See William Frey, "A Big City Growth Revival? Brookings (May 28, 2013), http://www.brookings.edu/research/opinions/2013/05/28-city-growth-frey.

27 The R-squared value of the correlation is 0.0452.

28 Bureau of Labor Statistics, Spotlight on Statistics, "The Recession of 2007-2009," February 2012, http://www.bls.gov/spotlight/2012/recession/pdf/recession_bls_spotlight.pdf

29 The most recent recession officially began in December 2007 and ended in June 2009. See National Bureau of Economic Research, Business Cycle Dating Committee report September 2010, accessed at http://www.nber.org/cycles/sept2010.html 22 July 2013.

30 Clark Williams-Derry citing research by Joe Cortright, Sightline blog, "Driving Declined During the Recovery," (Feb. 19m 2013), http://daily.sightline.org/2013/02/19/driving-declined-during-the-recovery/

31 Michael Sivak, "Has Motorization in the U.S. Peaked?" University of Michigan Transportation Research Institute (June 2013).

32 Michael Sivak & Brandon Schoettle (2012): Update: Percentage of Young Persons With a Driver's License Continues to Drop, *Traffic Injury Prevention* (2012) Vol. 13, No. 4, pp. 341-341.

33 On the relationship between VMT and GDP, see Liisa Ecola and Martin Wachs, "Exploring the Relationship Between Travel Demand and Economic Growth," paper prepared for the Federal Highway Administration (December 2012); Brantley Liddle,, "Long-run relationship among transport demand, income, and gasoline price for the US," *Transportation Research Part D: Transport and Environment*, Vol. 14, No. 2, 2009, pp. 73-82. See also David Leonhardt, "Growing Without Driving," New York Times Economix blog (Jan. 20, 2011).

34 This chart is from Tony Dutzik and Phineas Baxandall, *A New Direction: America's Changing Relationship to Driving and the Implications for our Future* (U.S. PIRG Education Fund and Frontier Group, May 2013), p. 23.

35 The national average unemployment rate for 2005 was 5.1 percent. The average for 2011 was 8.9 percent. The difference is 3.8 percent. This data derives from the Bureau of Labor Statistics, BLS series ID LNU04000000.

36 The R-squared value for the trendline is 0.003. With the relatively flat slope of the trendline, the 3.8 percent increase in unemployment would only have generated a 0.65 percent reduction in vehicle miles per person, about one tenth of the actual observed amount.

37 NHTS (2009) summary charts, Table 6.

38 Bureau of Labor Statistics data from the Current Population Survey and accessed at http://www.bls.gov/cps/aa2011/cpsaat01.htm July 27 2013

39 The R-squared value for the trend line is 0.0173. With the relatively flat slope of the trend line, the 3.8 percent increase in unemployment would only have generated a 1.66 percent reduction in vehicle miles per person, about one quarter of the actual observed amount.

40 Without North Dakota the R-Squared value for the trend line is only 0.0005.

Appendix 1: Vehicle Miles Traveled by State

	Vehicle-miles traveled per person in 2011	Percent change in annual per-person vehicle miles traveled, 2005 to 2011	Peak year for annual vehicle miles per person	Peak year annual vehicle miles traveled per person	Reduction in annual vehicle miles traveled per person since peak year	Percent decline in vehicle miles traveled per person since peak year
Alabama	13,516	3.26%	2011	13,516	0	0.0%
Alaska	6,355	-16.23%	2001	7,639	1,284	16.8%
Arizona	9,190	-8.72%	2006	10,131	941	9.3%
Arkansas	11,216	-2.50%	2006	11,743	526	4.5%
California	8,511	-6.61%	1999	9,244	733	7.9%
Colorado	9,108	-11.40%	2005	10,281	1,172	11.4%
Connecticut	8,713	-3.45%	2007	9,152	439	4.8%
Delaware	9,952	-11.71%	2005	11,272	1,320	11.7%
D.C.	5,774	-14.40%	2003	7,371	1,597	21.7%
Florida	10,067	-11.13%	2005	11,328	1,261	11.1%
Georgia	11,050	-11.68%	2001	13,249	2,199	16.6%
Hawaii	7,322	-7.40%	2007	8,061	739	9.2%
Idaho	10,055	-3.34%	1999	11,171	1,116	10.0%
Illinois	8,022	-4.94%	2004	8,585	563	6.6%
Indiana	11,736	2.52%	2004	13,113	1,377	10.5%
Iowa	10,213	-2.47%	2004	10,594	381	3.6%
Kansas	10,456	-3.12%	2006	10,931	476	4.4%
Kentucky	11,000	-3.29%	1999	11,720	720	6.1%
Louisiana	10,167	2.25%	2006	10,592	425	4.0%
Maine	10,727	-5.02%	2003	11,480	753	6.6%
Maryland	9,646	-4.08%	2007	10,057	411	4.1%
Massachusetts	8,318	-4.03%	2005	8,667	349	4.0%
Michigan	9,594	-6.68%	2007	10,387	793	7.6%
Minnesota	10,606	-4.34%	2004	11,110	504	4.5%
Mississippi	13,044	-9.68%	2008	14,875	1,831	12.3%

	Vehicle-miles traveled per person in 2011	Percent change in annual per-person vehicle miles traveled, 2005 to 2011	Peak year for annual vehicle miles per person	Peak year annual vehicle miles traveled per person	Reduction in annual vehicle miles traveled per person since peak year	Percent decline in vehicle miles traveled per person since peak year
Missouri	11,444	-3.45%	1999	12,204	760	6.2%
Montana	11,681	-1.77%	2004	12,116	435	3.6%
Nebraska	10,362	-5.53%	2004	11,324	962	8.5%
Nevada	8,882	3.24%	2001	9,796	914	9.3%
New Hampshire	9,650	-5.87%	2003	11,572	1,922	16.6%
New Jersey	8,286	-2.14%	2007	8,767	481	5.5%
New Mexico	12,262	-1.33%	2007	13,630	1,368	10.0%
New York	6,562	-8.13%	2006	7,321	760	10.4%
North Carolina	10,746	-7.85%	2005	11,662	916	7.9%
North Dakota	13,351	12.29%	2011	13,351	0	0.0%
Ohio	9,700	0.65%	2004	9,744	44	0.4%
Oklahoma	12,519	-5.54%	2006	13,603	1,085	8.0%
Oregon	8,619	-11.05%	1999	10,544	1,925	18.3%
Pennsylvania	7,785	-10.44%	2007	8,743	958	11.00%
Rhode Island	7,515	-2.55%	2000	8,326	811	9.7%
South Carolina	10,414	-10.36%	2004	11,806	1,392	11.8%
South Dakota	10,924	0.94%	2006	11,725	801	6.8%
Tennessee	11,049	-6.96%	2004	12,024	975	8.1%
Texas	9,248	-10.10%	2000	10,613	1,365	12.9%
Utah	9,308	-8.63%	2001	11,291	1,983	17.6%
Vermont	11,399	-7.92%	2003	13,423	2,024	15.1%
Virginia	10,001	-5.79%	1999	10,753	752	7.0%
Washington	8,339	-5.49%	1999	9,155	816	8.9%
West Virginia	10,221	-9.52%	2006	11,485	1,264	11.0%
Wisconsin*	9,525	-12.14%	2005	10,841	1,316	12.1%
Wyoming	16,272	-8.51%	2003	18,485	2,213	12.0%

Source: Federal Highway Administration (FHWA), Highway Statistics.

** Note that the Wisconsin Department of Transportation website lists state vehicle miles travelled for 2011 at a higher number than the FHWA, yielding a 5.4 percent decline in per person vehicle miles traveled since 2005.*

Appendix 2: Economic Impacts by State

	Unemployment rate 2005	Unemployment rate 2011	Increase in unemployment rate, 2005 to 2011	Employed persons as a percent of the civilian labor force, 2005	Employed persons as a percent of the civilian labor force, 2011	Change in percent of employed population
Alabama	3.8	9	5.2	59.0	53.4	-5.6
Alaska	6.9	7.6	0.7	66.8	63.8	-3.0
Arizona	4.7	9.5	4.8	61.0	56.1	-4.9
Arkansas	5.1	8	2.9	60.2	55.6	-4.6
California	5.4	11.7	6.3	62.0	56.0	-6.0
Colorado	5.1	8.3	3.2	69.2	63.5	-5.8
Connecticut	4.9	8.8	3.9	64.2	61.3	-2.9
Delaware	4	7.3	3.3	64.7	57.3	-7.4
D.C.	6.5	10.2	3.7	64.0	60.8	-3.2
Florida	3.8	10.5	6.7	59.8	54.6	-5.2
Georgia	5.2	9.8	4.6	64.8	58.2	-6.7
Hawaii	2.8	6.7	3.9	64.1	58.3	-5.8
Idaho	3.7	8.7	5	65.8	59.6	-6.3
Illinois	5.8	9.8	4	62.8	59.8	-3.0
Indiana	5.4	9	3.6	63.8	57.5	-6.3
Iowa	4.3	5.9	1.6	68.5	65.7	-2.7
Kansas	5.1	6.7	1.6	67.3	64.8	-2.5
Kentucky	6	9.5	3.5	58.5	55.7	-2.8
Louisiana	6.7	7.3	0.6	58.8	55.2	-3.6
Maine	4.9	7.5	2.6	63.1	60.2	-3.0
Maryland	4.1	7	2.9	66.4	63.0	-3.4
Massachusetts	4.8	7.4	2.6	63.6	60.8	-2.8
Michigan	6.8	10.3	3.5	61.0	54.1	-6.9
Minnesota	4.2	6.4	2.2	70.2	66.9	-3.3
Mississippi	7.8	10.7	2.9	56.9	53.4	-3.5

	Unemployment rate 2005	Unemployment rate 2011	Increase in unemployment rate, 2005 to 2011	Employed persons as a percent of the civilian labor force, 2005	Employed persons as a percent of the civilian labor force, 2011	Change in percent of employed population
Missouri	5.4	8.6	3.2	64.3	59.5	-4.7
Montana	3.6	6.8	3.2	63.6	59.3	-4.3
Nebraska	3.9	4.4	0.5	70.6	68.6	-2.0
Nevada	4.5	13.5	9	64.5	57.6	-6.9
New Hampshire	3.6	5.4	1.8	68.4	65.8	-2.5
New Jersey	4.5	9.3	4.8	63.5	59.5	-4.0
New Mexico	5.2	7.4	2.2	60.3	54.5	-5.8
New York	5	8.2	3.2	59.6	56.5	-3.1
North Caroline	5.3	10.5	5.2	62.8	56.5	-6.3
North Dakota	3.4	3.5	0.1	69.9	69.1	-0.8
Ohio	5.9	8.6	2.7	62.8	59.0	-3.8
Oklahoma	4.5	6.2	1.7	61.3	58.6	-2.7
Oregon	6.2	9.5	3.3	61.7	58.3	-3.4
Pennsylvania	5	7.9	2.9	61.4	58.2	-3.2
Rhode Island	5.1	11.3	6.2	63.7	59.3	-4.4
South Carolina	6.8	10.3	3.5	59.4	53.7	-5.7
South Dakota	3.7	4.7	1	70.2	67.7	-2.5
Tennessee	5.6	9.2	3.6	60.3	56.9	-3.4
Texas	5.4	7.9	2.5	63.5	60.6	-2.9
Utah	4.1	6.7	2.6	69.2	62.9	-6.3
Vermont	3.5	5.6	2.1	67.9	66.3	-1.6
Virginia	3.5	6.2	2.7	66.3	62.9	-3.4
Washington	5.5	9.2	3.7	63.9	59.5	-4.3
West Virginia	4.9	8	3.1	53.2	49.8	-3.4
Wisconsin	4.8	7.5	2.7	67.4	63.5	-4.0
Wyoming	3.7	6	2.3	68.7	65.1	-3.6

Source: U.S. Bureau of Labor Statistics