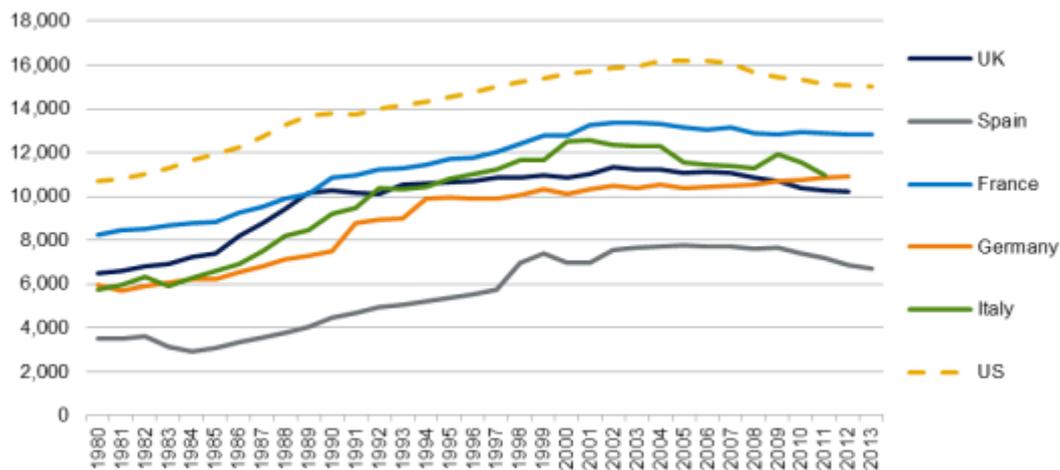


The end of the road: Has the developed world reached 'peak car'?

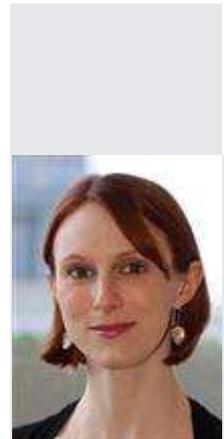
From boardrooms to showrooms, there is growing confidence in the recovery of the auto industry. However, longer-term data suggest that, cyclical tailwinds aside, the market for automobiles in developed markets could be in structural decline. For the past decade, the developed world has shown signs of hitting 'peak car', a plateau or peak in vehicle ownership and usage. Figure 1, below, shows kilometers driven per capita in the US and Europe, which has been in decline since the early 2000s in all countries except Germany. Available data for Japan also suggests driving behavior has plateaued in the last decade, at around 10,000km per capita.

Figure 1: Kilometers driven per capita



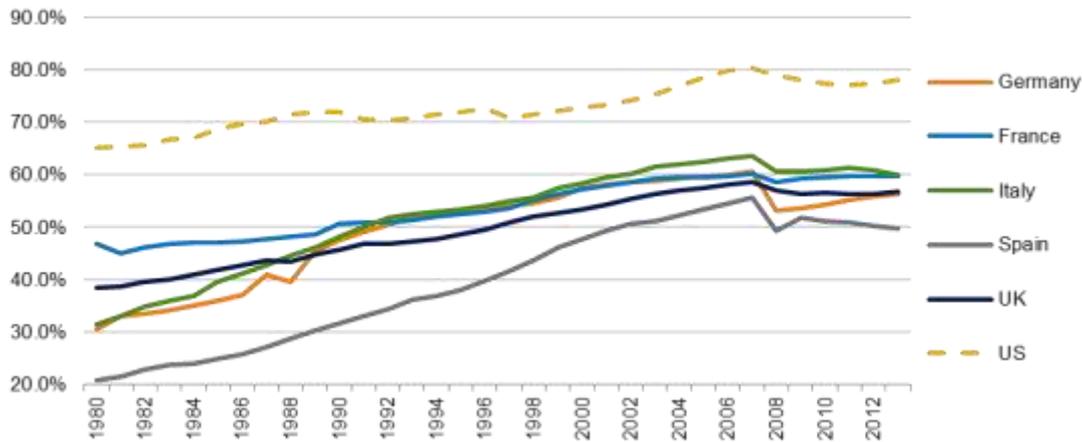
Source: OECD, Schroders, 2014. Countries shown for illustrative purposes only and should not be viewed as a recommendation to buy/sell.

Figure 2 shows vehicle density – the number of vehicles per capita – for the same markets, which has fallen due to lower car sales since the start of the financial crisis in 2007, but in many cases was slowing before that. Figure 3 shows additional data on density on a per driver basis for the US, the only market where this is available: this similarly shows that car ownership has fallen from a peak of almost 1.2 cars per driver in 2007 to around 1.15 today.



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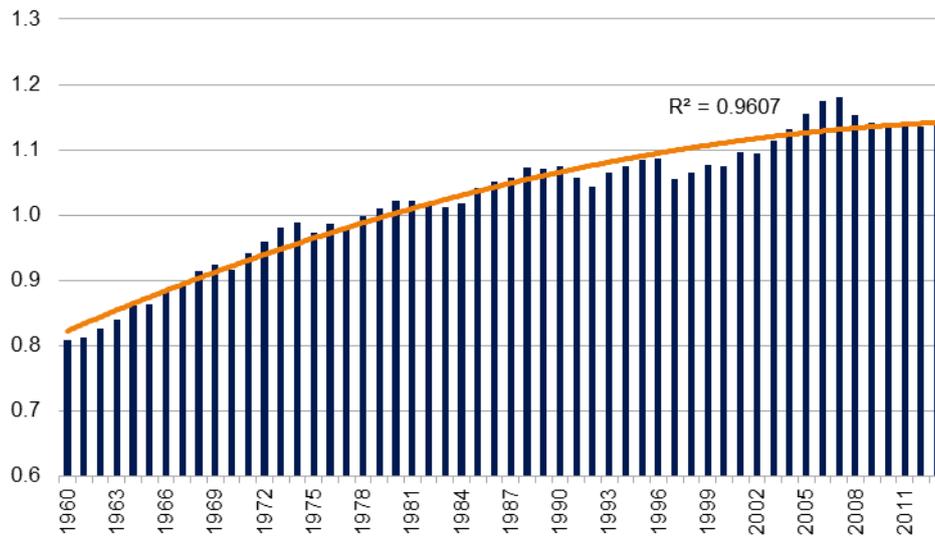
Figure 2: Vehicle density: light vehicles per capita



Source: LMC automotive, United Nations World Population Prospects, Polk Automotive, Schroders, 2014. Countries shown for illustrative purposes only and should not be viewed as a recommendation to buy/sell.

The logarithmic trend over the last 50 years suggests vehicle ownership is close to its natural limit, unsurprising given the US already has by far the highest vehicle density in the world.

Figure 3: US vehicles per driver

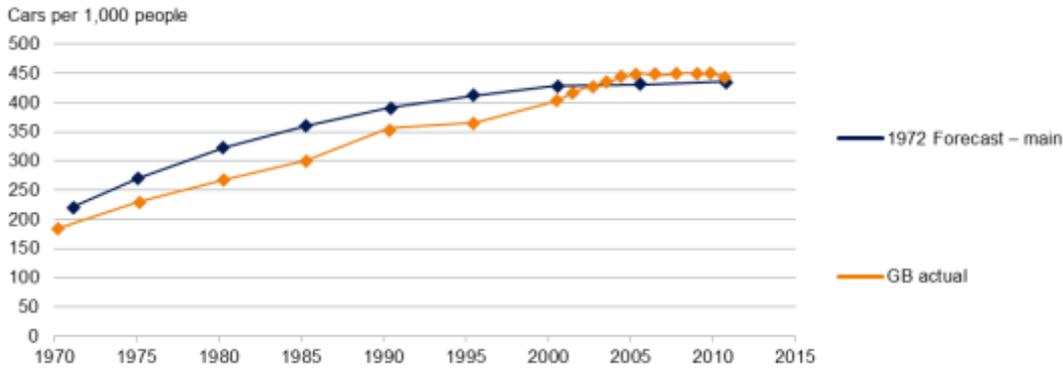


Source: United States Department of Transportation, Polk Automotive, Schroders, 2013.

A structural saturation in car ownership and usage has been predicted since the 1950s. Figures 4 and 5 below show forecasts of car ownership made by academics at the UK Road Research Laboratory in the early 1970s plotted against the actual data points. Considering how long ago these forecasts were made, with no retrospective ‘reinterpretation’, they have turned out to be strikingly accurate.¹

¹Goodwin (2012), *Peak travel, peak car and the future of mobility*.

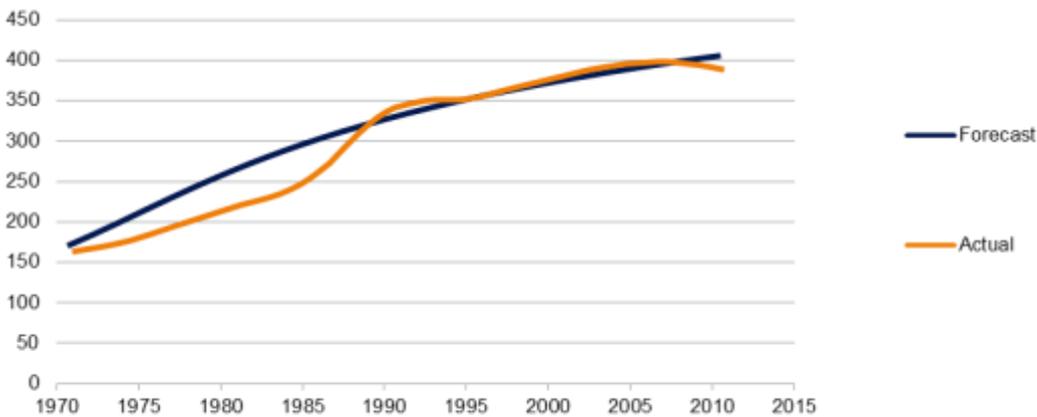
Figure 4: UK car ownership – Forecasts 1972 base



Source: Goodwin (2012), Peak travel, peal car and the future of mobility.

N.B. Data differs from that in Figure 2 which shows light vehicles (cars and small vans) versus just cars here. The opinions stated include some forecasted views. We believe that we are basing our expectations and beliefs on reasonable assumptions within the bounds of what we currently know. However, there is no guarantee that any forecasts or opinions will be realized.

Figure 5: UK car traffic 1970 – 2010 – Forecasts 1972 base

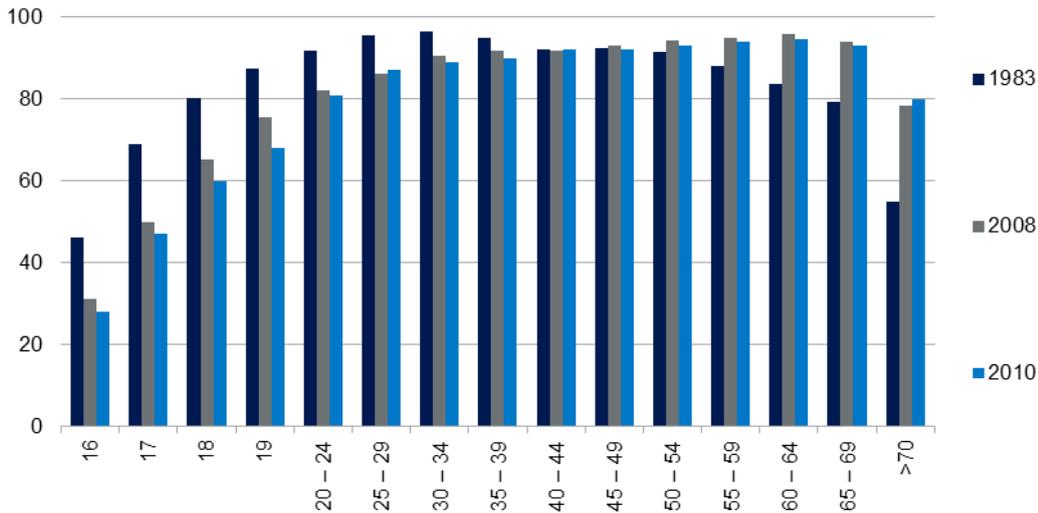


Source: Goodwin (2012), Peak travel, peal car and the future of mobility. The opinions stated include some forecasted views. We believe that we are basing our expectations and beliefs on reasonable assumptions within the bounds of what we currently know. However, there is no guarantee that any forecasts or opinions will be realized.

Millennials leading the change

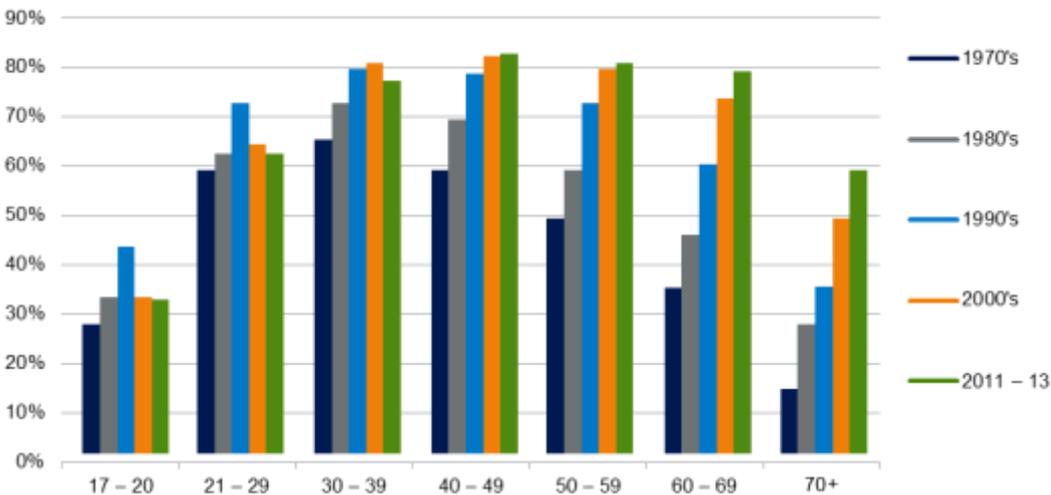
There are myriad possible explanations for this phenomenon, but a good place to start is by looking at the behavior of younger generations. Millennials – those born in the 1980s and 1990s – are leading the change in driving behavior, and as such represent ‘the canary in the coal mine’. Figures 6 and 7 show the proportion of the population by age who have a driving license in the US and the UK (the same pattern holds across Western Europe). The data clearly show a declining tendency for young people to get their license in recent decades, with the more granular UK data suggesting the turning point occurred in the 1990s.

Figure 6: Driving license penetration by age, United States



Source: University of Michigan Transportation Research Institute, 2012.

Figure 7: Driving license penetration by age, United Kingdom

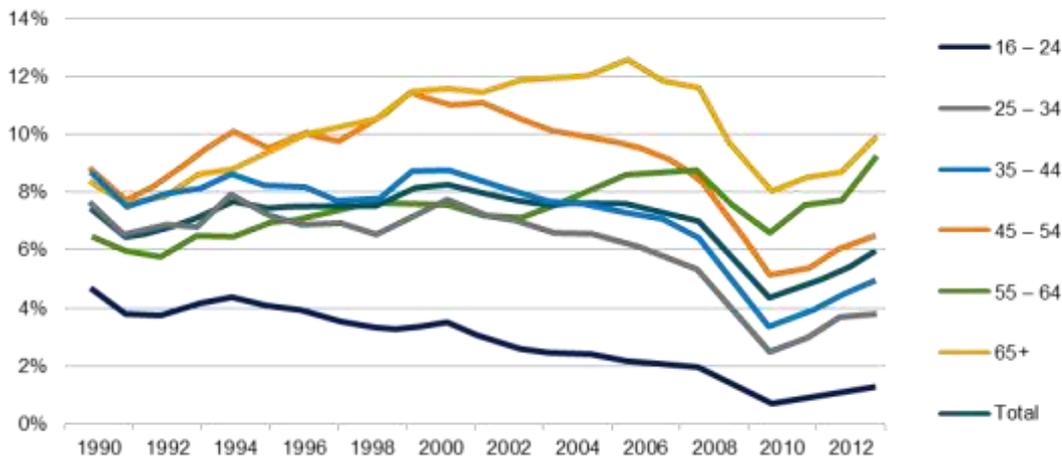


Source: UK Department for Transport Statistics; Goldman Sachs, 2014.

Lower license penetration at young ages may not matter much if it just represents a delay in normal driving behavior, but in fact studies suggest that people who delay learning to drive are less likely to ever do so (though they generally say they will) and drive less even if and when they do pass their test. Drivers in Britain who learn in their late 20s drive 30% less at any age than those who learn in their teens.² Unsurprisingly, lower license penetration implies lower car ownership, with data from General Motors (Figure 8) showing propensity to buy for 16 – 24 year olds has been falling since 1990.³

²Stoakes (2012), *Has car use per person peaked?*

³The Atlantic (2013), *The dubious future of the American car business – in 14 charts.*

Figure 8: Propensity to buy a vehicle by age, United States

Source: General Motors, 2013.

Lower car usage by youngsters has to date been largely offset by rising license penetration among older cohorts, who are a growing share of the population. The Baby Boomers (generally the Millennials' parents) are the first generation for whom car ownership has been 'the norm', and gains in affluence and life expectancy have allowed them to own more cars and keep driving for longer. However, in time, as this generation 'rolls off' (to put it euphemistically) and penetration ceases to rise for older cohorts, the driving behavior of younger cohorts will have more of an impact on the total.

What explains young people's lower enthusiasm for driving and vehicle ownership? The most straightforward explanation is rising urbanization (Figure 9), even in the developed world: the OECD expects urbanization in the rich world to rise from 77% in 2010 to 86% by 2050. As one would expect, there is a correlation between the percentage of a country's population that live in megacities and vehicle density,⁴ and city centers show the most marked decline in vehicle use.⁵ Young people in particular are residing in cities for longer, rather than moving to the suburbs to start a family. A recent Nielsen study finds that a higher proportion of US Millennials are living in cities than any previous generation – 62% – and 40% say they would like to stay in urban areas in the future.⁶

Aided by better public transport, this simply makes car ownership less necessary. In an AAA survey, 45% of respondents who did not get a learner's permit before their 18th birthday said they could get around without driving.⁷ 16 – 34 year olds in middle class US households increased their public transport use by 100% from 2001 to 2009.⁸

⁴Data from Sivak and Schoettle (2011), **Recent changes in the age composition of drivers in 15 countries.**

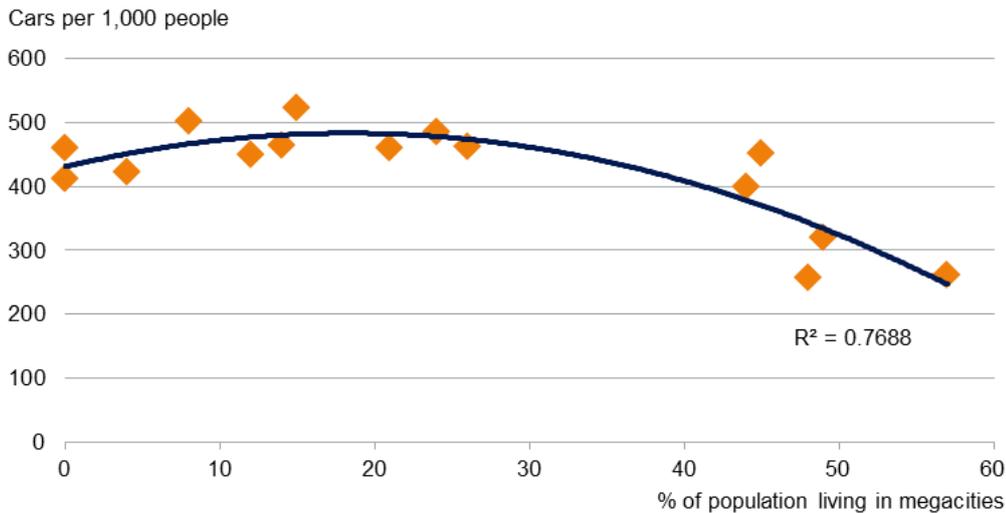
⁵E.g. Mileage in London has fallen by more than a third since 1995 while in rural areas it has been much more stable. Stoakes (2012), **Has car use per person peaked?**

⁶Nielsen (2014), **Millennials prefer cities to suburbs, subways to driveways**

⁷AAA (2013), **Timing of driver's license acquisition and reasons for delay among young people in the United States, 2012.**

⁸Economist (2012), **The future of driving.**

Figure 9: Vehicle density and urbanization

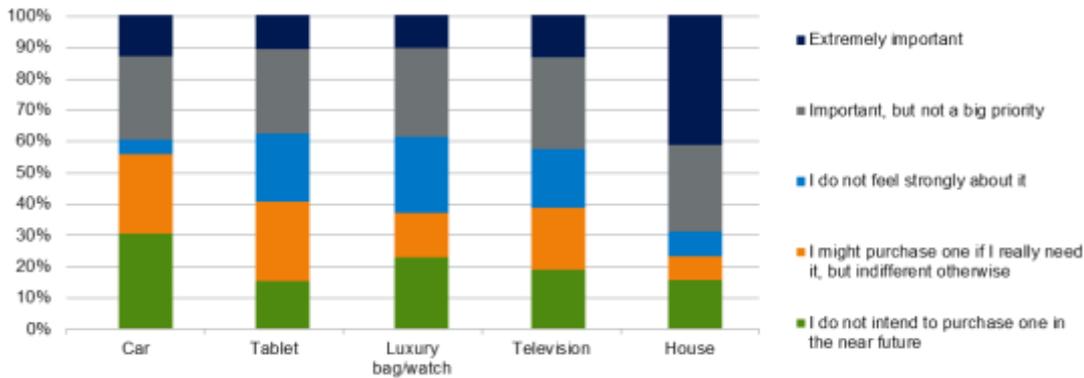


Source: Sivak and Schoettle (2011), Recent changes in the age composition of drivers in 15 countries.

Technological advances

However, the most important explanations of changing driving behavior appear to be related to changes in culture and society, in many cases precipitated by technology. An increasing body of data suggests that young people have a fundamentally different relationship with the car than their parents. For Millennials, cars are not as relevant as a status symbol, and getting a license is no longer a ‘rite of passage’ in the way it once was. A global survey of teen attitudes by TNS, a consultancy, found that young people increasingly view cars as ‘appliances not aspirations’.⁹ An admittedly small scale and unrepresentative survey by Goldman Sachs (Figure 10) of 250 interns in their London office found that less than 15% regarded car ownership as ‘extremely important’ and 60% were apathetic at best.

Figure 10: Survey of Goldman Sachs interns



Source: Goldman Sachs Fortnightly Thoughts intern survey, 2013.

In large part, this is because the car has been supplanted in the affections of young people by a more affordable alternative: the smartphone. This was anticipated as early as 1990 by prescient academics at the University of Oxford Transport Studies Unit:

“Some new product could hit the market which would make the car redundant in the psychological sense. It is hard to imagine what this could be... Some computing product (probably portable) could maybe be produced which would cater for power, or freedom desires, although it does not seem at all likely at the moment.”
 Stokes and Hallett (1990), Attitudes to car ownership –the link with advertising.

⁹Economist (2012), **The future of driving.**

The rise of smartphones and social media has also directly led to a drop in driving behavior as it gets easier to connect digitally, there is less need to drive to see friends or family. Similarly, there is some evidence that e-commerce has contributed to lower miles driven: in Britain, trips to the shops have been the category of car use that has declined most steeply since 1995.¹⁰ A University of Michigan study found that internet penetration in a country exhibited a statistically significant negative relationship with driving license penetration among young people.¹¹ Almost 20% of respondents in the AAA survey said one reason for not getting their permit was that they could connect with friends online.

A related technological factor is the rise of the so-called 'sharing' economy. Millennials have shown a remarkable willingness to rent or share rather than own assets – from Airbnb and Couchsurfing to Zipcar and BlablaCar (a car pooling network) – and technological improvements have greatly facilitated these business models. A study commissioned by Transport for London suggests that one shared car results in 11 – 17 fewer cars on the road (either sold or not purchased), though it need not be negative for overall miles driven.¹² Most of the schemes are relatively nascent, but it seems inevitable that they will become increasingly important in the future.

Counting the cost of car ownership

The obvious push back to the 'peak car argument' is that the recent data points have been distorted by the financial crisis, which has caused a temporary blip in the long-term trend of ever increasing car usage. For young people in particular, rising youth unemployment and economic uncertainty has delayed household formation, homeownership and presumably also vehicle ownership.

However, a closer examination of the data suggests that this is not the case, or at least not the whole story. While the inflection in vehicle density does indeed coincide with the crisis, Figure 1 shows that the decline in driving behavior preceded the crisis by several years. Furthermore, the 1970s models that successfully anticipated the slowdown in driving and ownership in the UK had no way of predicting the recession, suggesting it is just a coincidence that the recession occurred at the same time as the 'natural' level of motorization was reached. While the financial crisis caused a cyclical fall in auto demand, the longer-term trend looks structural in nature, suggesting a more muted recovery or stabilization at persistently lower levels.

This is not to say that economic factors may not be part of the structural trend. Survey data (Figure 11) suggests that cost is indeed the main reason for young people not having a driving license. About a third of respondents in both the AAA survey and a University of Michigan survey cited cost as a key reason for not having a license.¹³ While the affordability of a new car has significantly improved since the 1990s,¹⁴ the total cost of ownership appears to have risen as a result of higher fuel prices, road tax, congestion charging, parking charges etc.¹⁵ for young people in particular, spiraling insurance costs represent a major deterrent, as anyone who has recently tried to insure their offspring will attest.¹⁶ Combined with better public transport and the falling cost of air travel, this reduces demand for cars versus other modes of transport.

¹⁰Economist (2012), **The future of driving.**

¹¹Sivak and Schoettle (2011), **Recent changes in the age composition of drivers in 15 countries.**

¹²Cited in UBS (2014), **How disruptive is 'car-on-demand' for autos?**

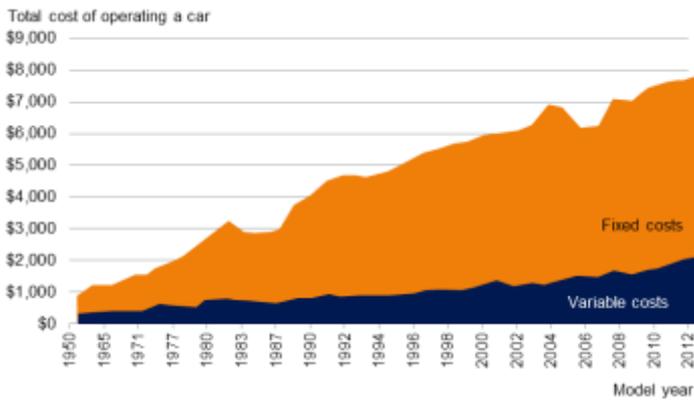
¹³Sivak & Schoettle (2013), **The reasons for the recent decline in young driver licensing in the US.**

¹⁴US Auto Affordability Index (discontinued YE13) – shows weeks of median income needed to purchase a new car.

¹⁵The Atlantic (2013), **The dubious future of the American car business – in 14 charts.**

¹⁶Data from GM suggests that in the US annual auto insurance premiums for 16 – 19 year olds amount to 15.5% of their median wage, versus a ratio of 2 – 3% for middle aged drivers.

Figure 11: The increasing cost of operating a vehicle

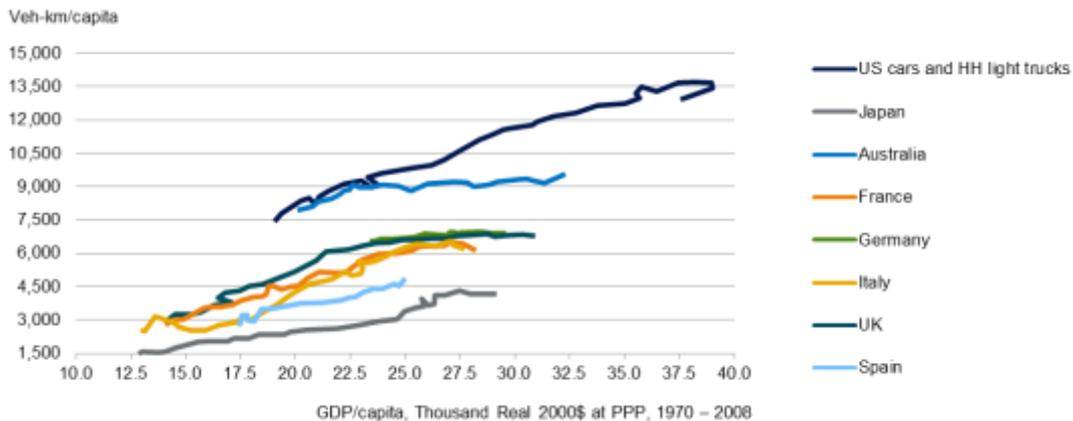


Source: General Motors, 2013.

This implies that the crash in the oil price may change behavior (and indeed has a fairly high correlation with miles driven in the US), but fuel is a relatively small proportion of total ownership costs, especially with improvements in fuel efficiency. Plus, oil prices are likely to rebound at least partly from current depressed levels and are still well above where they were in the early 2000s (~\$20 – 30) when the slowdown in car usage began.

Data on the income elasticity of vehicle ownership and usage also suggests that economic factors cannot be the whole story. While GDP per capita has a positive correlation with vehicle density and miles driven up to a point, the relationship weakens progressively at high levels of income, suggesting there is indeed a natural level of saturation, albeit at different levels in different countries.¹⁷ Data (figure 12) in the UK also suggest that car use is declining the fastest for highest income groups, potentially suggesting that wealthier people find it easier to develop a less 'car-dependent' lifestyle.¹⁸

Figure 12: Vehicle kilometres per capita vs. GDP per capita (PPP), 1970 – 2008



Source: Goodwin 2012.
 N.B. US data is for cars and household light trucks; all other countries cars only. Countries shown for illustrative purposes only and should not be viewed as a recommendation to buy/sell.

Implications for the auto industry

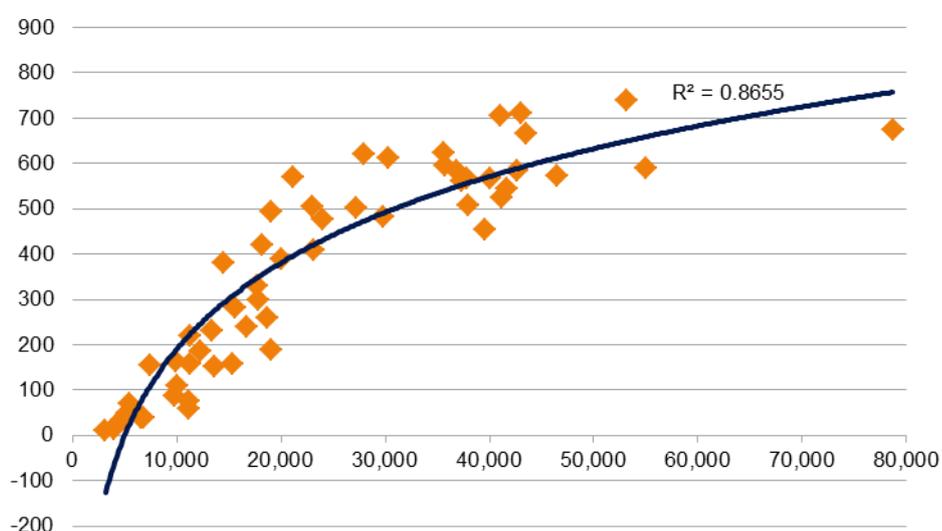
What are the implications for the auto industry? The bearishness of the outlook depends in large part on whether we are witnessing saturation or an actual peak in auto demand i.e. whether it will fall from here. In any case, a plateauing of per capita demand in many developed countries will imply a reduction in overall demand as populations begin to decline. Our base case is that there will be a structural stagnation in the developed world auto industry, with no further gains in density and all future vehicle sales driven by replacement demand.

¹⁷Goodwin (2012), **Peak travel, peak car and the future of mobility.**
¹⁸Stoakes (2012), **Has car use per person peaked?**

While we have seen a meaningful recovery in US demand, auto sales have now reached pre-crisis levels and we see little reason to expect volumes to exceed prior peaks, beyond the possibility of a short-term 'overshoot' (especially if the oil price stays depressed). In Europe, there is some room for a cyclical recovery, but it is important to note that the trends vary by market: of the 'big 5', the UK has actually already exceeded prior peaks, and Germany and France are not particularly depressed versus pre-crisis levels. Italy and Spain are the major swing factors, but it is hard to have high conviction about a rebound in these markets, plus they are less relevant for industry economics.

The fate of the auto industry will therefore depend increasingly on emerging markets (which in fact already account for a majority of profits for many automakers). The prospects for growth in most of these markets are still good given much lower levels of current vehicle penetration and rapid GDP per capita growth: vehicle penetration in China is approaching 10%; in India it is as low as 2%. This compares to levels of almost 80% in the United States and 50 – 60% in Western Europe, as shown earlier in Figure 2. Figure 13, below, shows that most emerging markets are on the steep part of the 'S-curve' for vehicle ownership.

Figure 13: Vehicles per 1000 population vs. GDP per capita (PPP), 2013



Source: IHS Global Insight; IMF; Schroders, 2013.

However, it seems likely that emerging markets will reach their 'saturation point' at a lower level than the developed world, in large part due to technology. Emerging markets have shown themselves to be remarkably quick adopters of many technologies – smartphones, mobile payments, e-commerce etc. Growing up in the digital age, and often living in severely congested cities (the result of vehicle ownership outpacing urban planning), young people in emerging markets may never develop the 'love affair with the car' that we had in the developed world. However, it is probably fair to assume that emerging markets can continue to support decent industry growth for at least the next 5 – 10 years.

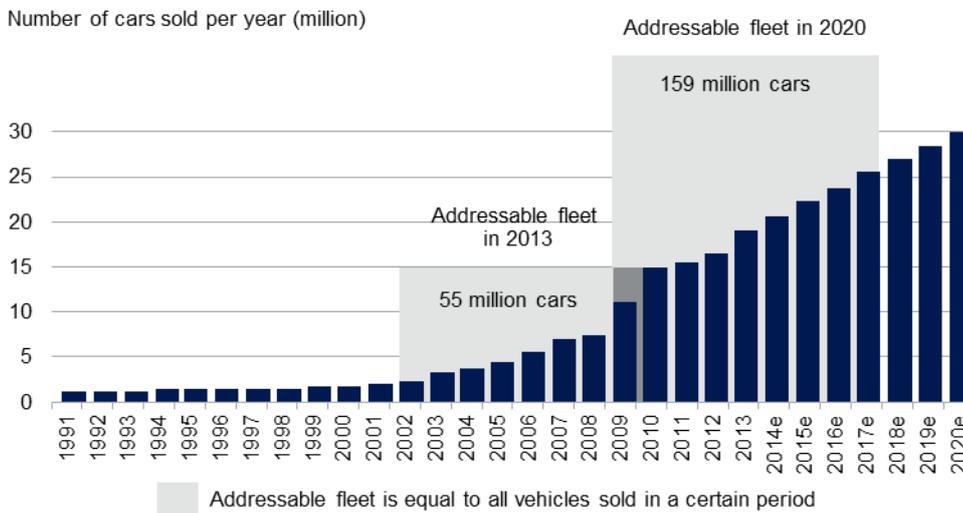
A shift in demand from the developed to developing world has, and will continue to, necessitate restructuring at auto manufacturers, primarily to enable them to sell cars at lower prices in poorer countries. More capacity needs to be closed in Europe and Japan (though the latter is less urgent with the yen at its current levels), which is challenging given unionized labor and government pressure on 'national champions'. Companies will also have to refine their model line-ups for their new customers, getting better at making smaller cars for the Indian market (which is dominated by first-time buyers) for example, and pandering to Chinese consumers' love of SUVs and plush interiors. Ultimately companies will only thrive in emerging markets if they have strong brand equity (i.e. premium brands), or can cut their costs to compete with (slowly) improving local competition, as well as each other.

Ultimately, we would expect to see further consolidation in the industry as growth slows and profitability is pressured. We believe emerging market carmakers are likely to act as consolidator: indeed, we have already seen China's Geely buy Swedish Volvo, Dongfeng buy part of JV partner Peugeot-Citroen, and Indian Tata Motors buy – and execute an impressive turnaround at – Jaguar-Land Rover.

The outlook for parts suppliers again depends on the geographic footprint and product profile. Tier 1 suppliers with strong intellectual property and barriers to entry should benefit from rising vehicle production and content per vehicle in emerging markets, allowing them to outgrow the industry. However, producers of commoditized parts will continue to struggle as they come up against domestic competition in emerging markets, with automakers increasingly looking to local sourcing to cut their own costs, and less willing to shield legacy suppliers or group companies from competition.

The outlook for tires is more positive. Assuming miles driven is largely flat in the developed world (lower ownership offset by more car-sharing), tire demand will still benefit from an expanding global vehicle fleet. Tires are generally replaced after 3 – 4 years of driving, so tire companies have not yet benefitted from the strong growth of the industry in recent years and should have a long runway for growth (Figure 14). Analysts at Redburn find that even if there is zero annual growth in car sales in China from here, the total fleet will still grow by 160% by 2020.¹⁹ Tire-makers will also benefit from the rising share of premium cars and SUVs, as larger tires are harder to make and more profitable.

Figure 14: Chinese addressable vehicle fleet, assuming zero sales growth from 2013



Source: Redburn 2014. The opinions stated include some forecasted views. We believe that we are basing our expectations and beliefs on reasonable assumptions within the bounds of what we currently know. However, there is no guarantee that any forecasts or opinions will be realized.

Conclusion: What are the implications for investors in the auto sector?

Our key takeaway is that, while auto investors are generally concerned with discussions of the cycle, there are also structural trends in the sector that cannot be ignored. When investing in the sector we believe it is important to be cognizant of these trends, choosing companies with a competitive advantage in terms of cost or brand, and where the management teams have a coherent long-term vision for the company. We tend to prefer premium automakers, select emerging market automakers, Tier 1 suppliers and tire companies as long-term holdings, steering clear (pun intended) of mass market automakers with high cost structures and a high dependence on their home markets.

¹⁹ Redburn (2014), *European Tyremakers – “Irreversible”*.

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