Plateau Car

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Introduction

There is good evidence that the average distance travelled per person by car in many developed economies ceased to grow towards the end of the last century. This phenomenon has been termed 'Peak Car', by analogy with 'peak oil', which refers to the expected peaking and decline in output of this finite resource (Goodwin and Van Dender, 2013). However, for car use, the evidence points to a cessation of growth as the prime effect, with possible long-term decline not yet generally apparent. Accordingly, I propose the term 'Plateau Car' to designate the phenomenon (Metz, 2013a).

Evidence for Plateau Car

National travel surveys commissioned by governments are an important source of data on travel behaviour. Time series data for three key parameters from the English National Travel Survey are shown in Figure 1 (NTS, 2018; Table 0101). The average distance travelled by all modes (other than international travel by air) increased from 4500 miles per person per year in the early 1970s to reach 7000 miles around 2000, falling thereafter and stabilising at about 6500 miles in recent years. Three quarters of this distance is currently travelled by car, driver and passenger together; car use per person has declined somewhat since 2002 (Figure 2)

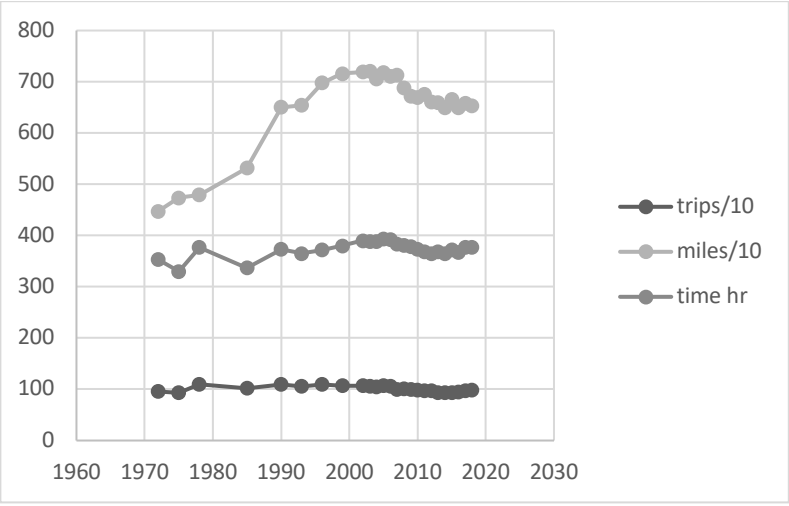

Figure 1. National Travel Survey. Source: NTS(2018) Table 0101

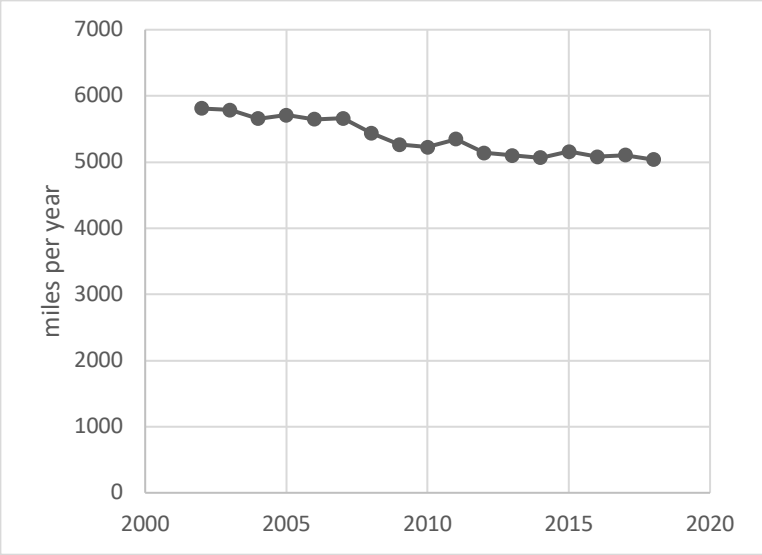

Figure 2. Distance travelled by car per person (driver and passenger). Source: NTS(2018) Table 0303

The US National Household Travel Survey found growth in average daily travel by all modes increasing from 25.1 person miles in 1983 to reach 40.2 miles in 2001, growth then ceasing (39.0 miles in 2017) (NHTS, 2017; Table 14). Average distance per person travelled by private vehicle was 30.85 miles in 1990 and 30.45 miles in 2017 (NHTS, 2017; Table 12).

Data for distance travelled by car per capita in 11 developed economies are shown in Figure 3, estimated from official statistical sources for total distance travelled by car and for total population. Car use grew until around the turn of the century, when it stabilised or fell in all but one case (Poland). Millard-Ball and Schipper (2011) found evidence for a levelling out or saturation of total passenger travel since the early years of the twenty-first century for eight developed countries.

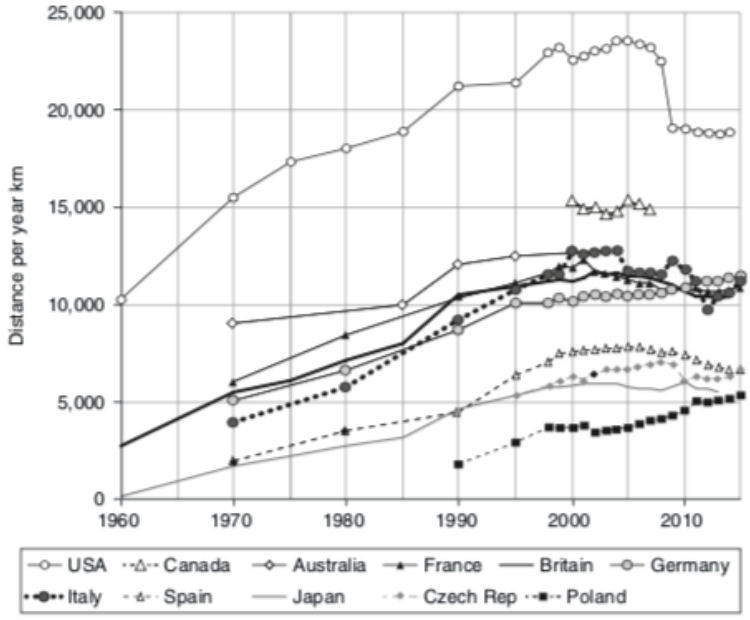

Figure 3. Distance travelled by car per person. Source: Dr Kit Mitchell, from UN ECE Transport Statistics for total distance travelled by car and official population statistic for total population.

Demand saturation

Cessation of growth of demand for a product or service is a common feature of all markets. A new product that offers benefits to users is taken up, initially by early adopters with the more cautious following later. High levels of ownership, as for instance found with many household appliances, characterise a mature market in which growth has substantially ceased and demand is said to have saturated. It is plausible that the cessation of growth in surface travel and car use reflects demand saturation for daily travel for the purpose of gaining access to a wide choice of destinations offering services and opportunities.

The growth of average distance travelled in the last century shown in Figure 1 is a consequence of an increase in speed, given the unchanged average travel time over the period, and is largely attributable to growth of car ownership. Conventional economic appraisal of transport investments that result in faster travel assumes that the main user benefit is the saving of travel time [cross ref 10011, 10097]. However, the observed invariance of travel time implies that the main benefit is better access to desired destinations and the associated increase in opportunities and choices [cross ref 10045]. Access is subject to diminishing returns as choice and opportunities increase. However, access also increases with the square of the speed of travel, being proportional to the area of a circle, the radius of which is proportional to speed. This combination of diminishing returns while increasing with the square of speed yields a saturation function.

There is some evidence in support of the relevance of saturation in explaining cessation of growth of per capita car use. Figure 4 shows the proportion of households in England owning one or more cars, which increased steadily until the end of the last century when growth ceased, suggesting both saturation of demand for car ownership and the main cause of the cessation of average distance travelled by all modes of travel [cross ref 10452].

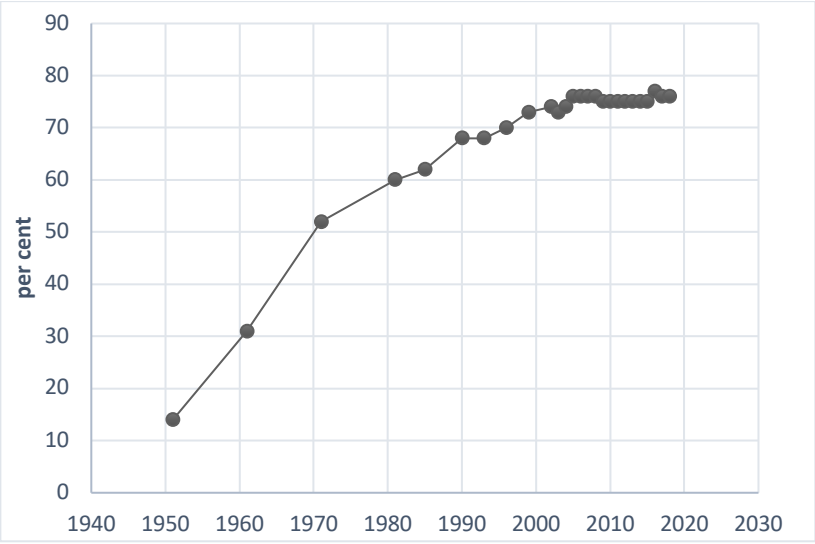

Figure 4. Proportion of UK households owning one or more cars. Source: NTS(2018) Table 0205.

UK data on access to key services by journey time indicates high proportions of potential users having access within reasonable travel times. For example, for access to family doctors (termed General Practitioners, GPs), 71% of users are within 15 minutes travel time by public transport/walking and 96% within 30 minutes, while 87% are within 15 minutes by bicycle and 98% by car (JTS, 2017; Table 0201). Similar high levels of access are found for other services, including employment, schools, food stores and town centres.

Journey time statistics can be used to infer levels of choice of key services. For instance, the populations of a majority of English localities have access on average to five or more GPs within a 30-minute journey by public transport/walking, and almost all localities have such choice within 15 minutes by car (Metz, 2013b). A study of access to supermarkets in Britain found that 80% of the urban population had access to three or more large stores within 15 minutes by car, and 60% to four or more (Metz, 2010). Such high levels of access and choice are consistent with the proposition that demand saturation is contributing to the cessation of growth of per capita car use. In the case of supermarkets, this has come about through (a) the growth of car ownership and (b) the supermarket chains taking advantage of road construction that made land accessible for new large stores on the edge of urban areas, both trends now largely played out.

Demographic change

There are a number of demographic changes that are contributing to the cessation of growth of per capita car use (Metz, 2016). Movement of populations from country to city is a long-term global trend, reinforced in recent years in developed economies by the shift from manufacturing to business services and the 'knowledge economy' that prefers to locate in city centres. Contributing to urbanisation is the process that economists term 'agglomeration', which offers particular advantage to the business services sector. Concentrations of firms in one geographic area benefit from learning, sharing and matching. Firms acquire new knowledge by exchanging ideas and information, both formally and informally; they share inputs via common supply chains and infrastructure; and they benefit by matching jobs to workers from a deep pool of labour with relevant skills. Agglomeration leads to urban development and population growth at higher densities, despite the high land prices, rents and other costs. This growth has increased congestion on the urban road network and so made car use less attractive, but at the same time has improved the economic viability of public transport (Metz, 2019).

The growth of the economy in cities, as well as the expansion of city centre universities, has attracted young people to move to vibrant cities to study, work and live. This has contributed to a significant change in travel behaviour amongst young people in developed economies. A recent comprehensive review of the research evidence and survey data noted a trend that began some 25 years ago for young people (ages 17-29) to drive less than previous generations (Chatterjee et al., 2018) [cross ref 10429]. The general trend in the developed countries has been for each cohort of young people since the early 1990s to own and use cars less than the previous cohort. This contrasts with the baby boomers, born from 1946 to 1964, who led a rapid, prolonged and persistent growth in car ownership and use.

Factors contributing to this trend away from car use include the cost of car ownership (not least, high insurance charges for younger drivers), problems of parking in cities and on campuses, and the viability of alternatives such as bicycles, public transport, shared car use, and smart-phone apps to summon a taxi. However, according to Chatterjee et al. (2018), the main causes lie largely beyond the transport system and include increased participation in higher education, for which the car is not part of the lifestyle; the use of digital communications and social media; and more generally a delayed transition to what was traditionally seen as adulthood – commitment to a career, getting married, home ownership, starting a family, with stable employment a strong determinant of being a car driver.

An important question is how this shift away from car use by young people will affect the way they travel as they get older. Stokes (2013) has shown that those who start to drive later drive less when they do start; for instance, for those now in their thirties in Britain, if they learnt to drive when age 17, now drive 10,000 miles a year on average, while if they learnt at age 30, they are likely to drive around 6,500 miles a year. This reduced mileage seems likely to reflect greater experience of alternative modes to the car gained before learning to drive, as well as living in places where such alternatives are viable, in particular for journeys to work. Chatterjee and colleagues concluded that while there are many uncertainties about the travel behaviour of future cohorts of young people, as well as about how this may change as they get older, it is nevertheless hard to envisage realistic scenarios in which all these uncertainties combine to re-establish earlier levels of car use.

‘Peak Car’ in big cities

The discussion thus far has focussed on per capita travel demand. Population growth is, of course, an important determinant of total travel demand. The impact of urban population growth on car use is well illustrated by the experience of London, for which exceptionally extensive travel statistics are available (TfL, 2019). After of period of population exodus, when inhabitants left poor-quality, overcrowded housing for a better life beyond the city boundaries, decline reversed around 1990 as the built environment improved and agglomeration economics increased productivity, generating higher incomes. The population of London increased quite rapidly, from 6.8 million in 1991 to 8.9m in 2018.

Despite this population growth, road vehicle traffic in London as a whole, about 80 per cent of which is car traffic, has not increased over the past 20 years – indeed has fallen by about 10% (Metz, 2015; TfL, 2019, Table 9.1). This is due largely to the limited capacity of the road network. Plans were proposed in the 1960s to build more roads to accommodate the expected growth in car use. An initial section of elevated motor road was constructed westwards from central London, but this was seen as damaging to the urban fabric and plans for similar new roads around central London were largely abandoned. Thus London has essentially retained its historic road network, which has constrained the growth of traffic. Indeed, there has been a reduction in the capacity of the road network for cars as the result of reallocation of road space to bus and cycle lanes and pedestrian uses.

Given that London’s population has been increasing but car traffic has fallen, it follows that the share of journeys by car must have declined, as is indeed observed. In 1993, when the

relevant data series starts, 50 per cent of all trips in London were by car (driver and passenger), but this declined to 35 per cent in 2018 (TfL, 2019; Figure 2.3). Over the same period, the share of walking trips held steady at 25 per cent, while cycling grew from a low base to reach about 3 per cent of all journeys. The decline in car trips was compensated by the growth in use of public transport, which currently account for 37 per cent of all journeys.

Figure 5 shows an estimate of the share of journeys by car in London in the century 1950-2050, based on historic data, Transport for London's recent data mentioned in the previous paragraph, and future extrapolation that takes account of projected population growth and assumes no addition to road capacity but continued investment in urban rail. From 1950 car ownership and use grew while at the same time the population was falling. Car use peaked at 50 per cent of all journeys at around 1990, the time when the decline in population reversed. As the population subsequently grew, the historic road network acted as a capacity constraint, which meant that the share of trips by car had to fall, a trend projected to continue out to 2050, when some 27 per cent of trips would be by car, on the stated assumptions. The Mayor of London has more ambitious plans, aiming to reduce car use to only 20 per cent by 2041, driven by concerns about health impacts (Mayor, 2018).

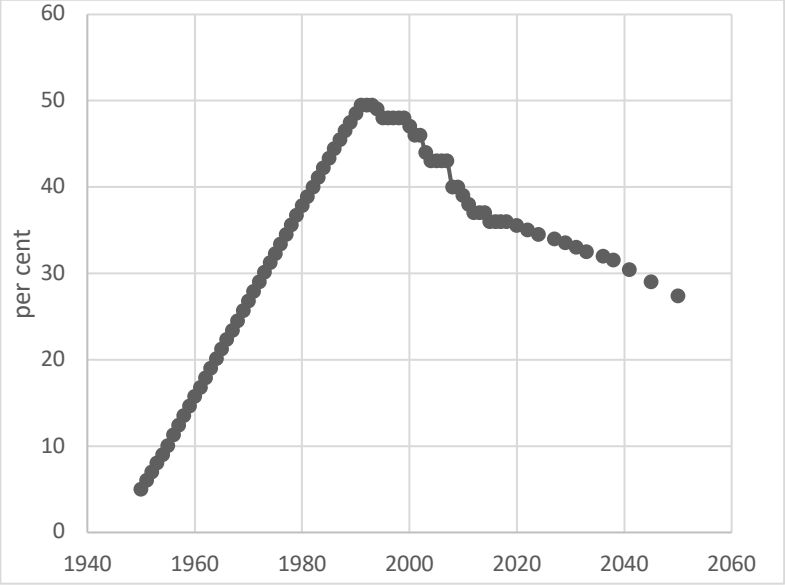

Figure 5. Share of journeys by car in London, 1950-2050. Source: author's estimates and Transport for London (Metz, 2015).

What is shown in Figure 5 is the clearest illustration of the concept of 'Peak Car', a peak followed by decline in the *share* of trips by car. I have termed this 'Peak Car in the Big City', to distinguish it from peak or plateau car, referring to the distance travelled per person as discussed above (Metz, 2015).

While London provides the best data sources, there is evidence for a similar phenomenon in other large cities. A substantial study identified a peaking of car use in terms of car trips per day in Paris, Berlin, Vienna and Copenhagen, as well as London; on the other hand, data from US cities indicates a continuing very high level of car use (Jones, 2018). There is supporting evidence of a decline in car traffic in a number of UK cities, particularly in their

centres, including Manchester and Birmingham (Metz, 2013a), as well as in the major Australian cities (Newman and Kenworthy, 2011).

A broad distinction may be made between cities with historic central areas where the street pattern limits car use and the population density make public transport economically viable; and more recent cities built at low density with the car in mind as the main means of mobility. This distinction is broadly between European and North American cities, although with central parts of the some of the latter having high density, and suburbs of most generally being of low density. The available evidence suggests a general phenomenon whereby successful cities with well-established centres attract people to work, study, visit and live; the total population and population density both increase; the authorities recognise that the road network cannot be expanded to accommodate more car use without damaging the urban environment; hence decisions are made to invest in public transport, particularly rail, which provides speedy and reliable travel compared with cars, buses and taxis on congested roads, as well as to improve facilities for walking and cycling. A common characteristic is the existence of a historic city centre that people find attractive for work and leisure, where declining car use increases the attraction. In the absence of an appealing downtown district, population growth may lead to continued low-density development, with no mode shift away from car use.

In the twentieth century, increasing prosperity was associated with increasing car ownership and use in developed economies. In the twenty-first century, increasing prosperity is associated with *decreasing* car use in big cities having attractive centres, growing populations and that can afford to invest in an extensive network of high-quality public transport as an alternative to the car on congested roads. A question for low income economies, where car ownership is still relatively low, is whether the peaking of car use in large, densely populated cities use can be avoided, transitioning instead to the modest mode share envisaged in the developed economy cities discussed above [cross ref 10624].

Impact of technology

Innovative technologies have been central to the historic development of transport. Until the coming of the railway, travel generally was at walking pace, with few able to take advantage of horse-drawn vehicles, which were not much faster on poor roads. Time has always been a constraint on the distance that could be travelled. In the nineteenth century, the railway harnessed the energy of coal to achieve higher speeds and mass mobility that transformed economic and social geography. In the twentieth century, the motor car using oil, the other fossil fuel, allowed speedy door-to-door travel, with further gains in access to desired destinations, opportunities and choices, within the time constraint of about an hour a day average travel time. The cessation of growth of average distance travelled by car in part reflects the inability to travel both faster and more safely on uncongested roads, and the difficulty of mitigating road traffic congestion.

There are new technologies, both deployed and entering the market, that will change how cars are propelled and used. Electric propulsion in place of the internal combustion engine will eliminate tailpipe emissions of carbon dioxide and noxious pollutants, but will not change the basic features of the car. Automated vehicles will reduce, or even eliminate, the

role of the driver, but are unlikely to permit faster travel on existing road systems. Digital navigation devices are used widely, offering optimal routing through congested networks and estimates of journey time that mitigate the uncertainty associated with road traffic congestion. Digital platforms provide improved ways of locating vehicles for hire and sharing vehicles. All these innovations improve journey quality without having much impact on the speed of travel and are therefore unlike past transport innovations that offered step-changes in velocity (Metz, 2019).

Innovative technologies may affect car use by offering alternatives to travel from home. Online shopping is a likely contributory factor to the downward trend in shopping trips in England - 15 per cent decline in numbers of trips and 18 per cent in distance, between 2002 and 2018 (NTS, 2018). Journeys to work in England have also been declining, from 7.1 per worker per week around 1990 to 5.7 in 2014, attributed to people working fewer days a week, more able to work from home, and more self-employment (DfT, 2016). More generally, there is scope for interactions made possible by personal travel to be replaced by interactions mediated virtually by digital technologies. On the other hand, digital technologies make possible a wider range of personal contacts, which may prompt travel to reinforce relationships through face-to-face engagement. The net impact on travel behaviour is unclear.

Conclusion

As the developed economies moved from the twentieth to the twenty-first centuries, car use per capita generally ceased to increase, bringing to an end nearly two centuries of growth of personal travel that began with the development of the railways in the first part of the nineteenth century. The evidence suggests that the main contributory factors to this cessation of growth were saturation of demand for daily travel, reflecting high levels of access achieved; population growth in successful cities where space for car use is limited; and technological limitations that prevent faster travel, given constraints on travel time. Despite the deployment of new transport technologies, car use per capita seems unlikely to change much in the future.

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Further reading

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'Peak Car' – Themes and Issues. Transport Reviews, 33(3), 243-254. A special issue devoted to Peak Car.

Biography

David Metz is honorary professor in the Centre for Transport Studies, University College London, where his research focuses on how demographic, behavioural and technological factors influence travel demand. After an initial career in biomedical research, he took senior posts in a number of UK government departments, as both policy and scientific

advisor, including five years as Chief Scientist at the Department of Transport. His recent research has been summarised in a book entitled ‘Driving Change: Travel in the Twenty-First Century’ (Agenda Publishing, 2019).