Determinants of travel demand

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This note responds to the request for submissions by the Commission for Travel Demand. It is largely based on the author's analyses previously published.

The National Travel Survey (NTS) has been tracking average travel behaviour by all modes (except international air) for the past 40 years. The key parameters are shown in Figure 1. Both trip rate and average travel time have held broadly unchanged at 1000 journeys a year and an hour a day respectively. The average distance travelled increased steadily until the mid-1990s, mainly the consequence of private investment in vehicles and public investment in roads. This permitted faster travel and hence further travel in the unchanging amount of travel time. The benefits were greater access to desired destinations, yielding more opportunities and choices of employment, homes, services etc. However, the growth in distance travelled ceased in the mid-1990s.

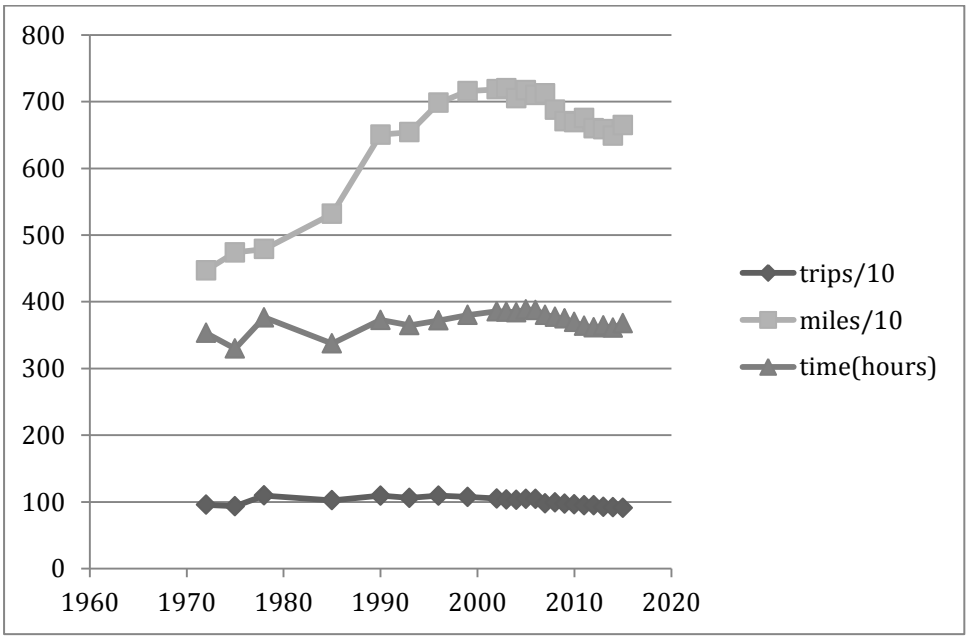

Figure 1. National Travel Survey, Table 00101

About three-quarters of the average distance travelled in Britain is by car, driver and passenger. Consistent with the NTS findings, average per capita distance travelled by car has stabilised, a phenomenon found for the developed counties generally and known as Peak Car. The contributory factors have been extensively analysed by Peter Jones and colleagues under the auspices of the Independent Transport Commission and other bodies, and do not need to be discussed here. There are, however, further factors contributing to the cessation of travel demand growth that are less well recognised.

Demand saturation

In general, demand for a product or service cannot forever grow faster than the rate of growth of the economy as a whole. Growth must slow and then cease, described as 'market maturity' and 'demand saturation' (Metz 2013a). The distance travelled time series shown in Figure 1 is consistent with such a situation. Analysis of Department for Transport accessibility statistics and other sources indicates that people with use of a car or good public transport have high levels of choice of routinely used services: GPs, hospitals, schools, food stores and employment (Metz 2013b). For instance, 80% of the urban population of Britain have access to three or more large supermarkets within a 15 minute drive, and 60% to four or more, suggesting little incentive to travel further for greater choice and hence travel demand saturation for the purposes to travel to supermarkets (Metz 2010). This high level of choice has come about over the years through increasing car ownership, road improvements to make accessible edge of town locations, and the opening by the supermarket chains of additional stores, trends that have now largely played out.

However, not all journey purposes are subject to demand saturation. The main exception is commuting between home and work. There is in general a plentiful supply of housing accessible from where people work. However, affordability is a problem. Given price pressures in the housing market in many parts of the country, people take advantage of faster travel to seek more distant homes they can afford. An example is the popularity of London's Overground, a much improved inner orbital rail route that allows access to lower priced housing in locations previously seen as difficult to reach. Some of the largest percentage price increases in London housing were seen when the Overground allowed locations in inner southeast London to be accessed from employment in Docklands.

Demand saturation is also applicable to air travel. Figure 2 shows passenger numbers between the UK and USA and UK and Japan. In both cases, there was strong growth in the last century, which then ceased (US) or peaked (Japan). Detailed analysis of data from the International Passenger Survey shows a very substantial decline in inbound tourism from Japan, possibly reflecting an ageing population, a static economy and alternative holiday destinations. The rise and decline of tourism at particular destinations is nothing new: the English seaside resorts grew with the building of the railways and statutory paid holidays, and then declined as cheap air travel allowed Mediterranean resorts to be preferred.

Conventional forecasts of demand for air travel at UK airports project strong growth at least to mid-century. However, the evidence from the US and Japanese market segments, which are both substantial and well established, suggests that market maturity may be an emerging phenomenon which in time would be generally observed, raising a question about long term growth (Metz, 2016; Metz, Graham and Gordon, 2016). More generally, econometric models used for such forecasts presuppose substantial continuity between past and future and therefore do not display the behaviour seen in Figure 2.

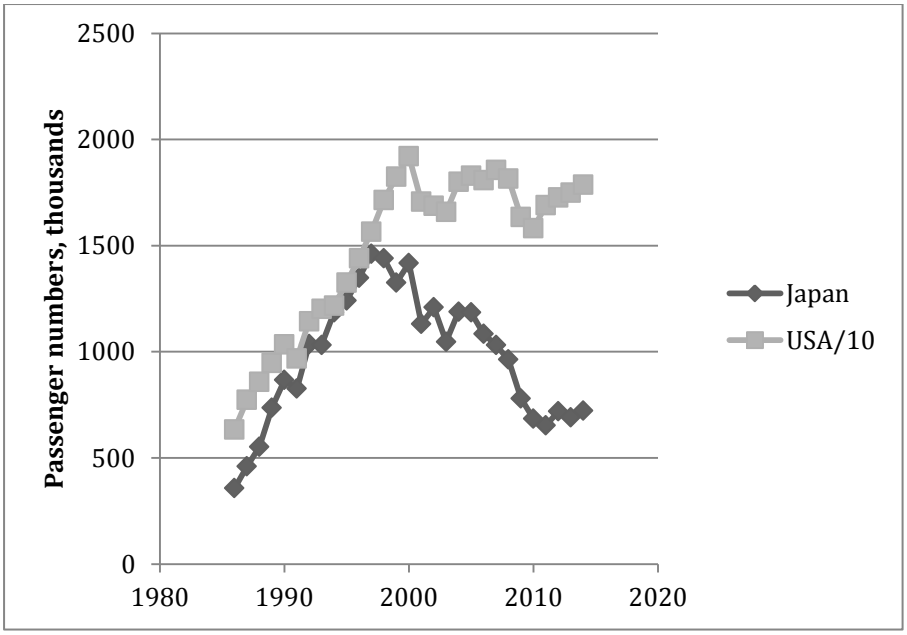

Figure 2. Annual passenger numbers between the UK and USA, and UK and Japan.

Constraints on faster travel

A fundamental contributory factor to the cessation of growth of average distance travelled shown in Figure 1 is the difficulty of going faster. Cars cannot travel faster on uncongested roads safely and with acceptable emissions. The prospects for reducing congestion are poor, whether by road construction or in other ways. While car ownership per capita is still growing slowly, car use per capita is flat, implying that the increased availability is among those who drive relatively little. High-speed rail offers faster travel but only to a minority of rail users who are a minority of all travellers, hence little impact is expected on the average speed of travel. Driverless vehicles will not travel faster than conventional vehicles, although it is conceivable that the travel time constraint may be relaxed since such time could be more productive if not at the wheel.

The way in which traffic congestion constrains road travel is a key issue for travel demand, since demand of any kind is constrained by supply. Congestion occurs in populated areas with high levels of car ownership, such that many potential trips are suppressed by the prospect of delays in congested traffic. Congestion is unavoidable but self-limiting: as traffic builds up, speeds drop, and some drivers who are flexible make other choices of time, mode or destination. Congestion is difficult to mitigate on account of the suppressed trips. For instance, increasing the congestion charge in London would deter some existing users, but others for whom the charge is of less concern than the time delay would take their place – a kind of 'rebound effect'.

Road capacity constraints are a central cause of traffic congestion. Past attempts to relieve urban congestion by enlarging road capacity were disappointing, failing to reduce congestion on account of the extra traffic attracted and damaging the urban environment. Such 'improvements' are nowadays often

being unwound. On the other hand, attempts to reduce congestion by adding capacity remain in fashion for interurban roads. But we know from experience that we cannot build our way out of congestion, on account of the hitherto suppressed trips that emerge when capacity is added – 'induced traffic' – much of which is car commuting, as evidenced by the marked morning and evening traffic peaks seen on motorways and main roads in or near populated areas.

While road capacity constraints are a cause of traffic congestion, at the same time they inhibit growth of demand for car travel. Car traffic has not generally increased in the main UK cities over the past twenty years or more. In London, rapid population growth and capped car use mean that the share of journeys by car fell from a peak of 50% around 1990 to 36% currently. Figure 3 shows an estimate of the car's share of journeys in London over the century 1950-2050. The forward projection assumes continuity of policies to invest in rail but not to enlarge road capacity.

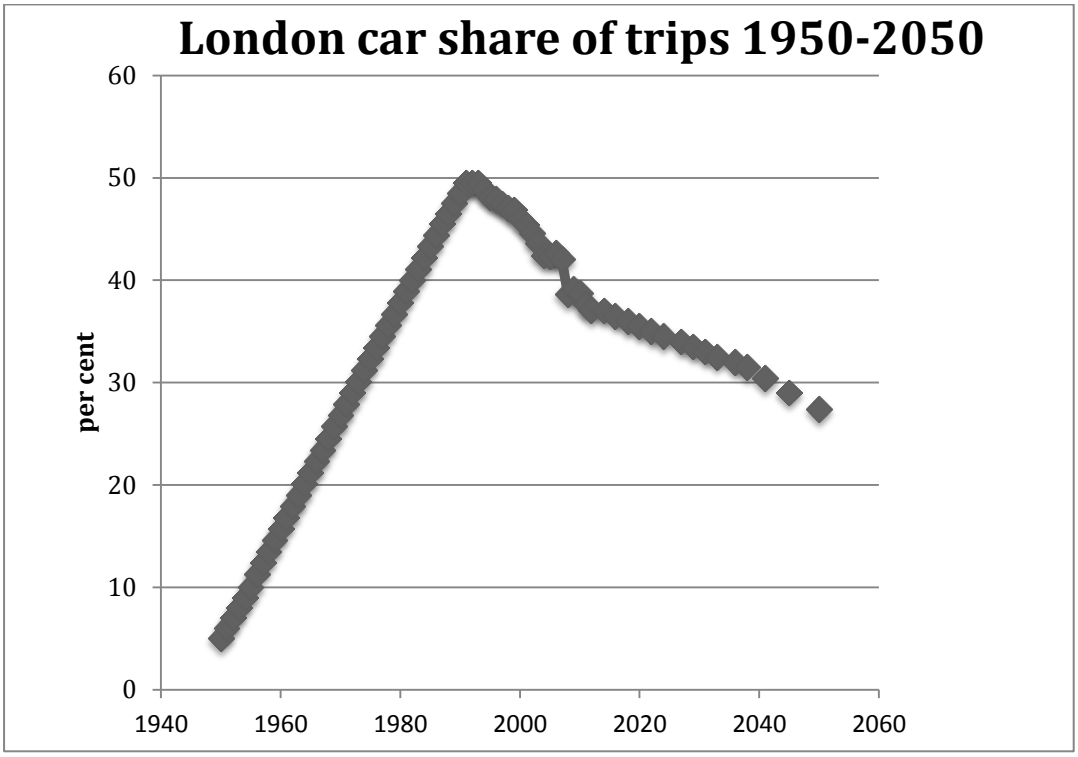

Figure 3. Car mode share in London 1950-2050, from Metz (2015).

The Department for Transport's National Transport Model projects car traffic growth in London of up to 37% by 2040, depending on scenario, with similar growth in other metropolitan areas. However, this is quite at odds with both historic trend and current policy. It appears that the model takes insufficient account of road capacity constraints.

Behavioural change

The three Figures show breaks in trend of travel behaviour coinciding with the transition from the twentieth to the twenty-first centuries. Such behaviour was not predicted by conventional econometric models used to project future travel

demand, which assume substantial continuity between past and future, with historic elasticities broadly conserved and change driven by exogenous factors such as population growth, GDP growth and oil prices.

These breaks in trend indicate that travel behaviour may be more open to policy influence than is implied by conventional modelling. The challenge is to identify emerging trends and shape policies that take advantage of favourable changes in travel behaviour.

In practice, however, professionals invest so much effort in building models that they are reluctant to recognise behavioural changes that are inconsistent with their models. Indeed, they commonly fail to recognise the significance of new evidence. The peak of car mode share in London shown in Figure 3 happening 25 years ago, yet the DfT modellers responsible for the National Transport Model remain in denial about Peak Car.

While travel behaviours change, a long-term invariant is average travel time, which has remained at about an hour a day for settled human populations probably since humans ceased to be foragers and established farming communities. In the past, investments and interventions that allow higher speeds result in greater distances travelled. Conversely, interventions that reduce speed lead to smaller distances traversed, with a loss of opportunities and choices, which is a reason for the limited impact of measures aimed at getting people out of their cars.

We are now in an era in which average per capita travel behaviour has stabilised and seems unlikely to grow in the future. So total travel demand will be driven by population growth. The pattern of demand will depend on where the additional inhabitants are housed: to the extent on greenfield sites, then they would acquire cars and investment in roads would be needed. But to the extent that population growth occurs in cities, investment in public transport would be required. The spatial context is therefore important when addressing the likely future growth of travel demand.

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