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Commentary

Mobility and income

The relationship between income and mobility

The total income of a country is normally measured by the gross domestic product (GDP), that is to say, by all economic activity, measured in money terms, taking place in a country during a year (ONS, 2004a). Similarly, physical mobility can be measured by the total amount of passenger and freight travel, measured in passenger miles (DfT, 2003a) and tonne miles (DfT, 2003b), respectively, taking place in a country during a year. As can be seen in figure 1 there is a clear relationship in the UK between the growth of income and the growth of mobility. This finding has been confirmed throughout the world (Schafer and Victor, 1997).

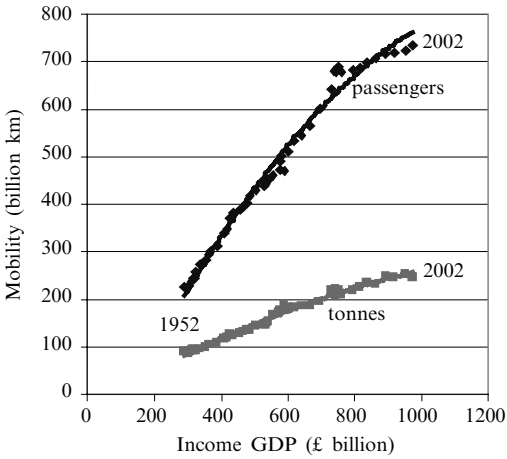

Figure 1. Mobility and income in the UK 1952 – 2002 (sources: GDP—ONS, 2004a; passengers—DfT, 2003a; freight—DfT, 2003b).

The bulk of this increased mobility is due to the greater use of cars for passenger travel and of lorries for freight transport. The apparent reduction of the rate of growth of mobility with respect to GDP growth since the 1990s is probably because the statistics do not include travel outside the country. The foreign component of passenger and freight travel has grown substantially with the reduction in passenger air fares and with the increase in international trade.

Component aspects of mobility

Personal mobility can be analysed by distinguishing two aspects: first, the average number of trips (a one-way course of travel starting at a place and finishing at another place) by a person in a year, and, second, the average length of the trips made (DfT, 2004a). Similarly, freight mobility can be analysed by distinguishing the average number of tonnes 'lifted' per person per year (DfT, 2003b, and ONS, 2004b), that is to say, tonnes transported without taking into account the distance travelled, and the average length of the freight trip.

As can be seen in figure 2, each person makes on average about 1000 trips in a year and 'lifts' just above 20 tonnes per year. These values are fairly stable through time and are not related to changes in average incomes. Therefore, the growth of mobility is only

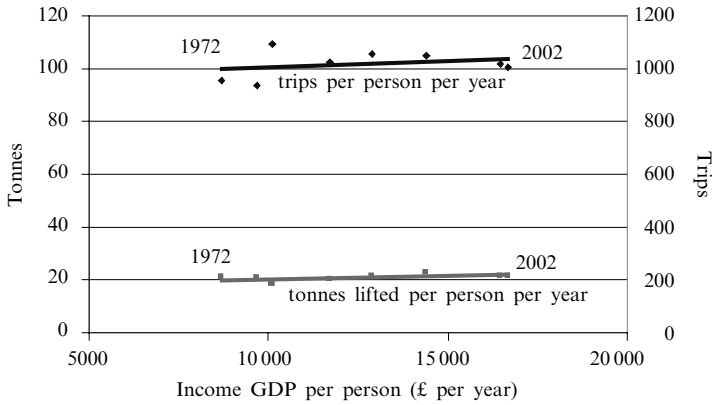

Figure 2. Income, tonnes, and trips generated per person per year 1972 – 2002 (sources: GDP—ONS, 2004a; population—ONS, 2004b; passengers—DfT, 2004a; freight—DfT, 2003b).

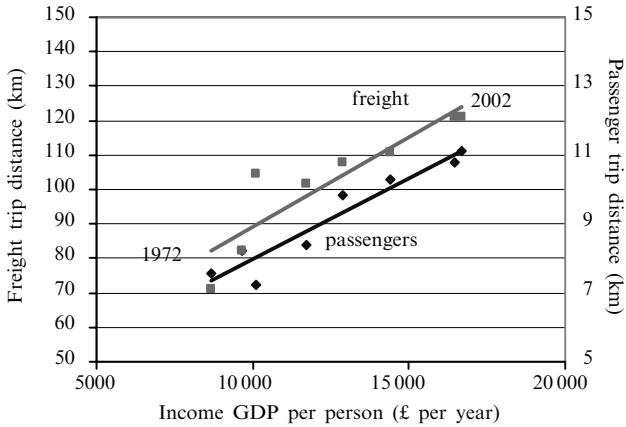

Figure 3. Income, average freight, and passenger trip distances 1972 – 2002 (sources: GDP—ONS, 2004a; population—ONS, 2004b; passengers—DfT, 2004a; freight—DfT, 2003b).

due to the increase in the average length of trips for both personal and freight transport and not to increased numbers of trips per person or freight tonnage transported per person. It can be seen from figure 3 that there is a high correlation between the increase in average passenger and freight trip length and the increase in average income.

Causality

The idea put forward by many economists[(1)] that the growth of income is the main cause of the increase in mobility is implausible. Why, for example, will a person spend more time and money to travel further to a shop when his or her income increases? Or, why would the management of a firm devote more labour time and expense to fetch inputs for a factory from further afield when its earnings increase? A more plausible explanation would be that a benefit is obtained by travelling further, either to buy a cheaper product or a better quality one, or a combination of both. In other words, travel is a derived demand: people travel not for the sake of it but to obtain something at the end of the trip. The corollary of this process is that, as the cost of what is obtained (inputs) reduces, the cost of living for households and of production for firms

[(1)] Most transport economists (see, for example, Gwilliam and Mackie, 1975) consider that the demand for travel is highly elastic with respect to income.

also reduces. Therefore, output prices of products and services offered by firms, or labour offered by households, can be priced more competitively. With better prices or quality, the market expands further for firms and household outputs, thus increasing their incomes.

There are a large number of references in the economic and geographic literature (see, for example, Aschauer, 1989; Lakshmanan and Chatterjee, 2005) that try to explain the effect of transport improvement in GDP growth, but no explanation is offered for the increase in distance travel.

The explanation for this phenomenon is simple: by travelling further, firms and households find more potential suppliers, increasing the competition between them, and thus putting downward pressure on prices. This explanation is based on geometry: the area of a circle increases by the square of the radius. Figure 4 illustrates the changes in potential area of suppliers with increased distance travelled by passenger in the period 1972 to 2002 (DfT, 2004a).

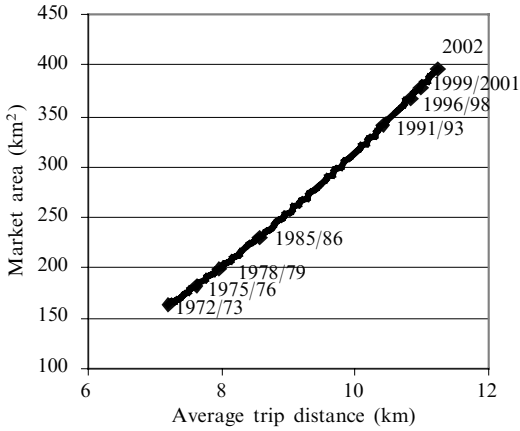

Figure 4. Increase in passenger trip length and in market area, 1972 – 2002 (source: DfT, 2004a).

The average passenger trip distance over the period 1972 – 2002 has gone up by 56%, creating a remarkable potential area for shopping provision or houses to live in (up by 143%). Meanwhile the average freight-trip distance has gone up by 70%, expanding the area of potential suppliers by 190%. The competition between suppliers encourages specialisation and efficiency gains through increase in the scale of operations. The final result of this process is income growth. This explanation conforms to the theory and evidence of international trade: increase in trade and thus increased freight distances results in economic growth (see, for example, Bhagwati, 2004).

The increase in opportunities offered by an increase in market area will be true only if the suppliers are more or less homogeneously distributed in space. If they are not (because of topographical or planning constraints), the impact on prices will be less. It is also worth pointing out that the location of some types of suppliers (such as industrial plants, warehouses, or shopping centres) are themselves influenced by transport provision.

It is important to note that the increase in personal mobility has occurred until recently without much increase in time devoted to travel. Logically it is possible that, if the increase in mobility leads to a substantial increase in time devoted to travel, the benefits will be reduced and, possibly, eliminated altogether.

Transport improvements

The growth in mobility is the product of technological improvements in transport, especially in road transport, with the consequent increased use of motorcars and of lorries. The change from slow forms of transport such as walking, cycling, and public transport to faster ones, such as cars, air transport, and high-speed rail, has reduced the average travel time for passengers per kilometre travelled (DfT, 2004a). Thus the average total transport cost per kilometre for passengers (including all forms of transport), has become cheaper overall when money cost as well as time cost is taken into account. Figure 5 illustrates for passenger travel the changes in travel time cost and travel money cost per kilometre. During the period 1972–2002, the money cost of travel per kilometre[(2)] went up by 29% in real terms, but the time spent per kilometre went down by 31%, because (until recently) of the increasing average speed of travel (DfT, 2004a). This reduction in time compensated for the increase in money travel cost. The total cost (money plus time) per kilometre has come down during the period by 15%. The total cost of travel per kilometre can be estimated by adding the time cost to the money cost. The time cost is calculated by multiplying the time taken for travel by a value of time for travel as recommended by the Government (DfT, 2003c).

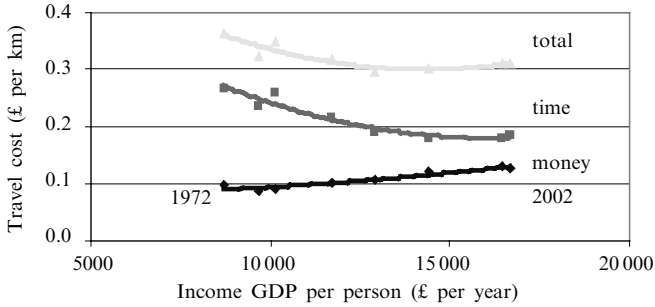

Figure 5. Income, money cost, time cost, and total cost per km, 1972–2002 (sources: GDP—ONS, 2004a; travel time—DfT, 2004a; cost of travel—DfT, 2004a; value of time—DfT, 2003c; all money values are referenced to year 2000).

It is interesting to note that the proportion of the household expenditure devoted to transport has gone up over the period 1972–2002 from 13% to 17%, reflecting the increases in trip distance and monetary cost of travel per unit of distance (see ONS, 2002). However, despite the increase in monetary cost, the overall cost, including time, has not gone up as much, as explained above.

Now, as more vehicles are using the roads without a corresponding increase in capacity, congestion is creeping in. In 2002 the average passenger travel time per kilometre increased for the first time since 1972 (DfT, 2004a). The total real cost of travel is going up, as now there is no reduction in time cost to compensate for the increase in money cost. It is probable that, as a consequence of the increased average total cost of travel (money and time cost), average trip distance will start to decline, reducing the availability of suppliers, increasing their monopolistic power, with the likely consequence of prices going up. This will result in an increase in the cost of living and cost of production, making the UK less efficient and thus slowing the growth in income.

[(2)] An average cost per kilometre travelled can be estimated from Household Expenditure Survey (ONS, 2002) transport expenditure per person divided by the average distance travelled per person from the National Travel Survey (DfT, 2004a).

Naturally, mobility is not the only factor affecting income changes. Indeed, recent work by Bhagwati (2007), while acknowledging the impact of globalisation (that is, mobility) on wages in different countries, concludes that advances in technology are much more important. However, if mobility of goods and services, including labour, is suppressed, there will be a negative impact on income growth, as explained above.

Alternative options for tackling congestion

Congestion is now biting and thus will start to affect the efficiency of the UK. There are three possible ways to reduce congestion: by rationing the use of roads through managing demand; by increasing transport supply; and by a combination of both.

The first option calls for pricing the infrastructure in such a way as to allocate this scarce resource to those who obtain a large benefit for using it and are willing to pay. The introduction of toll roads and high-occupancy toll lanes are examples of this option in certain transport links. An example of area-wide congestion charging is the one introduced in London. The price paid for the use of the infrastructure should reflect not only the private cost to the user, but also the social cost imposed on other users (Walters, 1961). Clearly, charging—as opposed to not charging in congested situations—improves economic efficiency, but this option is valid only up to a point. If the charge necessary to reduce congestion increases greatly, making the average cost of travel for people and freight larger than the savings in time produced by price rationing, then a reduction in the overall economic growth would follow. Therefore, there is a significant but limited contribution that congestion pricing can make. Eventually the capacity of the transport network will be exhausted and increasing the charges for reducing congestion will suppress mobility, rather than enhance it.

The second option calls for increasing the supply of transport infrastructure. The expansion of transport capacity is always fraught with difficulties—financial and environmental. The expansion of the public network could be more environmentally friendly, but it is expensive and unlikely to satisfy the requirement for the use of roads, that is by far the largest component in demand for passengers and freight. Public transport cannot compete in terms of time, flexibility, and comfort as well as, in many cases, in cost for door-to-door travel. Furthermore, for many passenger or freight trips there is no alternative to road transport. The increase in supply can be achieved by physical expansion as well as improved traffic management as a result of the introduction of ITS (intelligent transportation systems). Again, this option makes a significant but limited contribution to reducing congestion. The main reason is that unchecked demand for travel will eventually fill up all the available capacity.

The third option—a combination of both congestion pricing and capacity expansion—is the most viable one. The income generated by the pricing of the network should be used for its expansion. In certain places, such as in dense urban areas, capacity expansion will be limited by environmental factors. The introduction of congestion pricing in these areas will force economic activity to relocate to less congested places. However, there are areas where it is possible to expand the infrastructure, especially for the interurban network.

Assessment

The alternative options for expansion should be assessed carefully, taking into account environmental as well as economic factors. It may turn out that the economic gains are more than cancelled out by the environmental losses, especially in terms of greenhouse gases and other emissions. While environmental aspects are taken into account in the assessment methods currently employed, the assessment of economic benefits of transport investments in the UK (DfT, 2004b) do not take into consideration the effect explained in this paper, namely that the improvement in transport mobility breaks

spatial monopolies, exerting a downward pressure on prices, with the consequent increase in efficiency and thus in incomes.

Venables and Gasiorek (1998) suggest that transport investments can generate wider benefits from increased output in imperfectly competitive markets and propose a method for estimating them for industrial goods. Recent work by the Department for Transport (DfT, 2006) proposes rules of thumb for estimating these wider benefits and their impact on GDP. While this work is a step in the right direction, there is no attempt to model the effect of transport investment on prices. Models developed by the author are able to estimate such effects (see Echenique, 2004) and recent work demonstrates the order of magnitude of these effects, especially on housing and labour markets, in a study of transport alternatives for Cambridge (see Echenique and Hargreaves, 2003).

Finally, it is unlikely that improvements in telecommunications will reduce the need for travel. Examples in the past, such as the introduction of the telegraph and the telephone, did not reduce the mobility of people and freight, quite the contrary; these allowed increasing contacts and marketing of products and services, generating further travel. It is probable that there will be substitution of certain kinds of travel by telecommunications, but telecommunications will also generate further travel demands, especially for freight, as a consequence of the increased range of opportunities for trading created by the advances in communications.

Conclusions

In this paper I have argued that the increase in mobility has helped increase efficiency and thus income growth. The main reason for the increase in mobility has been the growth of motorcars for personal travel and of lorries for freight transport. The growth of road-based travel has contributed to a reduction of the average cost of travel for all transport, mainly as a product of increased average journey speed. Recently, however, the average speed has been reduced due to congestion. It is therefore likely that, unless the capacity of the transport network is increased, the growth of income will be adversely affected. The answer is the introduction of a combination of pricing and capacity expansion to reduce congestion and thus cost of travel. This combination should be properly assessed in environmental as well as in economic terms and, if acceptable, would contribute to increase mobility and therefore income growth.

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