# TRANSPORT ECONOMICS MATTERS

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## Applying Economic Principles to Transportation in Great Britain

**David J. Spurling, John Spurling and Mengqiu Cao**

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David was a founder of Learning Through Cooperation Ltd and its subsidiary LTC Kenya. He wrote 21 textbooks on a range of subjects including Transport, Economics, Business, Sociology, Tourism and Accounts. He also published a book on the Sittingbourne and Kemsley Light Railway. He taught people from more than fifty countries at a range of schools and colleges. He was an Associate Professor in Transport Economics at what is now Birmingham City University.

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CHAPTER 1

# Introduction

## Importance of Transport Economics

In this book, you will learn how to apply economic principles to transport. This will not only help you if you wish to study the subject for its own sake or if you work in the transport industry and wish to improve your knowledge of the subject, but will also help you if you are taking examinations. In addition, this book will also be beneficial for someone who is interested in the subject of transport economics, but has not studied economics, statistics or mathematics.

Transport is an important subject since motoring alone accounted for 14.4% of household expenditure in 2017 (ONS, 2018[1]). Of this, 36.6% was spent on purchasing vehicles, 11% on spares, accessories, repairs and servicing, 26.1% on petrol, diesel and other motor oils, 3.5% was spent on other motoring costs, 7.4% on transport fares and 15.4% on air and other travel in Great Britain (DfT, 2017[2]). The aggregated expenditure associated with motoring, such as petrol/diesel, maintenance, insurance and MOT fees, may be even higher than the cost of the vehicle itself, something which is often overlooked when purchasing a car. In car manufacturing, the aggregated costs of bulk buying materials used in the manufacturing process such as steel, account for a substantial part of the total costs, while a smaller proportion is spent on the production of high value, low bulk items such as the CPU and engine. Transport economics is therefore important since transport constitutes a major sector of the economy in most countries.

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[1]Office for National Statistics (ONS) (2018). *Family spending in the UK: financial year ending 2017*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/expenditure/bulletins/familyspendingintheuk/financialyearending2017 (accessed 5th August 2018).

[2]Department for Transport (DfT) (2017). *Transport expenditure*. London: DfT.

## Finance and the General Economy

Like any other branch of economics, it deals with the allocation of scarce resources. These scarce resources may be vast, such as the capital required for major projects or schemes such as the Channel Tunnel, on which over £10 billion was spent before it opened in 1994. Another example is the railway tunnel through the Brenner Pass, linking Austria and Italy, which has recently reopened at a cost of several billion pounds. However, in other cases, the costs can be small, as with many road haulage firms that operate using a single van and family members as drivers and part-time bookkeepers.

## Employment and the Transport Industry

Transport economists will consider the amount of labour that the transport industry uses. During the period after the regrouping of the railways in 1923 but before the Second World War, the London Midland Scottish Railway (LMS) was the largest employer in the UK. Employment patterns have changed but currently the transport sector is a major employer in the UK, particularly the road haulage sector. The wages paid may also be an important factor. Similarly, for those who work in the airline industry, the effects of strikes or stoppages on their wages can be significant. Until the 1960s and the container revolution, the ports were a major source of employment in many areas, including Tilbury in Essex, Liverpool in North West England and Glasgow on the West coast of Scotland. Whilst the ports are still important they employ far less labour as roll-on roll-off ferries tend to be used which enable vehicles to drive straight on to the ships, and containerisation, palletisation and many forms of mechanisation have all contributed to replacing the vast numbers of workers.

## Land and the Transport Industry

The land required for transport use may be considerable. For example in Los Angeles, it has been estimated that about 70% of the land space is used for vehicles, both for roads and parking. In nineteenth century, the railway occupied about 30% of the land which was used for the passenger station, as well as freight lines and sidings. Landowners in the nineteenth century often resisted the efforts of the railway companies to go through their land. This altered both the location of the railways and the total costs of the original railways.

Even today, it still affects some of the variable costs associated with railways, as well as the demand for rail travel.

Allocating land for transport purposes is a major problem. Massive amounts of land can be used for additional runways or terminals at airports. It is important to consider carefully where they should be constructed, since once they are built, it is difficult to find alternative sites. Transport space may be comprised of small pieces of land, which cumulatively will add up to a considerable amount. Planning regulations usually specify that houses must have garages, although the evidence suggests that often garages are not used for their original purpose. Therefore, a large amount of land is used inefficiently. In the United Kingdom both in urban areas and suburban areas, there are often complaints about allocating land for new housing, but more land is used for the provision of roads, than for the houses themselves. In Valencia in Spain, a town with a population of about 750,000, all new garages for residential properties have to be built underground. This reduces the volume of land space needed to accommodate the car and other vehicles.

## Airport Location

Modern airports are often massive and the problem of land is one which generally arouses strong feelings, although this is nothing new. The proposed third runway for Heathrow, announced in November 2007, is a case in point, sparking considerable controversy. In July 2016, Theresa May's new Conservative government postponed the announcement of a decision about which airport would have expanded capacity to cater for the expected increase in traffic. Subsequently it announced that Heathrow expansion was the preferred option and would go ahead. The Conservative government had previously appointed Lord Adonis a former Labour Cabinet minister, to head the infrastructure commission to speed up large-scale projects. After the 2017 general election, the minority Conservative government announced that it still favoured Heathrow expansion.

## Port Location

The location of ports is often subject to limitation, but once the location has been determined, the sunk costs are important. Sunk costs are costs which cannot be recovered. Because of the considerable size of modern ships, most ports have moved downstream. This means that they have generally moved nearer to the sea than they were originally.

## Irreversibility of Infrastructure Decisions

Transport infrastructure projects are often irreversible without major capital expenditure. However, there have been a few new ports created, such as Thames Haven in Essex, which is located on the site of a former oil refinery.

The problems of land allocation such as trying to preserve the trackbeds of railways, in case they might be used in the future or for roads, have not been satisfactorily resolved. The pricing policy for parking and roads also causes a significant number of problems, including how land is allocated for roads and whether there should be toll roads, and congestion charges.

## Donald Trump and the Environment

The US president Donald Trump has vowed to abolish many environmental policies that have been introduced and has publicly stated that he does not believe in climate change, often referred to as global warming. In 2017, the US withdrew from the COP21 Paris Climate Agreement. However, not all senior members of the US Republican Party agree with Donald Trump.

## Fuel and the Transport Industry

The amount of fuel required has been a problem for many non-oil producing countries, particularly since the oil price rises from Oil Petroleum Export Countries (OPEC) following the Iranian revolution in 1979. This has led many people to speculate on how far we can move away from fossil fuels. In 2015, the price of oil halved unexpectedly. Even in the USA, former president George Bush Junior had spoken about the need for Americans to reduce their dependence upon foreign oil. Barack Obama, president from 2008 to 2016, had been more receptive to the need to pay attention to climate change. There are currently many developments taking place in the use of renewable energy for transport. Lord Deben a former Conservative cabinet minister (probably better known by his original name, Selwyn Gummer) stated at a climate change conference in 2014 that whilst he was agnostic about the types of fuel used, renewable fuel prices were continuing to fall, whilst this is not true of fossil fuels.

## Climate Change Convention

In September 2016, both the US and China signed the climate change convention. These two countries between them accounted for more than 40% of the

total global emissions produced. The climate change convention needed 55% of countries that produce emissions to sign up in order for the agreement to be ratified. The 28 countries of the European Union also signed up to the agreement.

## Social Costs

More attention has been paid to the social costs or external effects of the transport industry. The increase in the number of air journeys has caused concern and most countries signed up to the Kyoto agreement in 1997, which aimed to limit the amount of pollution, greenhouse gas emissions (GHGs), etc. produced globally.

## Importance of Social Costs and Their Definition

Social costs are the total costs to the community and therefore include both private costs and external costs. External costs are costs which are not borne by the consumer or producer of goods or services. An example of this is the costs arising if a ship sinks, such as in the case of the MSC Napoli near Branscombe in Devon in January 2007. It was carrying several thousand containers and caused considerable pollution. On 13th January 2012, the luxury cruise ship Costa Concordia suffered an accident caused by the captain's reckless behaviour, which left at least 11 people on board dead, while 4,000 people had to be evacuated. The most important social cost in the UK is the 30,000 deaths from road vehicle pollution, which the cross-party environmental audit committee identified in 2010, chaired by the then Conservative MP Tim Yeo.

Social costs are particularly important in transport economics. This is because, whereas some other industries have little impact on people who are neither consumers nor producers, the same is not true of the transport industry. This is evident to economists in the case of proposals for new transport facilities such as airports or major roads or the proposed High Speed 2 link, from London to Edinburgh and Glasgow and many other major British cities in the North of England: many people have strong views about the projects even if they are not going to use the new airport, road or railway.

Other major social costs include road accidents, which in the UK account for approximately 1,500 deaths per year and about 300,000 injuries per year. This is a considerable improvement on the number of deaths and injuries that occurred in the 1970s, when about 7,000 deaths were caused each year. In general, there has been a reduction in the number of fatalities

from 2010–2017 onwards (Table 1.1), given that the considerable increase in volume of traffic.

In the past, lead additives were used in petrol and caused a considerable amount of pollution. Whilst these additives have been phased out, with minor exceptions, the numbers of deaths from pollution are still very high and Ken Livingstone, the former Labour Mayor of London, cited pollution effects as one of the reasons for the expansion of the area covered by the congestion charge. In a city such as London, traffic pollution is by far the major component of pollution, since industrial pollution is relatively minor by comparison. The current Labour Mayor of London Sadiq Khan is committed to reducing pollution further, especially in the Oxford Street area, the main shopping street in London.

**Table 1.1** The number of fatalities from 2010–2017 in the UK (DfT, 2018[3])

| Year | Pedestrian | Pedal Cyclist | Motorcyclist Rider/ Passenger | Car Occupant | Other Road User | All Road User Groups | Percentage Change from Previous Year |
|---|---|---|---|---|---|---|---|
| 2010 | 405 | 111 | 403 | 835 | 96 | 1,850 | –16.7 |
| 2011 | 453 | 107 | 362 | 883 | 96 | 1,901 | 2.8 |
| 2012 | 420 | 118 | 328 | 801 | 87 | 1,754 | –7.7 |
| 2013 | 398 | 109 | 331 | 785 | 90 | 1,713 | –2.3 |
| 2014 | 446 | 113 | 339 | 797 | 80 | 1,775 | 3.6 |
| 2015 | 408 | 100 | 365 | 754 | 103 | 1,730 | –2.5 |
| 2016 | 448 | 102 | 319 | 816 | 107 | 1,792 | 3.6 |
| 2017 | 470 | 101 | 349 | 787 | 86 | 1,793 | 0.1 |

## The Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol to the United Nations Framework Convention on Climate Change, which was signed by many countries, is an amendment to the international treaty convention on climate, assigning mandatory targets for the

[3]Department for Transport (DfT) (2018). *Reported road casualties – Great Britain: 2017*. London: DfT.

reduction of greenhouse gas emissions to signatory nations. In April 2016, nearly all countries signed up to the climate change convention in Paris.

## Air Transport Noise

Air transport noise is difficult to avoid and any airport expansion proposals tend to provoke complaints. It is not necessarily the noise from the aircraft themselves that people object to. Ironically, part of the concerns about additional noise from any proposed expansion of Heathrow centre on the number of cars travelling to and from Heathrow, which will add to both the noise and pollution in that part of the London area.

## Public Awareness

Social costs have attracted more public attention partly because of the growing awareness of climate change. The Stern Report, published in October 2006, warned of the dangers to the UK and other economies, which this could cause. In April 2016, nearly 200 countries signed up to a United Nations (UN) convention, which represents an important step in trying to reduce the level of emissions and hence global warming, more accurately called climate change.

Transport economists might also assume that as people get richer, they will become more aware of the problems of social costs, especially if they spend more money on housing. They will then be more likely to notice the noise and pollution caused by road traffic, which will prevent them from enjoying their wealth. In the UK, nearly all advertising for new housing will stress, if possible, that it is located in a quiet neighbourhood. Most new roads, apart from bypasses, trunk roads and motorways, are built so that they do not have through traffic travelling along them, and this has become increasingly popular. Aircraft noise on the other hand is more difficult to avoid since, in the London area, as is the case for many big cities, it is very difficult to find anywhere which does not suffer from this.

## Interdependence of Transport

Various different modes of transport are often interdependent. Air transport usually requires people to travel to and from the airport and so the accessibility of airports has caused a number of problems, which have not always been resolved satisfactorily. There have been some newer developments, such

as the railway line from Paddington to Heathrow (the Heathrow Express), which have solved some of the problems, although it could be argued that by encouraging people to go into or through London, rather than around the city, it may have added to the congestion for some other travellers instead of alleviating it. In Edinburgh in September 2007, the Scottish parliament decided to abandon the proposed airport link to Edinburgh Airport partly for this reason. There has been considerable debate about how desirable it is to make access to and from the airports easier when the world as a whole is suffering from the effects of climate change. Indeed it is often questioned whether expansion of the air travel market is desirable at all. Sometimes there is interdependence even within the same mode of transport: for example, before the 1960s many people used the railway branch lines to get to and from the intercity services.

## The Beeching Report (Reshaping of British Railways) in 1963 and Privatisation from 1994

The Beeching report (Reshaping of British railways) in 1963 largely ignored accessibility to the main railway lines and focused too narrowly on the costs and revenues associated with a line, without considering the overall impact of the line on the network as a whole. It could be argued that this lack of an overarching perspective has become even more problematic since the privatisation of the railways from 1994 onwards. A book entitled "Broken Rails" by Christian Wolmar, a well-known commentator, on rail problems, makes this point very forcefully. However, the new Elizabeth line in London will make it easier for many people to be able to transfer from one railway line to another, and has the added benefit of offering a very frequent service.

## Interdependence on the Road Network

The interdependence of transport can be seen in the competition for the same facilities on the road network where an increase in the number vehicles adds to the time taken for other travellers. If 10 vehicles take 10 minutes to travel along a piece of road and 11 vehicles take 11 minutes, the marginal time (i.e. additional time for travellers as a whole) is 21 minutes, and the total time will therefore be 121 minutes instead of 100 minutes. However, to the vehicle owner concerned, the decision is made on the basis of the 11 minutes that it will take them.

Because buses have to load and unload, the time they take to travel the same distance often increases over time for the same length journey and this explains why bus travel as a whole has declined in the UK. Transport economists will therefore come to the paradoxical conclusion that if the majority of travellers went by bus then everyone would spend less time travelling, but for any individual traveller, it is quicker to use the car.

There have been some exceptions to this decline in bus patronage: for example, in London congestion is so severe that fewer people as a percentage of the whole population wish to travel by car than is the case anywhere else. This lack of enthusiasm for car travel has been exacerbated by the congestion charge, which has been in force in London since February 2003. The congestion charge is now £11.50 per day for driving a vehicle within the charging zone between 07:00 and 18:00, Monday to Friday (Figure 1.1).


**Figure 1.1** The London congestion charge (Photo: Mengqiu Cao).

There have also been some improvements to bus lanes and other bus priorities, which mean that the decline in bus travel times has been partly alleviated. However, in most other parts of the UK travel by bus has continued to fall.

## Rationality and Transport Economics

Transport economists, like other economists, often assume that people make their decisions about whether and how to travel on rational grounds/or on the basis of marginal costs of either money or time, or a combination of these. The same is also true of freight transport. The time taken is a prime consideration. Marginal cost means the additional cost of the journey, and a great deal of transport economics is concerned with decisions made at the margin. It is untrue that people are always rational in their decision-making (e.g. behavioural economics – Professor Richard H. Thaler), since they often underestimate the costs involved. Before concluding that this is a reason for intervention, however, transport economists would need to be sure that if other stakeholders such as central or local government made decisions, these were made on a more rational basis. There has also been considerable misinformation about pollution, with many people previously assuming that diesel was preferable to petrol engines for environmental reasons, but this has since been disproved. In April 2016 Mitsubishi admitted that their figures for fuel consumption had been dishonest since at least 1992.

## Transport as a Derived Demand

Transport is not usually required for its own sake, unlike, for example, the demand for the theatre or cinema tickets, but because it gives utility of place. People may wish to travel for a variety of reasons including travel to and from work, for education, for social reasons such as a desire to go to entertainment facilities, or to visit friends and relatives.

## Links Between Transport Economics and Other Academic Disciplines

Transport economics is therefore often linked to other disciplines such as the built environment. It is also linked with sociology and psychology, since it is important to understand why people behave in certain ways.

## Changes in Location and Hence Changes in Demand for Transport

There has been a tendency for the inner city to decline, and for what geographers refer to as the Central Business District (CBD) to remain broadly the same size while suburban areas have increased both in terms of population and area covered. Even within these broad categories, there have been significant changes. Many commercial firms have become more footloose. Footloose means that firms are not tied to any one location because of costs. This is notably the case with the service sector, since most organisations no longer need a large central office where all their files are kept. The digital revolution has meant that files can be stored on a central computer system, which is available almost anywhere. The growth of car traffic means that often firms are not tied to a central location to suit either their customers or employees. The location of industry has changed and so has the demand. Countries such as the UK, are no longer mainly industrial with a large working class, often called blue-collar workers. Therefore, the total number of people employed in manufacturing industry has fallen rapidly. The coal mining industry, which used to employ vast numbers of people (e.g. about 200,000 people in the early 1980s), currently employs very few. This has consequences for the demand for both passenger and freight transport.

Most coal miners used to live near the coal mines so that demand for passenger transport to and from work was usually low. However, demand for freight transport was heavy, and it remains important, but most coal is now imported. Commitments to reducing climate change could decrease it even further. Heavy industry, such as large steel works, has also become less important as an employer. On the other hand, light industry units, such as those making plastics, have expanded. These are often found on industrial sites away from town centres and are often not very well served by public transport, especially rail.

## Importance of Travel Surveys

Travel surveys carried out by the government (e.g. London Travel Demand Survey or UK National Travel Survey) or private organisations will help to identity these broad trends but, for transport operators as well as the providers of these facilities, smaller local surveys may be helpful. Local authorities will estimate footfall (i.e. the number of people passing a particular location).

For instance, in the UK, Passenger Focus which was renamed Transport Focus in March 2015, carries out many surveys for the government.

## Changes in Shopping Patterns

Retailers or shop-owners will want to know about footfall before deciding on a location. Shopping centres have become very large in many cases (e.g. Lakeside in Essex and Bluewater in Kent, as well as the Metro centre in Gateshead in the Tyne region which has over 300 retailers and leisure facilities). This in turn generates traffic from both potential customers as well as people working in these centres. It also means that the pattern of freight demand is altered.

## Lack of Homogeneous Demand for Transport

In the case of air transport, and sometimes railway travel, there are often many different fares for the same journey.

The prices that cruise ships charge also often differ significantly between those for a luxury cabin and at the other end of the scale for a room in dormitory class.

## Total Journey Time and Importance in Decision-Making

Transport economists have observed that whether one travels in a mini or the latest limousine in urban areas, the journey often takes the same length of time. Sometimes the journey may even be quicker in a smaller vehicle, since it will be easier to find a suitable parking space. As far back as 1966, a House of Lords committee stated that small electric vehicles should have priority in towns.

## Social Media and Information

One of the criticisms which many passengers make is that when travel disruptions occur, operators do not use social media enough to inform them about what is happening. This was particularly apparent when Heathrow and Gatwick British Airways services were disrupted on 27th May 2017 by a computer glitch. Passengers complained that no staff were available at the desks at both airports to answer any questions.

CHAPTER 2

# Demand for Passenger Transport

In general, most economists use the phrase 'market demand curve' to show how much a particular good or service consumers in the market will wish to buy over a range of prices at a particular time. The market demand curve is the sum of the individual demand curves showing the demand for a particular service such as transport by individual consumers. The demand is always over a particular period. It is meaningless to say that there is a demand for 1,000 journeys unless economists mention the period (e.g. per week or year). Economists use the phrase 'elasticity of demand' to show how one variable affects the demand for a service such as transport. The most common form of elasticity of demand used by economists is price elasticity. The formula for the price elasticity of demand approximates to:

$$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

Transport economists would normally expect demand to fall if price rises and conversely to rise if price falls, and therefore to have a downward sloping demand curve. Thus, the price elasticity is negative, but economists often disregard the minus sign. Economists would state that demand is elastic if total expenditure rises as price falls or if total expenditure falls as price rises, whilst demand is said to be inelastic if total expenditure rises as price rises. If economists estimate part of the following demand schedules as follows:

Then in Table 2.1, the demand is elastic.

**Table 2.1** Elastic demand

| Fares | Demand | Revenue |
|---|---|---|
| £10.00 | 100 | £1,000 |
| £9.50 | 120 | £1,140 |