

# INTRODUCTION TO TRANSPORT ECONOMICS



**INTRODUCTION TO  
TRANSPORT ECONOMICS  
DEMAND, COST, PRICING, AND ADOPTION**

**DAVID J. SPURLING**



Universal-Publishers  
Boca Raton

*Introduction to Transport Economics:  
Demand, Cost, Pricing, and Adoption*

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Universal-Publishers  
Boca Raton, Florida • USA

2010

ISBN-10: 1-599-898-9

ISBN-13: 978-1-59942-898-7

[www.universal-publishers.com](http://www.universal-publishers.com)

Spurling, David J., 1940-

Introduction to transport economics : demand, cost, pricing, and adoption / David J. Spurling.

p. cm.

Includes index.

ISBN-13: 978-1-59942-898-7 (pbk. : alk. paper)

ISBN-10: 1-59942-898-9 (pbk. : alk. paper)

1. Transportation. 2. Transportation--Costs. 3. Transportation--Finance. I. Title.

HE151.S67 2009

388'.049--dc22

2009032882

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## ACKNOWLEDGMENTS

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I would like to thank my son John Spurling for his work in checking the book and suggesting ideas, especially about land use planning. I would also like to extend thanks to Christopher Bird for his suggestions about the railways and to James Gachihi for his help in the chapter on developing countries. I would additionally like to thank Christie Mayer for her work in editing the book, although any faults that remain are my responsibility. Thanks are also due to Sophie Martin and Tammy Maines for their audio typing work.



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# INTRODUCTION: THE 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 are taking examinations, but will also help you if you wish to study the subject for its own sake or if you are in the transport industry and wish to improve your knowledge of the subject.

Transport is an important subject since motoring alone accounted for about 14% of the household expenditure in the UK in 2005-2006 (source 2.7 Transport Trends). It is an even greater percentage for many total costs of production. It will be a very large part of the total cost for aggregates but a smaller part for the production of high value, low bulk items. Transport economics matters since we are dealing with a major sector of the economy, not just in the UK, but also in most countries.

### *Finance and the General Economy*

Like any other branch of economics, it deals with the allocation of scarce resources. The scarce resources may be vast such as the capital required for the major projects in schemes like the Channel Tunnel, where over £10 billion was spent before its opening in 1994. On the other hand, the finance could be quite small (e.g., with many road haulage firms operating a single van using family as drivers and also as part-time bookkeepers).

### ***Employment and the Transport Industry***

Let's consider the amount of labour used by transport. At one point before the Second World War, the LMS (London Midland Scottish Railway) was the largest employer in the UK. Employment patterns have changed, but at the present time the transport sector is a major employer in the UK, particularly in the road haulage sector. The wages paid may also be important. Similarly, air transport or airport wages can affect many people, as those who have been affected by airline strikes or stoppages can testify. At one stage, the ports were a major source of employment in many areas as old pictures of these areas portray. Whilst the ports are still important, they employ far less labour given the availability of roll-on/roll-off ferries where the vehicles drive straight on to the ships, containerisation, palletisation, and many forms of mechanisation, thereby replacing a vast numbers of workers.

### ***Land and the Transport Industry***

The land required may be considerable in the transport industry as seen in Los Angeles, for example, where it has been estimated that about 70 % of the land space is used for vehicles (both roads and parking). In York in the 19th century, the railway occupied about 30% of the land for the passenger station as well as freight lines and sidings. Landowners in the 19th century often resisted the efforts of the railway companies to go through their land. This not only altered the location of the railways, but also modified the total costs of the original railways. Even today this still affects some of the variable costs as well as demand.

Modern airports are often massive and the problem of land is one that arouses great passions, although this is nothing new. The proposed third runway for Heathrow announced in November 2007 aroused such a controversy.

The problem of land allocation for transport purposes is still a major problem. This may occur on a large scale, such as considering whether additional runways or terminals should be allocated for airports. After all, once built it is difficult to find alternative sites. It may occur in relatively small bits of land, which cumulatively will add to a considerable amount of land. For example, planning regulations usually specify that houses have to have garages, although the evidence is that in a large number of cases, the garages are not used for their original purpose. Therefore, we are using a large amount of land inefficiently. In urban areas, complaints about land allocation

for the purpose of new housing are common, but the land is more often used for the provision of roads rather than for the houses themselves.

The ports by definition may be limited in where they can be located, but are important decisions as they immediately become sunk costs nevertheless as many of these cases cannot easily be reversed. The problems of land allocation (such as trying to preserve railway trackbeds in case they can be used in the future or for roads) have not been satisfactorily resolved. The pricing policy for land, and particularly for parking, is one that causes a great number of problems. How we allocate land for roads in general and whether we need toll roads, congestion charges and so on are also of concern.

### ***Fuel and the Transport Industry***

The amount of fuel required by the transport industry has been a problem for many non-oil producing countries, particularly since the increase in the price of oil from OPEC in 1973 and following the Iranian revolution in 1979. This has led many people to speculate on how far we can move away from fossil fuels. Even in the USA, former President George Bush Junior has talked about the need for Americans to move away from their dependence on foreign oil. 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 the Kyoto agreement in 1997 which is trying to limit the amounts of pollution, etc. The Kyoto Protocol to the United Nations Framework Convention on Climate Change, signed by many countries, is an amendment to the international treaty on climate change, assigning mandatory targets for the reduction of greenhouse gas emissions to signatory nations.

### ***Social Costs Importance and Definition***

Social costs are total costs to the community and therefore include both private costs and external costs. External costs are those which are not borne by the consumer or producer of the goods or services. This could, for example, be the costs arising from a ship that goes down, such as the MSC Napoli near Branscombe, Devon in January 2007, which was carrying several thousand containers and caused considerable pollution.

Social costs are important in transport economics. This is because, whereas other industries have little impact on people who are

neither consumers nor producers, the same is not true of the transport industry. We can readily see this with proposals for new transport facilities such as airports or major roads where many people have opinions even if they are not going to use the airport or new road. We deal more extensively with this in Chapter 16 on cost benefit analysis.

Other major examples of social costs are road accidents, which in the UK, are just under 3,000 per year and about 300,000 injuries per year. This is a considerable improvement on the number of deaths and injuries in the 1970s when about 7,000 deaths were caused each year but is still obviously too high. There has been a 62% decrease in the number of fatal and serious injuries since 1980 to 2005 in spite of the considerable increase in volume of traffic. In the past, lead additives were important in the case of petrol and caused a considerable amount of pollution. Whilst these additives have been phased out with minor exceptions, deaths from pollution are still very high. Ken Livingstone, the former elected Mayor of London, cited pollution effects as one of the reasons for the area expansion covered by the congestion charge. In a city such as London, the traffic pollution is by far the greatest component of pollution since industry pollution is relatively minor by comparison.

### ***Noise***

Air transport noise is difficult to avoid, and with any airport expansion proposal there have been complaints. It is not necessarily from the aircraft themselves. Ironically, part of the concerns about additional noise from any proposed expansion of Heathrow has been the number of cars travelling to and from Heathrow, adding to both the noise and pollution in that part of the London area.

### ***Public Awareness***

The public has grown more aware of related social costs due in part to the growing awareness of global warming. The Stern Report, published in October 2006, warned of such dangers to the UK and other economies.

We might also assume that as people get richer they will be more aware of the problems of social costs, especially if they spend more money on housing. They then will notice the road noise and pollution that could prevent them from enjoying their great wealth. It is very noticeable in the UK that nearly all housing advertisements will stress, if it is true, that the new housing is in a quiet neighbourhood.

Most new roads, apart from bypasses, trunk roads and motorways, are built so they do not have through traffic going to the roads, a trend that is becoming increasingly popular. Air noise, on the other hand, is more difficult from which to be sheltered since it is very difficult to find area not affected by this surrounding an airport.

### *Interdependence of Transport*

It is important to remember that different modes of transport are often interdependent. Air transport usually requires people to travel to and from the airport, and the accessibility of airports has often caused a number of problems that have not always been resolved satisfactorily. There have been some newer developments, such as the railway line from Paddington to Heathrow (the Heathrow Express), that have solved some of the problems; although it could be argued that by helping people go into London rather than away from London may have added to the congestion rather than 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 have been arguments as to at which point it becomes less desirable to make access to and from the airports easier when the world as a whole is suffering from the effects of global warming.

In some cases, there is interdependence even within the same mode of transport (i.e., many people in the past have used the branch lines to get to and from the intercity services). The Beeching report (Reshaping of British railways) in 1963 often ignored the point that they were used for this purpose and looked too narrowly at the costs and revenues from the line without considering the overall impact of the line on the network as a whole. It could be argued that this lack of an overall view has become even more difficult with privatisation.

The interdependence of transport can readily be seen in the competition for the same facilities on the road network where more vehicles will add to the time taken for other travellers. To take an oversimplified illustration, if 10 vehicles take 10 minutes on a piece of road, and 11 people take 11 minutes, the marginal time or additional time for travellers as a whole is 21 minutes (i.e., 121 minutes instead of 100 minutes). To the vehicle owner concerned, however, the decision is made on the 11 minutes that it will take them.

Because buses have to load and unload, their time to travel the same distance tends to deteriorate for the same length journey and

this is one of the many reasons why bus travel as a whole has declined in the UK on the whole. We do have the paradoxical conclusion that if everyone or at least the majority of travellers went by bus, then everyone would spend less time travelling; however, for any individual traveller, it is quicker to use a car.

There have been some exceptions to this decline in bus patronage, such as in London where the congestion is so bad that fewer people as a percentage of the whole population wish to travel by car in London than elsewhere. This lack of desire has been in turn strengthened by the congestion charge that has been in force in London since 2003.

There have also been some improvements to bus lanes and other bus priorities which means that worsening bus times must have, to some extent, been alleviated.

### ***Rationality and Transport Economics***

Transport economists, like other economists, often assume that people make their decisions on rational grounds and marginal costs, whether they are money or time or a combination of these, when deciding whether to travel and how to travel. The same is also true of freight transport. The time taken will be one of these grounds. 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 not always true that people are rational in their decision-making process since they often underestimate their costs. Before jumping to conclusions that this is a reason for intervention, however, we would need to be sure that if other people such as the central or local government made decisions were more rational. We deal with this in more depth in the chapter on cost allocation.

### ***Transport as a Derived Demand***

Transport is not usually required for its own sake, unlike 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 going to and from work, for education, for social reasons (such as for entertainment purposes), or to visit friends and relatives.

Transport economics is therefore often linked to other disciplines such as land use planning since, if we follow the examples listed, we can trace some of the changes that have taken place in the location of those facilities. It is also linked with sociology and psychology as certain behaviours are important to understand.

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

There has been a tendency for the inner city to decline, the location of what geographers refer to as the CBD (Central Business District) to remain broadly the same in size, and for suburban areas to increase both in their population and relative area. Even within these broad categories there have been changes. Many commercial firms have become more footloose. Footloose means that these firms are not tied to any one location because of costs. This arises from the lack of need for a large central office where all the files are kept. The growth of information technology has meant that the files can instead be stored on a central computer system so they are available almost anywhere.

The growth of car traffic means that in many cases firms are not tied to a central area 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, also known as blue collar workers, so the total number of people employed in the 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), has fallen to a very low level. 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 small in most cases. Freight transport, however, was heavy. It still is important, but now most coal is imported. Heavy industry, such as large steel works, has also become less important. On the other hand, the light industry units, such as those making plastics have tended to expand. These are often found on industrial sites away from the centres of towns and are often not very well served by public transport, especially by rail.

### ***Importance of Travel Surveys***

Travel surveys carried out by the government or private organisations will help to identify these broad trends, but for the transport operator as well as for people providing these facilities, smaller local surveys may be helpful. For example, local authorities may well want to have an idea of footfall (i.e., the number of people passing a particular location).

### ***Changes in Shopping Patterns***

Shops will want to know about footfall before deciding on location as well. 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 with over 300 retailers and leisure facilities). In turn, this generates traffic for both potential customers as well as for people working in these centres. It will also mean that the pattern of freight demand is altered.

### ***Lack of Homogeneous Demand for Transport***

We see that in many cases the price of transport varies tremendously from one type of transport to another and even within one mode of transport for the same journey. We see this for travel by car where the car (whether a mini or the latest limousine) will often take the same time for the same journey, particularly in towns. In some cases, the journey may even be quicker with a smaller vehicle since it is easier to find a suitable parking space.

Lack of homogeneity is true with regard to the different prices of airlines where there are a vast number of fares, often for the same aircraft. Cruise ships also have great differences in price between those for a luxury cabin and at the other end of the scale for dormitory class.

### ***Self Examination Questions***

1. What is meant by “transport is a derived demand?” Why does this mean that in most cases transport economists will need to be aware of what is happening in a variety of academic disciplines?
2. Why are social costs important in transport economics?
3. Fuel is a non renewable resource and therefore we should take care to make sure that we look at transport options carefully for the benefit of future generations. The price mechanism will ensure that we have sufficient amounts of fuel in the future. To what degree do you agree with either statement?
4. Since railway carriages, multiple units, and locomotives, if used at all, may last upward of 30 years and the basic rail network in the UK alters very little, what implications does this have when trying to plan for the future? Does the same apply to the road system?
5. How far is transport a homogenous demand? Why does this matter when considering pricing policy?

6. Is it inevitable that demand for both passenger and freight transport will grow over time?



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## DEMAND FOR PASSENGER TRANSPORT

Economists use the phrase ‘market demand curve’ to show how much of a particular good or service consumers in the market 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 of time. It is meaningless to say there is a demand for 1,000 journeys unless we mention the time 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:

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

Although we would normally expect demand to fall if price rises and vice versa, and therefore to have a downward sloping demand curve, for price elasticity to be negative, economists often disregard the minus sign. Economists would say 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 we have part of the following demand schedules:

**Table 2.1**

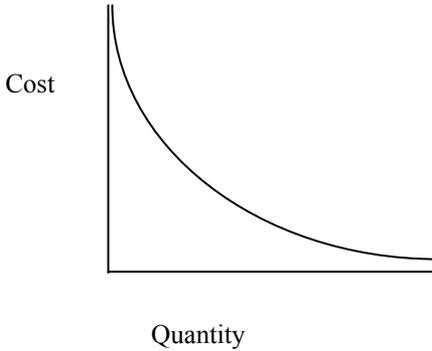
Fares	Demand	Revenue
£ 10 -00	100	£ 1000
£ 9 -50	120	£ 1140

Then in Table 2.1, the demand is elastic.

**Table 2.2**

Fares	Demand	Revenue
£ 10 -00	100	£ 1000
£ 9 -50	101	£ 959 -50

Then in Table 2.2, the demand is inelastic.



***Elastic Demand vs. Inelastic Demand***

In general we would expect the demand for business traffic to be more inelastic than demand for social travel, though there may be some exceptions to this rule. This is because, in many cases, there is not a substitute in the short-run for travelling, for example, to and from work, although there may be a choice of modes of transport the customer may use. This is one of the many reasons why peak fares are often higher than other times of the day. A price reduction is unlikely to lead to a more than proportionate increase in demand and, in most cases, the mode of transport is operating at full capacity anyway, so it could not cope with additional demand without considerable expense. We can readily see this in many rail commuter ser-

vices coming into London. The majority of peak traffic in town is likely to be commuter traffic and, to a lesser although increasingly important extent, traffic to and from educational establishments plays a role.

### ***Short- and Long-Run Elasticity of Demand***

It is probable even with short-run elasticity of demand that a fare change of upwards of 20% would have a different effect than a downward fare change. This is particularly likely to be true of bus journeys, since in many cases the existing passengers may well have alternatives including the use of a car, which can be used as a substitute fairly quickly. However, even if fare reductions encourage existing passengers to make more or longer journeys, the effect on people who do not use the bus regularly may well take more time to filter through. In the longer term, it may affect location of either work or housing. Therefore, in many cases, the elasticity figures are likely to be higher in the long- rather than the short-term.

### ***Educational Demand***

The nature of educational demand is changing. When grants were given, most people travelled long distances to and from university and few people went to local universities. Now, perhaps because of the cost of tuition as well as the absence of grants, more people are opting for local universities. More people are going to universities and the present government has set a target that 50% of the relevant age groups should go to a university or some other form of education. On the other hand, since in the UK we have fewer people under 16 than over 65, fewer people will be at school in spite of raising the age limit to 16 in 1972. The current government has recently changed the law so that children starting secondary schools in England are legally required to stay in education until they are 17; this will be increased to 18 for school leavers who started school beginning in 2005. This could affect future total demand for educational travel.

### ***Road Pricing***

The idea of charging more during peak times has been important in different modes of transport including rail, bus, and even during particular seasonal patterns for air; but this is not generally true for roads.

Road pricing, however, has not applied generally to road traffic except in Singapore. The London area, however, introduced a con-

gestion charge in 2003 and the covered area was extended in February 2007. There is also the M6 toll, where motorists can choose to pay to use the 27 mile route. The toll is higher during the day (06:00–23:00) than at night (23:00–06:00). Transport economists would suggest that the price charged should relate to the marginal social costs of congestion and pollution. This would help give the optimum solution to the utilisation of a scarce resource (i.e., road space).

### ***Social Travel***

On the other hand, where social travel is concerned, there are often a large number of substitutes, including not travelling at all. The mobile phone and texting may also be a substitute for personal travel. For a long while it seemed as though people would spend more and more time with home entertainment including television, home computers, and computer games so that, for example, demand for travel to and from the cinema would inevitably decline. This has been less true in the UK over the last few years. The decline in the number of cinemas and hence transport demand was partially offset by the growth in the number of Bingo halls that use the old cinema sites.

There are now many multiplex cinemas generating considerable travel demand. Families often live further apart than they did in the past and surveys by Wilmott and Young show how changes in family patterns affect travel to see other family members. Social Trends give an indication of how frequently people see other members of their family.

### ***Demand for Travel for Health Care***

The demand for health care can generate considerable amounts of traffic especially at some stages when cottage hospitals (i.e., smaller hospitals) tend to be closed while larger ones are open instead. Hospital patients are often elderly and therefore less likely to be car owners. Visiting patients may pose problems especially for non-car owners as newer hospitals are less likely to be in town centres (e.g. the new District General Hospital being constructed on the outskirts of Tunbridge Wells). Hospitals have come under media pressure for charging for parking. Whilst few people would wish to charge high prices for people visiting a dying patient, there seems to be no good reason why hospital parking should be subsidised universally. It is noticeable that less media scrutiny has been made about the problem

of sparse services to many hospitals and the high public transport fares that might be charged.

### ***Income Elasticity of Demand***

Economists also use the phrase ‘income elasticity of demand’ to measure the responsiveness of demand to changes in income. The income elasticity of demand is positive for normal goods and services and negative for inferior goods and services. Inferior is a technical term and does not refer to the quality of service.

It has often been assumed that cycling is an example of an inferior good (i.e., that as incomes rise, people will turn to other modes of transport); so, if a country had higher incomes, it would have less cycling. The assumption is that you can expect the demand for car transport to be regarded as a normal good or service whilst cycling is regarded as an inferior good or service in more developed countries. However, this would not necessarily be true in all developed countries since, for example, in the Netherlands, Denmark, and Germany, cycling is regarded as an ordinary activity and it is possible to see many commuters travelling by bike in these countries. Indeed, in Germany, although car ownership is much higher than in the UK, the bike share of trips is almost ten times higher than in the UK, according to Pucher and Buehler.

In China, on the other hand, cycling has been a conventional form of transport for many people, and with pollution levels very high in many cities, concern has been expressed about the increase that would occur if unconstrained car use that is in line with the great economic growth continues. Income elasticity of demand is approximated by the following formula:

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

Firms will usually try to enter markets for normal goods or services if they assume that incomes will rise. In some cases this may not always be possible as seen in the example of a road passenger operator who may not be able to move into another mode of transport. However, the road passenger undertaking may be able to offer better quality by offering food and more comfortable seating (or even the provision of toilets) on long distance routes. Another example is seen on older cruise ships, where there are efforts to provide slightly fewer but better class cabins.

### ***Importance of Inferior and Normal Goods***

In some cases, the firm may try to alter the image of their product so that it becomes a normal good. For example, steam trains were for a long while regarded as old fashioned in the UK, and the former British Rail had phased them out by 1968 with the exception of the narrow gauge line from Aberystwyth to Devils Bridge in Mid Wales. In recent years, some operators, such as the Cathedrals Express, are finding that there is a niche market for longer distance steam-hauled trains to and from the cathedral cities as the name implies. The term 'Cathedrals Express' is a slightly misleading title as it does now offer trips to some other destinations as well. Many of the voluntary railways, sometimes known as heritage railways, have also found that there is a niche for steam-hauled services; although in many cases this is supplemented by old fashioned stations.

### ***Use of Cross Section Data***

The use of cross section data means looking across different sections of society, often at different income brackets for households. We would normally need to modify this slightly since clearly a single person with a household income of £30,000 would have a different pattern of demand than a family with four children and the same total household income. In practise we would need to carry out surveys to find out whose household incomes are in this bracket, since even though Income Tax returns provide an indication (assuming no avoidance or evasion) of individuals' incomes, they do not give us an indication of the total household income. We may instead be able to find this on occasion from census data.

We can often use cross section data to find out what happens in different income groups with changes in demand, including public transport. This can then be used when forecasting future demand. However, care has to be taken when doing this. If we look at people with a household income around £30,000 per year, we cannot assume that people whose income is currently around £20,000 will have the same pattern of demand when their income rises to £30,000 in real terms. It might give realistic forecasts for car ownership, but be less accurate for leisure travel.

There may be problems in distinguishing between figures for different income groups and whether they are a matter of socio economic class rather than income. Some of these may be obvious. On the whole, people in higher social groups are much more likely to visit the opera house or even the ballet than people in lower groups.

Whilst the stereotypical football supporter might include older working class males, supporters of main clubs, such as Chelsea (perhaps because of the high price of tickets), are much more likely to be higher wage earners, often in their 30s or 40s. Therefore, looking at demand to and from sporting events in order to have some type of idea of socio-economic class may have greater impact when trying to forecast demand of different modes of transport.

### *Time Series Data*

Transport economists often use time series data such as those found in *Transport Statistics* (an annual publication issued by the Department of Transport). If, however, we are using them for forecasting, it is sometimes better to look at disaggregated data rather than aggregated data since some trends might not be as likely to continue in the long-term, which would affect our forecasts. The number of car trips made by women drivers increased by 13% between 1996 and 2004, whereas those made by men decreased by 7% in the same period. If we were doing a long-term forecast, we might assume that the number of trips made by women would increase to the point where there were similar numbers of women and men drivers. This may occur as younger generations are much more likely to have this pattern than the more traditional pattern of male drivers and women passengers.

Aggregated data may also conceal a number of different trends that may well be of interest in any case to both transport operators and government. The total number of air passengers may be important, but more important for the provision of airports will be where the passengers wish to go to and from. Clearly, if the majority of people wish to cross the Atlantic, this would tend to mean that we need airports to the West of the UK; whereas if the majority of passengers were wishing to go to and from the Continent, especially to Spain or Italy, it might well mean that we need greater capacity to deal with this in the South East of England.

### *Geometric or Arithmetic Growth Patterns*

Geometric growth means that we have the same percentage of growth in each year. In the case of China, the Gross National Product currently seems to be increasing by 10% per year. So, if we start with a base of 100 and increase it in the first year, it will rise to 110. In the second year, however, it will rise to 121 since there is 10%