

SOLUTIONS Symposium

## Economic Assessment of Transport Improvements

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## **Summary**

In this paper it is argued that conventional economic assessment of transport improvements are incorrect as it only focuses on the travel component of a transaction. The correct way of assessing transport improvement requires the inclusion of the total cost of a transaction, that is to say the price paid for a good or service acquired at the end of a travel as well as the cost of travel to obtain it.

## **Background**

Travel is a derived demand. Very rarely the act of travel in itself produces a benefit to the traveller. Most often it involves a disbenefit in terms of cost and time spent. The benefit of the act of travel is in the good or service obtained at the end of a trip.

Take for example a shopping trip. A shopper can make a short trip to a nearby corner shop or a longer trip to a shopping centre. In the first option travel is less costly but the goods obtained are more expensive. In the second option the travel is more expensive in terms of money and time but the goods obtained are less costly. The cost of the goods in a shopping centre is usually less expensive due to economies of scale that are achieved in large establishments.

If an analyst only looks at the travel component alone, it will miss the rationale of the traveller's behaviour. If the traveller chooses to go to a far away place to obtain a cheaper good, the cost of travel will have gone up and thus the benefits will be negative in the travel component. But if the end transaction is included in the assessment, the benefits will be positive and thus correctly estimated.

## Conventional assessment

The most widely used economic assessment of transport investment is cost-benefit analysis. It can be very sophisticated (see SACTRA 1999) but essentially entails the measurement of benefits obtained by travellers after implementing a transport investment and compared with the cost of the investment. The measurement of travellers' benefits is normally done by calculating the consumer (or traveller) surplus. The surplus is the difference between what the consumer is willing to pay and what he or she actually pays. The willingness to pay is described by the demand curve D in Figure 1. The Figure illustrates the case before and after the introduction of a transport improvement.

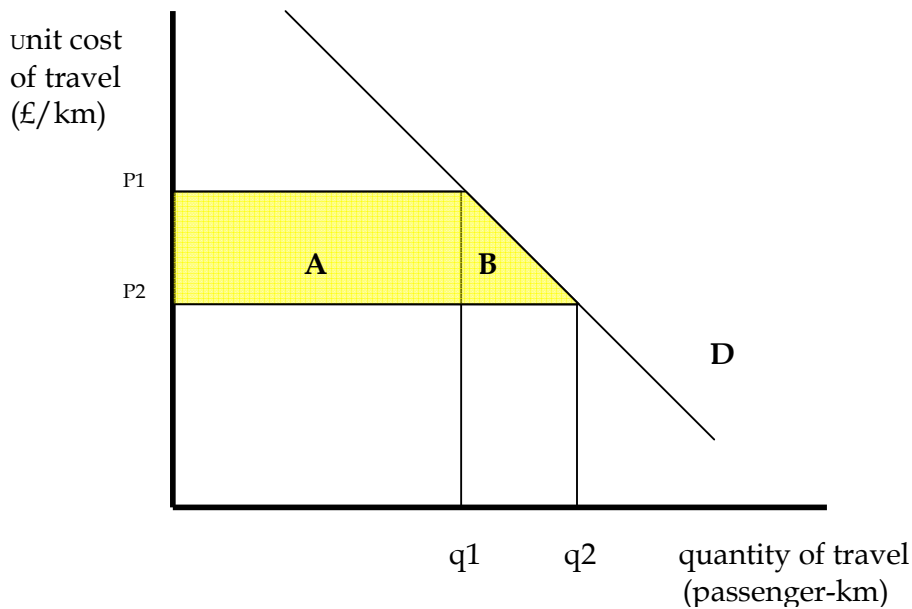


Figure 1 Travel consumer surplus of a transport improvement

Before the improvement in transport there is  $q_1$ , quantity of passenger-km travelling paying  $p_1$  for it (cost of travel plus time travel). After the improvement there is  $q_2$  passenger-km paying  $p_2$ . The area A measures the savings (difference between  $p_1$  and  $p_2$ ) by the passengers that used to travel before the transport improvement was

introduced. The area B measures the new travel that is induced by the drop in the cost of travel. The new travel can be the product of more people travelling or the same people travelling longer.

The expression that measures the benefits (shaded area) is as follows:

$$\text{Benefit} = \frac{1}{2} (p_1 - p_2) (q_1 + q_2) \quad (1)$$

### **The effect of congestion**

In many cases a transport improvement is only short lived as the induced travel produces an increase in congestion that could, in extreme cases, increase the cost of travel to the same level as before the improvement was introduced. For example, adding an extra lane to a motorway may reduce the cost of travel by increasing the speed of travelling in the short term. But as traffic increases, congestion creeps in, reducing the benefits obtained. In some cases the unit cost before and after can be the same, making the resulting benefits in equation (1) equal to zero (as  $p_1 = p_2$ ). This result provides the justification for people claiming that there are no benefits in increasing transport capacity as it fills up with cars. This is clearly wrong as after the improvement there are more persons-km, who must obtain a benefit, if not, they would not travel. The problem is in the method of measuring the benefits.

### **A more correct form of Assessment**

A more satisfactory method of assessing the benefits of a transport improvement should include not only the unit travel cost in the y axis but also the cost of good or service acquired at the end of the travel. If both components are included the measurement of benefits will be correct even if the cost of travel component is equal in the after situation, as illustrated in Figure 2.

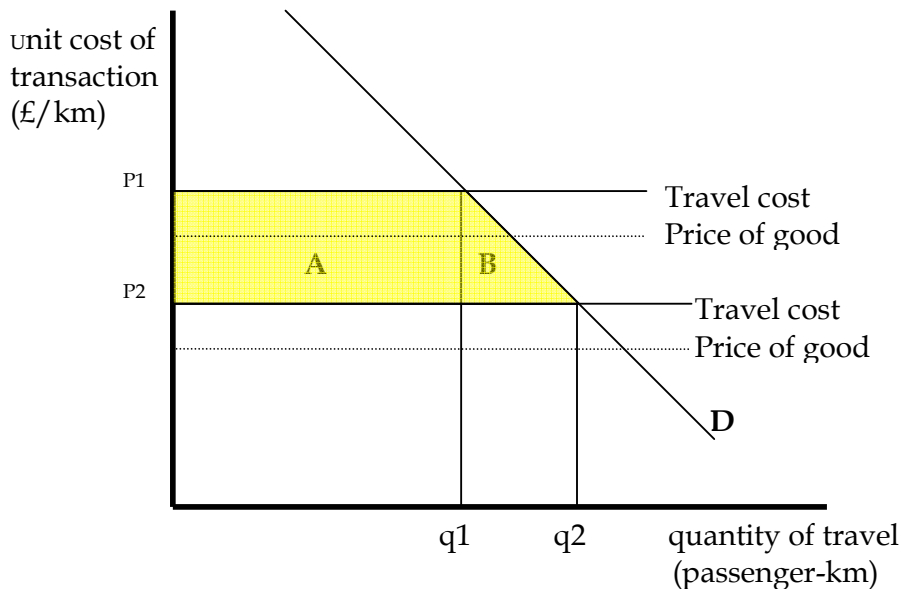


Figure 2 Transaction consumer surplus that includes travel and the cost of the good or services obtained

By improving transport a traveller can access a larger number of suppliers, and because of competition, prices can be lower (see Echenique 2004). The same reasoning is used by Venables and Gaslorek (1998) to estimate the effect of transport improvement in the presence of imperfect competition.

### An illustrative example

The largest numbers of trips that occur in a day are those for the purpose of going to and coming back from work. A person employed at a place can travel a short distance, incurring a relatively low cost of travel (out-of-pocket and time cost), but pays a higher rental for housing at the end of the journey. Alternatively, the person can spend more cost by travelling longer but finds a lower rental for housing at the end of the journey. Alonso (1964) has analysed these choices for the traveller.

The reason why the cost of rental drops with distance from a centre is because the area increases at the square of the distance, thus introducing a larger supply of land.

The cost of land is one of the main determinant of the final price (or rental) of a house.

Transport improvements in new railways were a clear determinant of the location of housing during the beginning of the twentieth century in the UK. For example, the Metropolitan line in London reduced the travel time from the centre to the suburbs. People took advantage of the reduction in travel cost and acquired cheaper houses on the periphery.

Today, an improved road capacity can open up land on the periphery of a city, offering housing at competitive prices. In the long run, the increase in travel distance may reduce the original advantage, but if the combined travel and rental cost is lower than before the improvement, there will be benefits.

### **Measuring overall benefits**

Each trip in an area incurs a transaction cost. The transaction cost includes the transport and associated cost of buying a good or service. For each trip purpose such as journeys to work, to shops, to recreation, etc., the monthly transport cost (including time and comfort) should be added to the monthly cost of renting a house or buying the monthly shopping goods or recreational services, etc. For each pair of zones and purposes, the transaction cost can be estimated before and after the introduction of a transport improvement. The benefits obtained by a change in the transaction costs can then be calculated by consumer surplus. The summation over all pairs of zones and purposes will give the total monthly benefit of the transport improvement.

### **Conclusion**

In this note it has been argued that measuring economic benefits by calculating the changes in the cost of travel is not correct as it ignores the cost of the good or service acquired for the purpose of the travel. A correct way of measuring the benefits needs to estimate the total transaction costs which include the cost of the good and service

as well as the cost of travel. By adding up all the charges in transaction costs a more satisfactory measure of overall benefits is obtained.

This method requires, however, the estimation of prices of goods and services before and after the introduction of a transport improvement. Only models that are able to estimate these price changes are the ones that can be utilised for assessing correctly the economic benefits of transport.

## **References**

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