Unit 4

Transport Demand Elasticity

Transport economics [TEC711S]
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Learning Outcomes:

On reading this unit, you will learn about:

– The importance of an understanding of elasticity of demand in the planning of transport services and the analysis of transport markets
– Elasticity of demand and the three main types of elasticity of demand relevant to the transport sector in the form of own price, cross price and income elasticity
– The major determinants of own price elasticity of demand for transport
– The significance of own price elasticity of demand and the revenue of the firm.
• INTRODUCTION

• As a general rule, when the price of any good or service rises the quantity demanded will fall.

• What is important is not the fact that demand will fall (as that is given by the basic law of demand) but rather by how much the quantity demanded will fall, and thus how price sensitive are consumers in the market? For example, how sensitive are people to purchasing train tickets if the fare was to rise by 2 per cent, 5 per cent or even 20 per cent?

• The answer lies in the concept of price elasticity of demand, as this indicates the responsiveness of passengers or potential passengers to changes in the prices on offer

• A general definition of elasticity of transport demand is the responsiveness of demand for a transport mode to a change in one of its determinants.

• Changes doesn’t just occur in price but as well as Income and Cross-price elasticity of demand; of which all would be discussed in this unit
**OWN** PRICE ELASTICITY OF DEMAND FOR TRANSPORT SERVICES

- **Definition**: is the consumers’ demand responsiveness to changes in the price

\[
\text{Price Elasticity of Demand} = \frac{\% \Delta D}{\% \Delta P}
\]

that is; PED = \frac{\% \Delta D}{\% \Delta P}

- A rise in price (a positive figure) will cause a fall in the quantity demanded (a negative figure) aside from `Giffen`good

- Where the price elasticity is greater than negative one (-1); is known as Elastic Demand
- Where PED is less than negative one (-1); is known as Inelastic Demand

- in the case of **elastic demand** this would indicate that consumers are relatively price sensitive, whilst inelastic demand that consumers in the market have a relatively **low level of price sensitivity**.
Perfectly price elastic demand

A substantial increase in price would result to demand fall to zero

PED = ∞
Perfectly price inelastic demand

- consumer behaviour is completely unaffected by changes in the price.

- PED = 0
- i.e. \( \frac{\% \Delta D}{\% \Delta P} = \frac{0}{25\%} = 0 \)
Perfectly price inelastic demand

• A change in price would produce absolutely no change in the quantity demanded, i.e. consumer behaviour is completely unaffected by changes in the price. They will purchase exactly the same quantity of the good whether the price rises or decreases. This extreme case is known as perfectly price inelastic, as shown by the figure above.

• Where demand is perfectly inelastic, then no matter the price, consumers will purchase exactly the same quantity of the good or service, i.e. the demand curve is vertical e.g. an increase in fare of transport from N$8 to N$10 would result in no change in quantity demanded

• Price Elasticity of Demand is equal to zero
Unitary Price Elastic Demand

- demand falls in direct proportion to the change in price
- PED = -1
Determinants of price elasticity of transport demand

- The number and closeness of alternative modes of travel (substitutes)
- The proportion (and timing) of disposable income purchased on the mode of travel
- The time dimension.
The number and closeness of alternative modes of travel (substitutes)

- The higher the number of alternative modes available and the closer they are in meeting the same basic travel need, the higher will be the price elasticity for a particular transport service. If I use the Intercape Bus service to travel to oshakati, and “Intercape” should increase its price then I am far more likely to switch to an alternative mode if that alternative is readily available. If “Silas Ndapuka bus service” left from the same stop one minute later and took the same journey time, then for this particular trip that would be an almost perfect substitute for “Intercape” I could easily make the switch to “Silas Ndapuka bus service”.
The proportion (and timing) of disposable income purchased on the mode of travel

• We have seen income already as a determinant of demand, i.e. the quantity purchased.
• The proportion of income spent, however, is also a determinant of price elasticity of demand.
• It refers the proportion of disposable income as opposed to net income, i.e. income after tax has been paid.
• In simple terms, the higher the proportion of disposable income spent on the mode of travel, then the higher the price elasticity of demand.
Time dimension

- In the short term individuals are tied in to using a certain company’s products or services; however, time may bring about a change in behaviour.
- To use Yellow Bus Company example, while this was the only service in the short term one would have little choice but to use their service,
- hence price elasticity of demand would be relatively inelastic.
- In the longer term, however, one may decide to purchase a car or alternatively another bus company, such as Intercape, may decide to start up a competing service.
- In this case demand would be more elastic.
- Time therefore is an important dimension in determining price elasticity of demand as elasticity can vary between the short and long run.
Price elasticity, total revenue and demand curves

• The preceding section has shown it to be a mechanism for assessing the extent to which consumers will react to changes in the price or other demand determinants of transport service.
• In order to throw more lights to elasticity of demand lets analyse the following implications.
• A company’s total revenue from selling a good or service can be found by multiplying the quantity sold by the price of each unit sold.
• If for example 100 units are sold at N$5 each, then total revenue would simply be N$500. In a more generic form, this could be written as P * Q, where P is the price (N$5) and Q is the quantity sold (100 units), as shown on the diagram below the area of the rectangle outlined by points 0, Pa, a and Qa shown in light grey in Figure is the total revenue received from selling at price Pa ($5 x 100 = $500)
Price elasticity, total revenue and demand curves

Illustrating total revenue using demand curves
Revenue = Price X quantity sold
• If the price was to increase to Pb, then we could show the gain and loss in revenue such a price change would bring about.

• If the firm was to increase price, it would sell less units (basic law of demand), but would receive more per unit sold, hence the overall impact this would have upon total revenue would not be known. This is illustrated by the following Figure.
Illustrating changes in total revenue using demand curves
• if the firm was to sell at price Pb, it would sell quantity Qb and the total revenue would be given by the rectangle outlined by 0, Pb, b, Qb.

• What you should be able to see is that there is a common area shared by these two different scenarios.

• That is the cross-hatched area above and labelled unimaginatively as the ‘Common Area’.

• In effect, that proportion of revenue will accrue to the firm if it applies price Pa or price Pb.
If however the firm was to increase its price from Pa to Pb, then it would not receive the revenue in the area labelled ‘Loss in Revenue’ as it would be selling less units overall.

This ‘loss’ however would be offset by a gain in the revenue received for each unit sold, labelled ‘Gain in Revenue’

The key issue to be examined is the balance between the gain per unit sold and the loss from selling less units.

You should be able to see that in this example the area of the gain is greater than the area of the loss.

Hence increasing price from Pa to Pb will lead to an increase in total revenue. This is because demand is relatively inelastic.

If however this example had concerned a cut in the price from Pb down to Pa, then total revenue would actually have decreased.
The effect on revenue of price changes of a relatively elastic good
Relatively elastic demand

• In this example, a rise in price from Pa to Pb will reduce demand from Qa to Qb, with the loss in revenue given by the area Qb, c, a, Qa and the gain shown by the area outlined by Pa, Pb, b, c.
• In this case, therefore, the increase in price has led to a decrease in total revenue.
• Note again that if the price change had been the other way around, then total revenue would have increased.
CROSS PRICE ELASTICITY

Definition: a measure of the effect of a change in the fares or rates of one mode of transport or transport operator on the demand for the services of another mode/transport operator.

\[
\text{Cross price Elasticity} = \frac{\%\Delta DA}{\%\Delta PB}
\]

Percentage change in quantity demanded of service A
Percentage change in price of service B

CPED = \-------------------
\%\Delta DA
\%\Delta PB

- Examination of cross price elasticity of demand therefore involves examining two goods or services

- CPED could be examined at different levels: two different modes of transport e.g. car and bus and lastly a single operator with variety fare structure for the same journey but different standards of service

- For example a train operator could examine the quantity demanded of their standard service versus the first class fare charge
• Cross price elasticity of demand also allows a distinction to be made between substitute goods and services and complementary goods and services

• If the effect of a price increase in one good has a positive effect in terms of the demand for another, then these two goods or services would be considered to be substitutes. For example, say a ↓ in the subsidy paid to rail operators caused an ↑ in the price of rail services

Cross price elasticity of demand, substitutes
• **Note**: For substitute transport services, cross price elasticity will always be positive. As the price of one service rises, demand for the alternative service also rises and vice-versa.

• The cross price elasticity of demand will be negative for goods and services that are complements.

• the higher the negative value, the more the two goods are interdependent

• the value is around zero however, this indicates that the two goods are completely independent, i.e. neither substitutes nor complements.

• for example lets consider a case of complementary goods in transport i.e cars and petrol

• Substitutes leads to a positive change while complementary would lead to negative change
INCOME ELASTICITY

Definition: Income elasticity of demand is a measure of the responsiveness of demand to changes in income.

\[
\text{Income elasticity} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}
\]

\[
\text{YED} = \frac{\%\Delta D}{\%\Delta Y}
\]

- When income elasticity is measured, it is not the total income of consumers that is used in the assessment but rather disposable income, i.e. net of income tax.

- In the short term, income elasticity for bus travel is negative, and hence as real incomes increase consumers will use other forms of transport, most notably the private car.

- In the longer term the income elasticity of demand for bus services is likely to become less negative due to social effects like congestion, pollution and land use.