IPART
New South Wales

Independent Pricing and Regulatory Tribunal

Elasticities

Final Report – Information Paper 9

Introduction

The price elasticity of demand is a key input to our fare optimisation model. In general, a price elasticity measures how responsive the demand for a good/service is to changes in its price. For example, a price elasticity of -0.5 means that for a 1% increase in price there will be a 0.5% decrease in the quantity demanded.

For public transport, there is a range of substitutes or complements available in Sydney and surrounds. For example, instead of a bus, passengers may be able to travel by private car, rail, light rail or ferry. In addition, instead of travelling in the peak, they may be able to travel in the off-peak.

Given these choices, we needed to estimate three elements of the price elasticity of demand for each mode of transport:

- **Own-price elasticity** – the change in demand for a service when its own-price changes
- **Modal substitution** – the change in demand for other services when the price of a particular service changes
- **Time-of-day substitution** – the change in demand for a service in different time periods when the price in one period changes.

The following slides outline the estimated price elasticities and rates of substitution we used to model optimal fares.

Own-price elasticities

Own-price elasticities used to model optimal fares

	Peak	Off-peak
Rail	-0.35 (-0.31 to -0.38)	-0.44 (-0.39 to -0.49)
Bus	-0.38 (-0.35 to -0.42)	-0.51 (-0.45 to -0.57)
Ferry	-0.38 (-0.27 to -0.48)	-0.48 (-0.36 to -0.60)
Light Rail	-0.38	-0.51

- For rail, bus and ferry, the ranges shown above are based on results from the Sydney Strategic Travel Model (STM) for 2016 for a 20% fare change
  - The low point of the range is the elasticity from a 20% fare increase
  - The high point of the range is the elasticity from a 20% fare reduction
- For light rail, we set the own-price elasticity in line with that for buses as the STM results did not allow us to separately identify elasticity values for light rail
- These estimates are fairly consistent with the literature but are higher than the previous set we obtained from STM runs (BTS recently moved to a new version of the STM)

Substitution between modes of public transport, and between public transport and cars

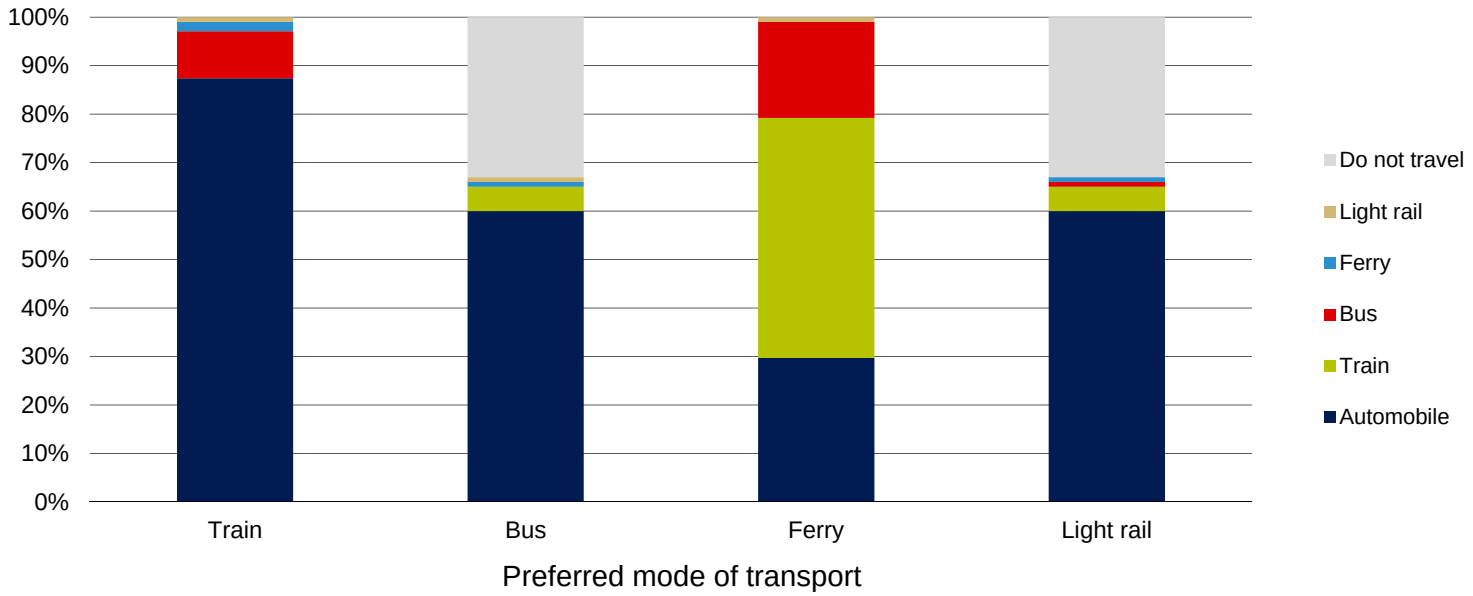
Modal substitution rates used to model optimal fares

	Train	Bus	Ferry	Light rail
Automobile	-0.90	-0.60	-0.30	-0.60
Train	1	-0.05	-0.50	-0.05
Bus	-0.10	1	-0.20	-0.01
Ferry	-0.02	-0.01	1	-0.01
Light rail	-0.01	-0.01	-0.01	1

- These are our best estimates of how readily people switch their travel between different modes of public transport in response to price changes and between each of these modes and car (automobile) travel
  - We assume that people do not shift to a different time period and that they continue to make journeys of the same distance
  - These assumptions are based on outputs from previous STM model runs provided by the Bureau of Transport Statistics using STM version 2
- We have also used assumptions about car occupancy rates obtained from BTS to take into account that some people drive (a totally new automobile journey) and some travel as passengers

What people do if they don't use their preferred mode of transport

Based on the modal substitution rates in our model



How to read this chart:

- On average – if train travellers did not use the train, 87% would travel by car instead, 10% would go by bus, 2% would go by ferry and 1% would go by light rail.
- On average – if bus travellers did not use the bus, 60% would travel by car, 5% by train, 1% by ferry and 1% by light rail. 33% would not travel at all.

Time-of-day substitution

- To model peak and off-peak fares, we needed to make an assumption about how people substitute travel between peak and off-peak times of day in response to fare changes.
- We do not have good empirical data on this.
- Therefore, we used a time-of-day elasticity of -0.1 for all modes:
  - Theoretically, it will be between zero and -1
  - The persistence of crowding and congestion in peak hour on all modes suggests it is closer to zero than to -1