What actually happens when fares change

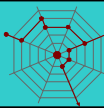
Experience from the introduction of free concessionary bus travel

Second Minnerva Seminar on Modelling Challenges

11th April 2008

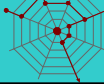
Andrew Last

Minnerva Ltd



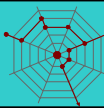
Structure

- Concessionary fares
- Role of elasticities
- Principal impacts observed to date
- Implications for modelling



Concessionary Fares

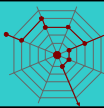
- Basic concept – public subsidy to reduce the public transport fare paid by selected passenger groups
  - principally, older and disabled passengers, children
- Was entirely at discretion of local Councils but now mandatory:
  - from April 2001, half fare for older and disabled bus passengers off-peak in their own area
  - April 2006, free concession for older and disabled, own area only
  - April 2008, free concession anywhere in England (but still bus only, and off-peak)
- Expenditure on reimbursement of bus operators about £1 billion in 2008-9 in England
  - doubled in 10 years



Reimbursement of bus operators

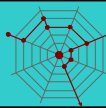
- Objective is that operators should be reimbursed so that they are “no better off and no worse off”
  - reimbursement for revenue forgone
  - reimbursement for additional costs
- Needs assumptions - how much travel has been “generated” by the low/free fare compared with the “commercial” fare?
  - volume of travel?
  - length of trip?
  - what fare would have been paid?
- And also - how would service levels have changed if no generated travel?
- Hence need for demand models and elasticity estimates

Note: reasonable (-ish) data on concessionary trip volumes, because this is used to calculate payments due to operators, but on not much else

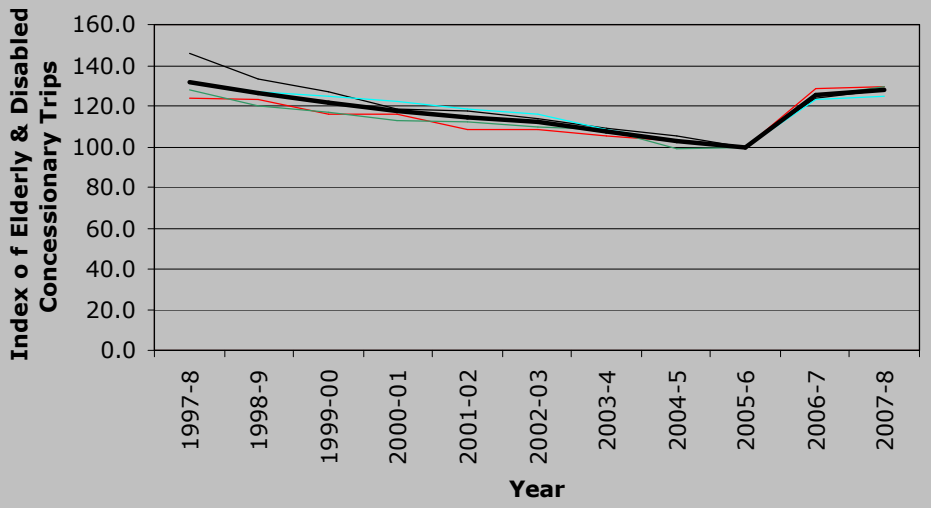


Role of elasticities in transport planning

- Use in simple forecasting models
- Sense checks for outputs from more complex multi-modal models
- Elasticities related to other model parameters implicitly or explicitly
- Succinct way of summarising sensitivity of passenger responses to supply-side changes
  - hence substantial body of academic work that focuses on elasticity values e.g. “Demand for Public Transport”
- But!
  - many different definitions of elasticities
  - poor reporting of fare levels at which elasticities are measured



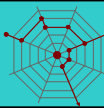
So what has happened?



Analysis by MVA for pteg of data from GMPTE, Nexus, Metro and SYPTE

In the 4 PTE areas that went to “free”…

- Before April 2006, a variety of concessions, typically flat fare of about £0.40
  - note: Centro and Merseytravel already provided free travel
- Headline change ’06-07 trips from ’05-06 of +25%
  - relatively uniform: range 23.5% to 28.6%
- Increase in pass take-up of about 6%
  - already fairly high e.g. 70% to 80% of those eligible
- Underlying trend of long term decline in usage of 1% to 2%

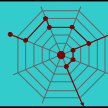


Elasticity implications

- Depends!
  - on the assumed relationship between demand and fare i.e. what demand model
  - and what elasticity definition is used
  - and (for most demand models) at what fare the elasticity is measured
- DfT guidance on operator reimbursement is to use a negative exponential model with elasticity proportional to fare
- Change in trips in PTE area implies typical fare elasticities at £1.00 fare of -0.5
  - range of -0.495 to -0.569
  - very sensitive to assumptions about trends and “new passholder” effects
- Higher value (in absolute terms) than typical “default” bus fare elasticities

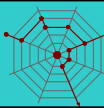
  e.g. previous DfT recommended central value for Met areas of -0.4
- With –ve exponential model, fare elasticity heavily dependent on the fare at which it is calculated

  e.g. - 0.25 at £0.50, and -0.75 at £1.50



Outside the PTE areas…

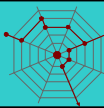
- Wide variety of types of area
  - a few larger urban areas, smaller urban areas, rural districts
  - wider range of availability of bus service and hence varying propensity to use bus
- More variable data quality
  - reliance on operator-provided data rather than comprehensive, continuous survey
  - consistency of data reporting by operators likely to be affected by change from cash transaction to free travel
- Many Travel Concession Authorities (Shire Districts or Unitaries outside Met Counties) with very poor historic data and no technical expertise



Headline results from some non-PTE schemes

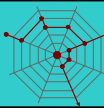
- Increase in concessionary journeys of up to 93% (and minimum of 50%) – average 65%
- Substantial increases in numbers of passholders – up by 30% or more
- Change in trips by “old” passholders (who did not obtain a pass because of the free concession) of between 30% and 45%
  - this is the best basis for calculating elasticities
- Elasticities at £1.00 of between -0.45 and -0.63, with average of -0.55
  - measured assuming DfT negative exponential model

Based on analysis by MCL for local authority clients

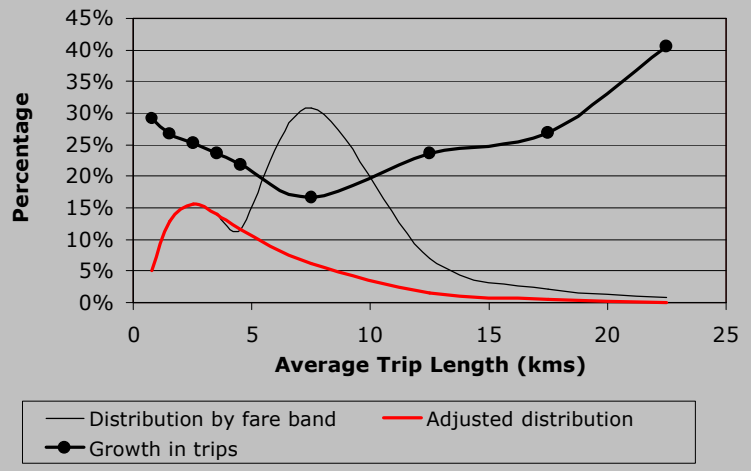


Impacts on trip lengths

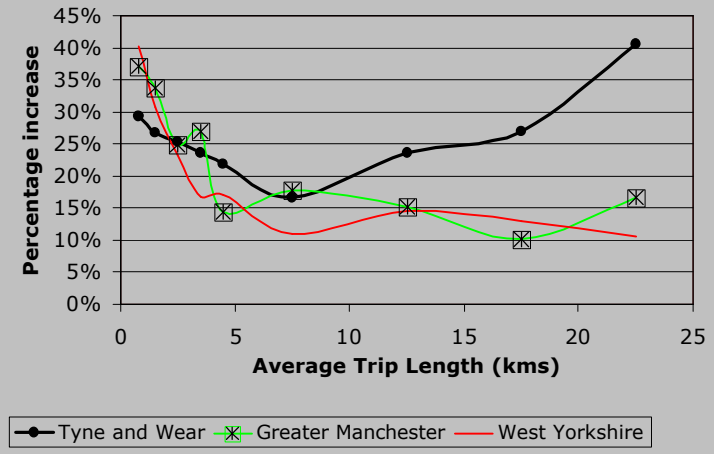
- Slight reduction in average trip length in PTE areas
  - PTE surveys explicitly measure trip length
  - reductions in average length of -1% to -4%
- Very substantial increase in average trip length in Countywide schemes
  - average 17%, and up to 28% increase in average value of concessionary trips after allowing for fares increases
  - but note reliance on fare value of trip as measure of length
  - very difficult to get more detailed data
- Different impacts probably reflect different trip length distributions in large urban areas compared to Shire counties



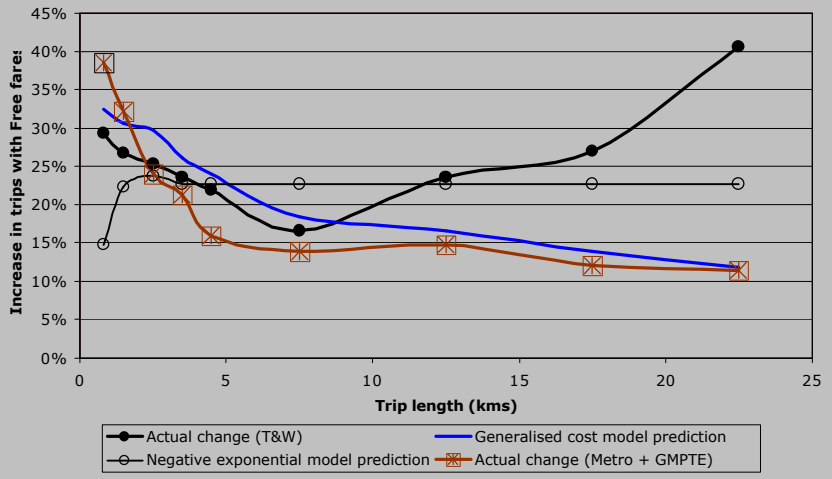
Trip length distribution in Tyne & Wear…



Changes in trips in PTEs areas…



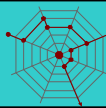
Using aggregate (single-elasticity) models to replicate pattern of change…



Dangers of relying on aggregate data and average characteristics…

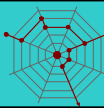
Elasticities from identical data on trips (e.g. T&W)

- Negative exponential model calibrated on aggregate data: fare elasticity of -0.49 at £1.00
- Constant GC elasticity formulation gives GC elasticities of
  - -1.50 if calibrated on aggregate data ("County-wide"), but
  - -1.40 for trips of less than 10 miles
  - -2.36 for trips longer than 10 miles
- Fares elasticities at these points
  - -0.44 for trips of less than 10 miles
  - -0.75 for trips longer than 10 miles
- All of these elasticity values heavily conditioned by:
  - underlying trip length distributions
  - underlying distribution of actual and potential trip destinations
  - assumptions about non-fare components of generalised cost



Long term impacts

- Data shown here is for first year after the change to free fares: second year of data (2007-8) indicates further growth
- Reflects impact of change in fares on longer term travel choices
- Particularly significant since reimbursement guidance now appears to be recommending long run elasticities rather than short run elasticities
- Variable picture of second year of growth:
  - in PTE areas, additional growth of 1% to 5%
  - in County areas, reports of additional growth of as much as 20%

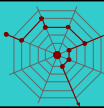


Implications for modellers

- Elasticities are useful measures for summarising sensitivity of passenger response to fare changes

But

- Gross simplification – better descriptive measure than predictive tool
- If used at an aggregate level, will hide lots of things going on beneath the surface
- Multitude of elasticity definitions – may or may not be associated with well defined demand curve assumptions
- Specific values likely to be associated with specific fare values (but may not be measured/quoted)



More generally…

- Figures quoted here are all for older and disabled concessionary bus passengers only – generalise with care
- But insights about what has happened should be of interest to all transport modellers:
  - increases in bus trips
  - probably reductions in walk trips, possibly also in car trips
  - changes in trip destinations
  - changes in trip frequencies
  - changes in attitudes and social habits
- Further change to the concession with effect from April 2008, and potentially more to come