V. Fares and Revenue: Policy, Analysis and Collection

Public Transport

Planning and Regulation:

An Introduction

Planning and Analysis Building Blocks

Schedule Building

Cost Analysis and Financial Planning

Performance Analysis

Measures & Standards

Service Monitoring and Data Collection

Network and Route

Focus of Discussion

Fares and Revenue: Policy, Analysis, and Collection

Market Factors and Demand Analysis

Terminology and Basic Relationships

How Should Fares Be Set?

- **Based on public policy**
  - **Financial sustainability**
  - **Equity**
  - **Social and environmental functions of public transport**
- **Reflect quantitative analysis**

Affordability Index

Measure	**Bus Fares for 60 Monthly Trips as a Percent of Average Per Capita Income for the Poorest 20 Percent (Quintile) of Population**
Standard	**Maximum of 10%**

World Bank Technical Paper 68 ***Bus Services: Raising Standards and Lowering Costs***
World Bank Transport Papers TP-3 ***Affordability of Public Transport in Developing Countries***

Public Policy Alternatives

- **Market-based fares with no government oversight**
- **Cost-based fares with reasonable profit and government oversight**
- **Publicly-subsidized fares to meet social and other objectives**
  - **All riders**
  - **Targeted, e.g., disabled, students**

Fare Considerations

- **Fare Revenue Requirements**
  - ***How much of costs should users cover?***
- **Fare Structure and Levels**
  - ***How much should user charges be?***
- **Fare Collection**
  - ***How can users pay for their trips?***
- **Fare Integration**
  - ***How should fares be paid for trips involving transfers?***

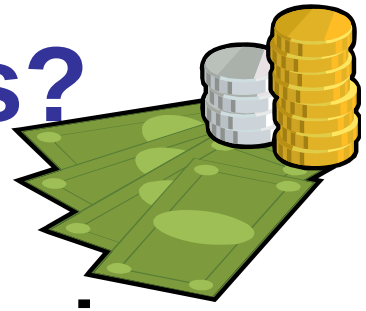
Subsidies

- Why?
- How?
- Issues

Why Subsidies?

- **Affordability**
  - **Provide mobility for all regardless income**
    - **All US, EU, and Chinese, some Indian cities)**
- **Managing externalities**
  - **Congestion (e.g., London)**
  - **Pollution (e.g., Beijing)**
  - **Economic, social development (e.g., Accra, Ghana)**
  - **Sustainable land use (e.g., Toronto)**

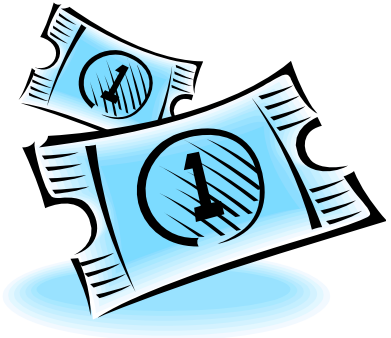
How to Provide Subsidies?



- **Cross subsidization within enterprise**
  - Across routes (Bangalore)
  - Across types of service (TransMilenio)
  - From PT related activities (Hong Kong)
  - From other business activities (Mumbai)
- **Public payments to operators**
  - Line item in government budget (Argentina)
  - Dedicated sources of funds (France, US)
- **Direct payments to users**
  - Employer (Brazil, US, Canada)
  - Social agencies (US)

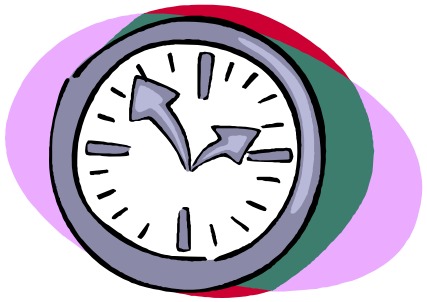
Policy Issues

- **Leakage**
  - **Wrong people get subsidized**
- **Incentives for operators**
  - **Positive: Can use conditional subsidies to promote efficiency and effectiveness (US)**
  - **Negative: Can promote inefficiency (China)**
- **Financial sustainability and reliability**
  - **Can government continue to make payments as costs grow? (An issue in most places)**



Basic Fare Structures

- **Flat Fare**
  - **The same fare is charged for all trips regardless of distance or service quality (New York, Paris)**
- **Distance-Based**
  - **Higher fares are charged for longer distances (India, Washington)**
- **Service Quality-Based**
  - **Higher fares are charged for higher quality service (Seoul, Korea)**



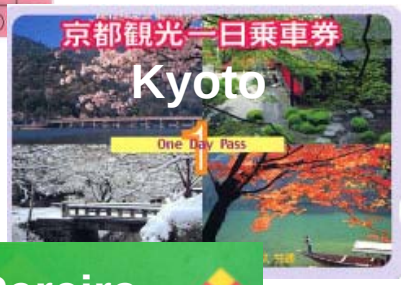
Time-of-Day Fares

- **Approach:**
  - **Charge higher fares in peak periods than in off-peak periods**
- **Two objectives**
  - **Shift peak users to off-peak periods to reduce peak demands and better use off-peak capacity**
  - **Increase off-peak riding by offering lower fares**
  - **Examples: London, Washington**

Fare Collection

- What media?
- Who sells?
- When sold?
- Effects on service and operations?

Fare Media



- Cash
- Tickets/tokens
- Stored value cards
  - Time (pass)
  - Trips (punch, tear-off)
  - Money
- "Smart"/Integrated circuit cards
  - Public transport only
  - General purpose (Singapore)

Sales and Collection

- **Media Sales Options**
  - Driver/conductor/station agent
  - Third party (e.g., shop, kiosk)
  - Automated (e.g., vending machine, Internet)
  - User “convenience” dictates broad availability
- **Collection Options**
  - Driver/conductor/station agent
  - Contractor hired by government
  - Automated (e.g., station *and/or vehicle* turnstiles)
  - Proof-of-Payment

Payment Time Frames

- **Prepayment**
  - Operator receives payment before service provided
  - Best “cash flow” option for operator
- **Time-of-service**
- **Post Payment**
  - Operator receives payment after service provided
  - Common for concessionary fare compensation
  - Worst “cash flow” option for operator

Fare Payment Affects Boarding and Travel Times

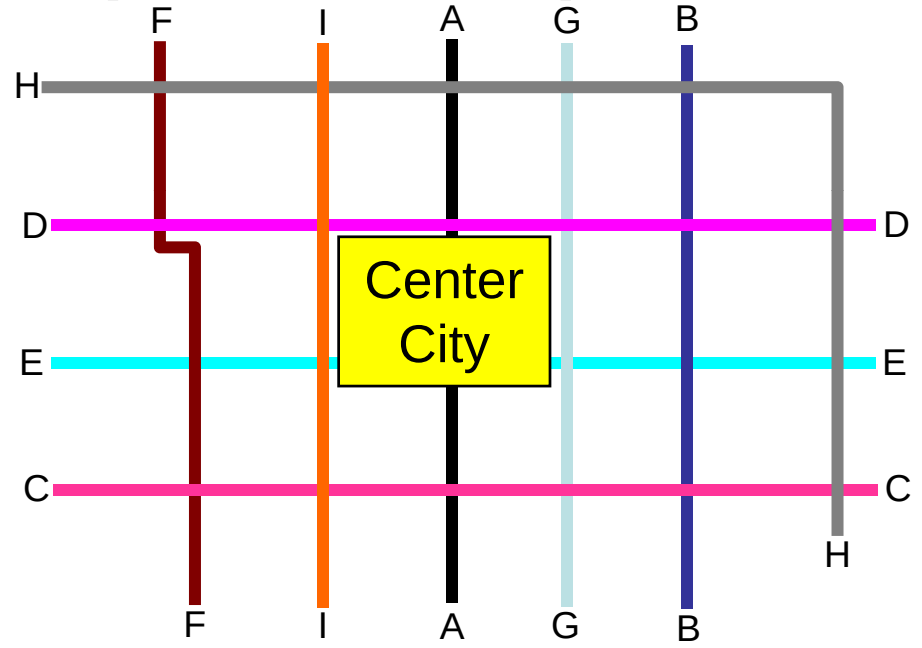

Pereira

- **Ways to Speed Fare Payment**
  - **Encourage use of prepaid media**
    - **Tickets, tokens, passes, smart cards**
  - **Implement off-vehicle fare payment**
    - **Enclosed area for waiting passengers who have paid**
    - **Proof-of-payment plan**
  - **Change passenger exiting**
    - **Encourage exiting by rear (non-paying) door**
    - **Use double-flow doors**

Bangalore

Fare Integration

- **Important to riders who must use more than one route (transfer) to complete their trips**
- **User Perspective**
  - **Price**
  - **Psychology**
  - **Understandability**
  - **Convenience**



- **Operator Perspective**
  - **Fares paid in proportion to cost of service**
  - **Administrative effort and costs**
  - **Fare evasion and shrinkage**

Should There Be a Discount?

- **A balance of views**
  - **Trips requiring more than one leg are longer and thus should cost more**
  - **No "double fare" penalty for transfers since riders that must make then receive poorer service**
- **Most public transport systems moving to free or discounted transfers, at least for some locations and interchanges**
  - **New York: Metro-metro, bus-metro**
  - **Paris: Bus-bus, Bus-Tram, RER-Metro within City of Paris**

Institutional Arrangements: Multiple Operators

- **Sharing fare revenues**
  - Issue when there are discounts
  - Allocation agreement needed
- **Audit and control**
  - Insure proper fares charged and collected
  - Insure fare revenues accurately reported
- **Fare collection mechanisms**
  - Most places moving to common electronic ticketing and collection

Facilitating Integration: Technology

- **Inexpensive IC cards**
  - **Can provide for nominal charge or free**
- **GPS/automatic passenger counters**
  - **Yield planning data and enhance revenue/cost management**
- **Inexpensive handheld ticketing machines and IC card data terminals**
  - **Facilitate on-board collection**

Fare Integration Examples

- **Singapore**
- **Hong Kong**
- **Paris**
- **London**

Singapore: EZ-Link Card

- Introduced in 2002
- 100% owned by public authority
- Administered by MasterCard
- Used for all PT public and private operators
- Features:
  - Multipurpose smartcard
  - Can be used in shops, restaurants, schools, recreational places, government agencies, health services, and kiosks
- Intermodal fare rebates (8% average)
- >95% fare transactions are through EZ-Link cards

Hong Kong: Octopus

- Introduced in 1997
- Joint venture of the major 6 operators
- Access includes taxis, ferries, and car-parks
- Features:
  - Multipurpose smartcard
  - Can be used in shops, restaurants, recreational places, and telephones
- Intermodal transfer discounts
- >95% of population use it.
- More than 11 m daily transactions, totaling > US$ 10.1 million!!!

Paris: Navigo

- Introduced in 2001
- 100% owned by a public joint venture
- Can be used for all PT modes, including rental bicycles
- On, off board payment
- No fare discounts for bulk purchases
- 16% of all fare transactions in Paris Region use Navigo cards

London: Oyster

- Introduced in 2002
- 17-year contract with private joint venture
- Can be used for all PT modes
- Features :
  - Some discounts on shops, museums, restaurants…
- Up to 60% fare discount for bulk purchases compard to single cash fare
- Over 80% of all mode fare transactions use Oyster cards

Fare Analysis Considerations

- **Explicit public subsidy policy (e.g., affordability)**
- **Characteristics of users and their travel**
- **Customer ability and willingness to pay**
- **Operation's efficiency and effectiveness**
- **Full operating and capital costs**

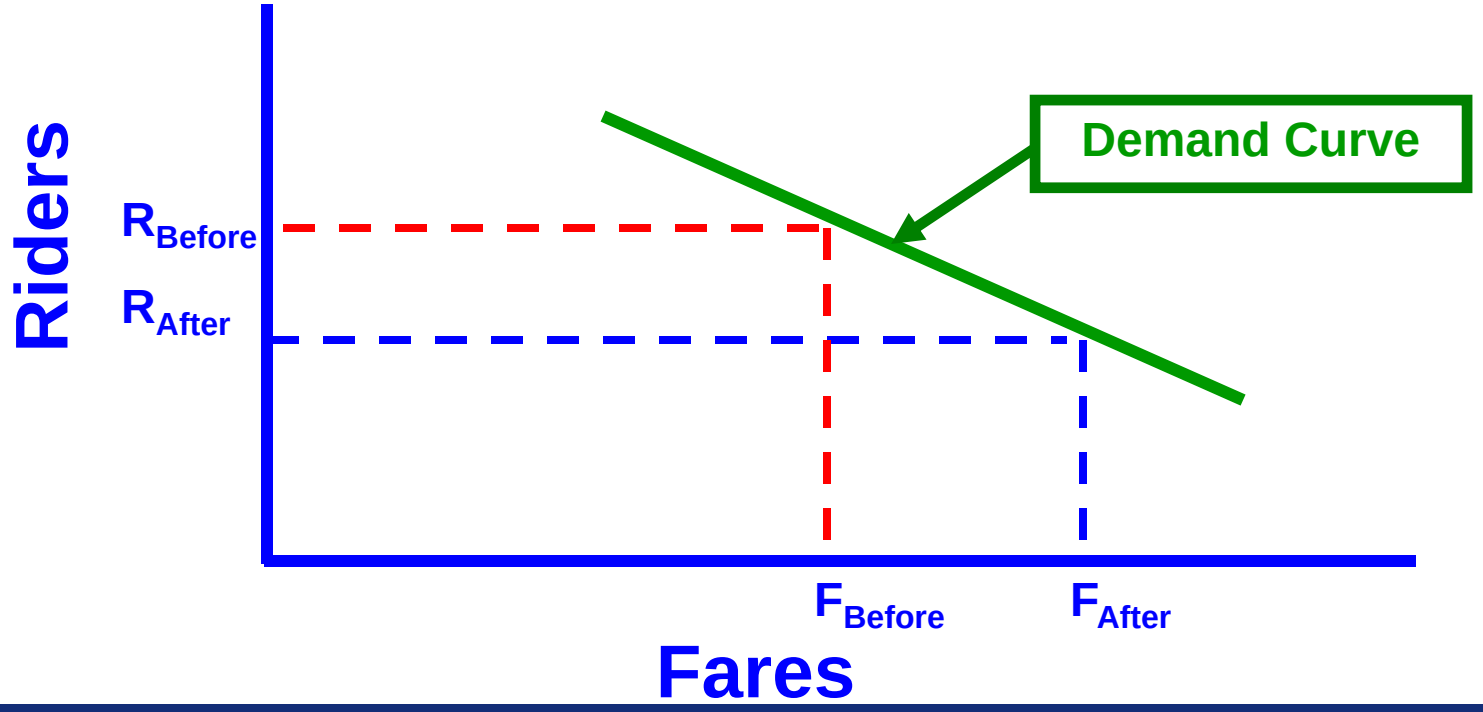
Quantitative Analysis

- **Can analyze response to fare changes using quantitative methods (e.g., elasticities)**
  - **By type of user and type of trip**
  - **Impact on revenues**
- **Significant, documented experience with fare elasticities from all over the world**
  - **TRL (UK), TRB (US)**
- **Stated preference surveys to provide more input into the analysis**
  - **Survey: *What will you do if fare increased to $X?***
- **"Affordability" analysis**

e Elasticity Models

Method

Elasticity is the ratio of the percent change in ridership to the percent change in a transit service parameter (e.g., fares, service levels)



Transit Demand Is "Inelastic" with Respect to Fare

- **Percentage change in demand less than percentage change in fares**
- **Most studies are from developed countries**
  - **Elasticities expected to apply to developing countries**
- **Mean value of fare e = -0.40**
- **Elasticities vary widely by market (type of customer, trip)**

Transit Demand Is "Inelastic" with Respect to Fare

Transit Mode	Bus	-0.35
	Rapid Rail	-0.17
Time Period	Peak	-0.17
	Off-Peak	-0.40
Trip Purpose	Work	-0.10
	School	-0.19

Applying Elasticity Models

1. **Select appropriate elasticity value**
   - **Historical experience in given city**
   - **Analogue "peer" experience**
   - **Given market (type of customer, trip)**

2. **Use selected elasticity value and the proposed change (e.g., increased fare, reduced service) to estimate future ridership**

Arc Elasticity Formula

$$e = \frac{\frac{(R_{After} - R_{Before})}{2}}{\frac{(F_{After} - F_{Before})}{2}}$$

R_{Before} = Ridership before fare change

R_{After} = Ridership after fare change

F_{Before} = Fare before fare change

F_{After} = Fare after fare change

Example of Elasticity, Ridership, and Revenue

Problem **ABC Transport has a fare of $1.00 and carries 1,000 passengers. What is the impact of raising the fare to $1.20?**

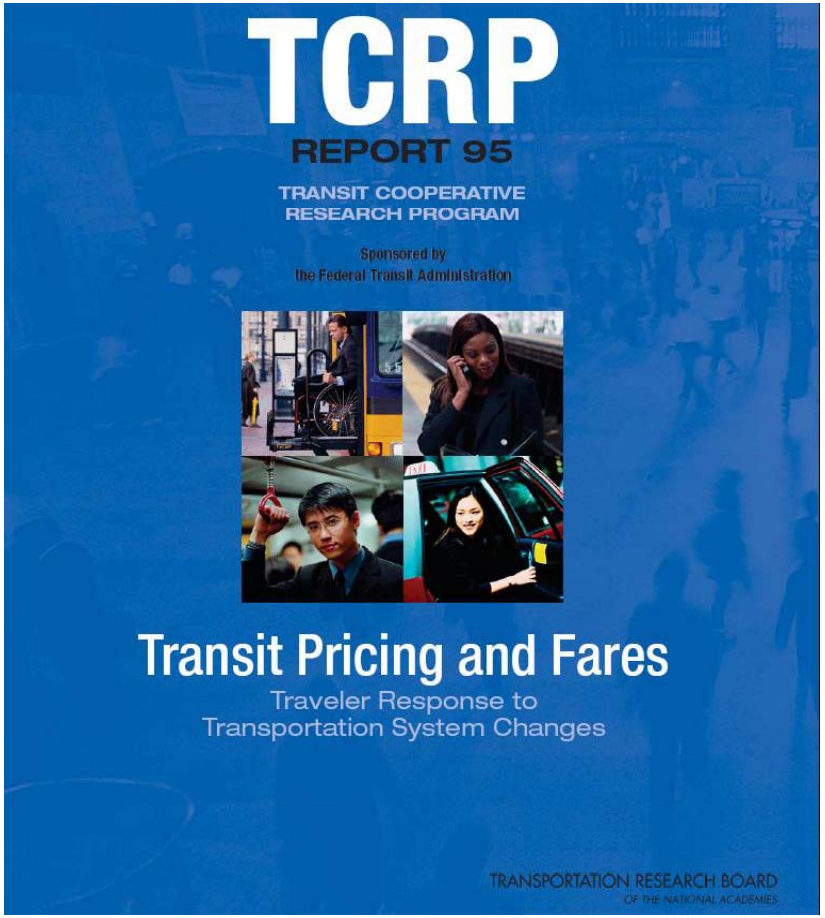
Solution

"Average" Transport

e	Riders	Revenue
0.20	964	$ 1,156,800
0.40	930	$ 1,116,000
0.60	897	$ 1,076,400
0.80	864	$ 1,036,800
1.00	833	$ 1,000,000
1.20	803	$ 963,600
1.40	774	$ 928,800
1.60	746	$ 895,200
1.80	719	$ 862,800

Inelastic

Elastic



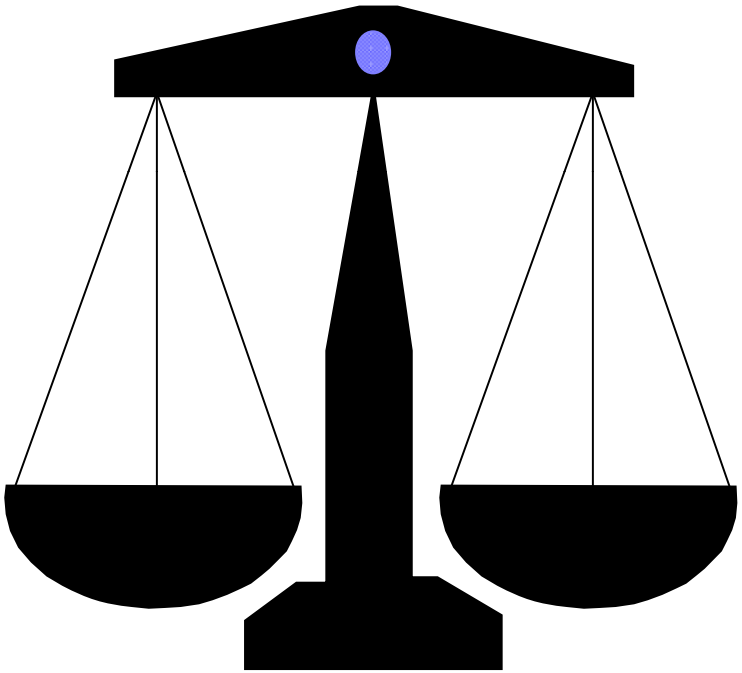
Elasticity Resources

and/or

The Demand for Public Transport, A Practical Guide
TRL Report 593

R. Balcombe, et al; Transport Research Laboratory, UK, 2004

Which Fare Approach is Best?



One that yields the required revenue and balances:

- **Equity**
- **Customer Understanding**
- **Administrative Ease**
- **Impact on operations, especially speed**
- **Revenue Security**

Summary

- **Described fare planning issues and design elements**

- **Design of a fare structure, payment/ collection approach is a “balancing act” that involves many considerations**

Simplicity is a virtue!

Charlie on the MTA: Boston Mayoralty Election Campaign Song RE High and Complex Public Transport Fares

1. Let me tell you the story
   Of a man named Charlie
   On a tragic and fateful day
   He put ten cents in his pocket,
   Kissed his wife and family
   Went to ride on the MTA
2. Charlie handed in his dime
   At the Kendall Square Station
   And he changed for Jamaica Plain
   When he got there the conductor told him,
   "One more nickel."
   Charlie could not get off that train.
3. Now all night long
   Charlie rides through the tunnels
   Saying, "What will become of me?
   Crying
   How can I afford to see
   My sister in Chelsea
   Or my cousin in Roxbury?"
5. Charlie's wife goes down
   To the Scollay Square station
   Every day at quarter past two
   And through the open window
   She hands Charlie a sandwich
   As the train comes rumblin' through.
6. As his train rolled on
   underneath Greater Boston
   Charlie looked around and sighed:
   "Well, I'm sore and disgusted
   And I'm absolutely busted;
   I guess this is my last long ride."
7. Now you citizens of Boston,
   Don't you think it's a scandal
   That the people have to pay and pay
   Vote for Walter A. O'Brien

Chorus:
Did he ever return,
No he never returned, and his fate is still unlearn'd
He may ride forever 'neath the streets of Boston
He's the man who never returned.

Kingston Trio Rendition (UTUBE)

http://www.youtube.com/watch?v=ujufZnN_uho