Appraisal of Taxi Fare Structure Issues

Prepared for IPART by
Booz Allen Hamilton

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

Appraisal of Taxi Fare Structure Issues

Prepared for IPART by Booz Allen Hamilton

Research Paper RP22

July 2003

ISBN 1 877049 61 1

This report was commissioned by the Independent Pricing and Regulatory Tribunal. The views expressed her are those of the author alone and do not reflect the position of IPART or the New South Wales Government. The author of this report is Booz Allen Hamilton.

Inquiries regarding this paper should be directed to
Dennis Mahoney (02) 9290 8494

Independent Pricing and Regulatory Tribunal of New South Wales
Level 2, 44 Market Street, Sydney NSW 2000
Ph 02 9290 8400 Fax 02 9290 2061
www.ipart.nsw.gov.au
ALL CORRESPONDENCE TO: PO BOX Q290, QVB POST OFFICE NSW 1230

FINAL REPORT

APPRAISAL OF TAXI FARE STRUCTURE ISSUES

NSW Independent Pricing and Regulatory Tribunal

July 2003

Our ref: A4116/REP/0647

Booz | Allen | Hamilton

Table Of Contents

1 INTRODUCTION

This report has been prepared for the NSW Independent Pricing and Regulatory Tribunal (IPART) by Booz Allen Hamilton. It presents an Appraisal of Taxi Fare Structure Issues, prepared as an input to IPART's 2003 review of taxi fares in NSW.

The report is structured as follows:

- Chapter 2 - sets out details of current taxi fare levels and structures in each of the Australian states/territories
- Chapter 3 - presents the results of an international review of evidence for the pricing of different components of taxi trips (eg. flagfall v distance components, booking charge) and in particular any analyses of the relative costs of these different components
- Chapter 4 in the light of the Chapter 3 findings, sets out an appraisal of NSW taxi cost structures according to key cost 'drivers', and outlines the structure and level of taxi tariffs based on these cost structures
- Chapter 5 - presents the results of an international review of evidence on the price elasticity of demand for taxi travel.

2 INTERSTATE TAXI FARE SCHEDULES

Table 2.1 sets out current taxi fare schedules for each Australian state/territory.

At this stage no comprehensive comparison of these schedules has been attempted. However, the following comparative features might be noted:

- **Phone booking charges**. Some states (NSW, Vic, Qld, ACT) have separate booking charges, others do not.
- **'Day' versus 'night' rates**. All states have higher tariffs for night/weekend relative to weekday periods. However the division between 'day' and 'night' time differs between states. Also, the form of the 'night' surcharge differs: in some cases it takes the form of a higher distance rate (as in NSW); in some the form of a higher flag-fall rate; and in other cases both rates are higher.
- **Flag-fall versus distance rates**. The flag-fall: distance (per km) ratios vary between the states. For weekday 'day' tariffs, the ratio flag-fall: distance rate varies between 1.75 (NSW) and 3.04 (Darwin).
- **Waiting time**. Waiting time rates vary between $22.50 per hour (Tasmania) and $37.35/hour (NSW). In most cases, waiting time applies only when the taxi is waiting for a passenger etc. However, in Victoria waiting time also applies during operations when the speed falls below about 20 km/hr.

Table 1: Australian State Taxi Fare Schedule

State	*Ph Booking Fee*	*Flagfall*	*$ per distance*	*Other Fees/Notes*
New South Wales (from 1/7/02)				
Tarriff 1 (between 6am and 10pm)	$1.25	$2.55	$1.450	**Waiting time $37.35** per hour (62.25c per min), **luggage rates** are no charge for 1st 25kg and then **10c** for each 25kg or part thereof (**max 55c**). **User pays all toll and ferry charges**. A return toll is payable on the Sydney Harbour Bridge and in the Sydney Harbour Tunnel.
Tarriff 2 (between 10pm and 6am)	$1.25	$2.55	$1.45 + 20%	
Maxi-Cab Fares Tarriff 1 (between 6am and 10pm)	$1.25	$2.55	$1.450	
Maxi-Cab Fares Tarriff 2 (between 10pm and 6am)	$1.25	$2.55	$1.45 + 20%	
Maxi-Cab Fares Tarriff 3 (between 6am and 10pm) (for 6 or more pax per single hiring)	$1.25	$2.55	1.5 times Tarriff 1	
Maxi-Cab Fares Tarriff 4 (between 10pm and 6am) (for 6 or more pax per single hiring)	$1.25	$2.55	1.5 times Tarriff 2	
Country - Cab Fares Tarriff 1 (between 6am and 10pm, less than 12 kms)	$0.75	$3.05	$1.51(+ 20% on Sun.&PH's)	
Country - Cab Fares Tarriff 2 (between 10pm and 6am, over 12 kms)	$0.75	$3.05	$2.11(+ 20% on Sun.&PH's)	
Country - Maxi-Cab Fares Tarriff 3 (between 6am and 10pm)	$0.75	$3.05	Tarriff 1+ 20%	
Country - Maxi-Cab Fares Tarriff 4 (between 10pm and 6am)	$0.75	$3.05	Tarriff 2+ 20%	
Victoria (from 2/12/00)				
Metropolitan & Outer Suburban				**Late night surcharge ($1.10)** midnight to 6am. (**Melb. Airport Parking** $2.00 / **Prebook from Airport** $3 / **Tolls** - W Link $2.20, Sth Link $2.20, W & Sth Link $3)
Tarriff 1 (Single hiring, less than 6 pax (conv vehicle) or any multiple hiring)	$1.10	$2.80	$1.310	**45c** per min when speed below 21 kph
Tarriff 2 (Single hiring for 6 or more pax or pre-booked (non WAC) where spec req)	$1.10	$2.80	$1.965	**67.5c** per min when speed below 21 kph
Urban (Ballarat, Bendigo & Geelong)				**Late night surcharge ($2.20)** midnight to 6am
Tarriff 1 (Single hiring, less than 6 pax (conv vehicle) or any multiple hiring)	$1.10	$2.80	$1.370	**45c** per min when speed below 20 kph
Tarriff 2 (Single hiring for 6 or more pax or pre-booked (non WAC) where spec req)	$1.10	$2.80	$2.055	**67.5c** per min when speed below 20 kph
Country				**Late night surcharge ($2.20)** midnight to 6am
Tarriff 1 (Single hiring, less than 6 pax (conv vehicle) or any multiple hiring)	$1.10	$2.80	$1.400	**45c** per min when speed below 19.3 kph
Tarriff 2 (Single hiring for 6 or more pax or pre-booked (non WAC) where spec req)	$1.10	$2.80	$2.100	**67.5c** per min when speed below 19.3 kph
Queensland (BNE metropolitan area)				
Metered				
6am - 8pm weekdays & 6am - 1pm Sat	$1.00	$2.50	$1.250	**Fare evasion** up to **$3000** & **soiling fee**, up to **$75**
All other times	$1.00	$3.70	$1.250	
Exempt				
7am - 7pm & 7am-1pm Saturdays	$1.00	$2.50	$2.100	**Fare evasion** up to **$3000** & **soiling fee**, up to **$75**
All other times	$1.00	$3.70	$2.100	
Western Australia				
Metropolitan Area				
Tarriff 1 (6am-6pm MON to FRI)		$2.90	$1.170	Surcharge of **$2.30** on **Christmas Day and New Year's Eve** (between 6pm on 31 Dec and 6am on 01 Jan). **Detention** charge **$33.60** per hour. **Cleaning charge**, **$33.60** per hour. **Country Running**, **72 c** per km travelled. **No charge for luggage**. **Toll** charge =all tolls. Charges for **weddings** ($93.20 1st hr, $11.65 add./0.5 hr), **Funeral** ($46.60 1st hr, $11.65 add./0.25 hr), **Metro Tours** ($50.65 1st hr, $12.25 add./0.5 hr)
Tarriff 2 (6pm to 6am MON to FRI, 6pm FRI to 6 am MON, all day on Public Holidays)		$4.20	$1.170	As above

Northern Territory

Nhulunbuy Taxi Area				
Tarriff 1 (6am to 6pm MON to FRI & 6am to 1pm SAT)		$4.40	$1.377	**Waiting time** is **10 c** for each **9.3 sec**. (**$38.71** per hour). **Cleaning fee $50.00**. **Special journeys $34.70** 1st hour and then **$17.40** each hour after or part thereof.
Tarriff 2 (Outside Nhulunbuy Taxi Area and 6pm to 6am MON to FRI & 1pm to 6am SAT, SUN and Public Holidays)		$5.30	$1.690	
Katherine Taxi Area				
Tarriff 1 (6am to 6pm MON to FRI)		$2.80	$1.299	**Waiting time** is **10 c** for each **11.2 sec**. (**$32.14** per hour).
Tarriff 2 (For journeys outside the Katherine Taxi Area and 6pm to 6am MON to FRI & SAT, SUN and Public Holidays)		$3.40	$1.624	
Alice Springs Taxi Area				
Tarriff 1 (6am to 6pm MON to FRI)		$3.00	$1.290	**Waiting time** is **10 c** for each **10.4 sec**. (**$34.62** per hour). **Cleaning fee $50.00**.
Tarriff 2 (For journeys outside the Darwin Taxi Area and 6pm to 6am MON to FRI & SAT, SUN and Public Holidays)		$3.80	$1.582	
Darwin Taxi Area				
Tarriff 1 (6am to 6pm MON to FRI)		$3.30	$1.086	**Waiting time** is **10 c** for each **10.3 sec**. (**$34.95** per hour). **Cleaning fee $50.00**.
Tarriff 2 (For journeys outside the Darwin Taxi Area and 6pm to 6am MON to FRI & SAT, SUN and Public Holidays)		$3.90	$1.335	
Tennant Creek				
Tarriff 1 (For a journey WHOLLY within the Tennant Creek Area.		$6.30		**Cleaning fee $50.00**. **Special journeys $32.60** 1st hour and then **$16.30** each hour after or part thereof.
Tarriff 2 (For a journey, part of which takes place within the Tennant Creek Area.)		$2.10	$1.245	**Waiting time** is **10 c** for each **7 sec**. (**$51.43** per hour). **Cleaning fee $50.00**. **Special journeys $32.60** 1st hour and then **$16.30** each hour after or part thereof.
ACT				
Rate 1 (6am - 9pm MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$3.20	$1.315	**Soiling charge** is **$50.00**. **$30.00** per hour for **detention**. **Airport departure toll $2.00**.
Rate 2 (9pm - 6am MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$3.20	$1.512	
Rate 3 (6am - 9pm MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$2.40	$0.944	
Rate 4 (9pm - 6am MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$2.40	$1.086	
Rate 5 (High Occupancy Taxi) (9am - 6pm MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$4.80	$2.054	As above plus, the hiring is by a group of 6 or more persons.
Rate 6 (High Occupancy Taxi) (9pm - 6am MON to FRI, all day SAT, SUN and PUBLIC HOLIDAYS)	$0.80	$4.80	$2.362	
South Australia				
Tarriff 1 (between 6 am and 7pm weekdays)		$2.40	$1.180	**Waiting time $23.40** per hour. **Soiling fee $60.00**. **Country running** is **78c** per km each way.
Tarriff 2 (between 7pm and 6am MON to THURS and 7pm FRI to 6am MON and ALL public holidays)		$4.40	$1.260	**Waiting time $23.90** per hour. **Soiling fee $60.00**. **Country running** is **78c** per km each way.
Tasmania				
Tarriff 1 (6am to 8pm MON to FRI)		$2.60	$1.360	**Waiting time** is **$22.50** per hour. For **hirings that originate outside** Hobart, Launceston, Burnie and Devonport Taxi Areas, between 12.30 am and 5 am a surcharge of **$2.60** will apply. May require deposit. **Credit payments may incur 10% accounting fee**.
Tarriff 2 (8pm to 6am WEEKNIGHTS, ALL weekend, MON and Public Holidays and Bank Holidays)		$2.60	$1.630	

3 APPRAISAL OF TAXI COST COMPONENTS – INTERNATIONAL REVIEW

This chapter reports on international evidence on the rationale for the pricing of different components of taxi trips (eg. waiting time v travelling time, call-out v hail), and in particular any analyses of the relative costs of these different components.

Perhaps surprisingly, we have not been able to identify any international research that addresses this topic directly; and only able to identify one article that addresses it indirectly. It is surprising that so little research appears to be available on this topic internationally, given that setting the relative fare components is a common issue faced by taxi companies and regulators.

The one study of (indirect) relevance (Pagano and McKnight, 1983) involved a survey and analysis of data for 23 taxi companies in the Chicago area. This data was used to develop and calibrate a number of cost models, designed particularly to examine the relationship between taxi cab company costs and company size. However, we have been able to manipulate the data provided to derive relationships between average trip cost and trip distance over the distance range of 1.5 miles (2.4 kms) to 6.0 miles (9.6 kms).

The result is a relationship:

Cost per trip = \$0.942 + 0.25 * trip kms.

This indicates that the 'flag-fall' charge represents 3.8 times the charge per kilometre.

(We note that:

- This 3.8 factor may be compared with the factor of about 1.8 used in the current NSW taxi tariff.
- The 3.8 factor is much closer to the ratio incorporated in typical urban bus fare tariffs, which is in the range 3 to 5.)

4 APPRAISAL OF COST-BASED TAXI FARE STRUCTURES FOR NSW

4.1 Introduction

It is evident from Chapter 3 that very little work has been undertaken internationally (or in Australia) on the relative costs of the different components of taxi trips, and on the application of such information in setting taxi tariff structures. This chapter therefore develops an *ab initio* appraisal of NSW taxi cost structures according to key cost 'drivers', and outlines the structure/level of taxi tariffs based on these cost structures. This appraisal should be regarded as somewhat experimental and indicative only.

4.2 Cost Analyses

The starting point used for the analyses was the NSW Urban Taxi Operating Cost Model (as developed by the NSW Taxi Council and subsequently amended by IPART – IPART, April 2003).

For analysis purposes a number of operating statistics and ratios were required, ie:

- Distance per taxi per annum – taken as 175,000 km (we understand this is used as one basis of the NSW Cost Model)
- Average operating speed
- Proportion 'live' kilometres
- Proportion 'live' driver hours
- 'Live' trips per driver hour
- Proportion of trips through radio bookings.

In the absence of ready data for NSW, ratios for these latter five items were all taken from statistics for taxis in Adelaide (Adelaide Taxi Industry Study, 2002).

The NSW model cost items were first attributed to their main cost 'drivers' and unit costs thus derived, relating to:

- Vehicle kms (fuel, tyres, repairs/maintenance)
- Driver hours (driver imputed wages and on-costs)
- Vehicles (fixed annual charges, including capital/leasing charges)
- Radio calls (network fees).

Costs were then reallocated between, and unit costs derived for:

(A) **Direct Costs**

- 'Live' vehicle km costs (that proportion of vehicle km costs that apply to 'live' kilometres).
- 'Live' driver hour costs (that proportion of driver hour costs that apply to 'live' driver time).
- 'Waiting' driver hour costs (driver hour costs for waiting time).
- Telephone booking costs (radio call costs plus kilometres and hour costs associated with positioning travel to pick up telephone passengers – based on average 3 km positioning).

The 'live' vehicle km costs and 'live' driver hour costs may usefully be combined into a combined rate per vehicle km (based on average 'live' speeds), for purposes of tariff formulation.

(B) **Indirect Costs**

- Other vehicle km costs (associated with all running without passengers or picking up telephone bookings).
- Other vehicle hour costs (similarly, for all time without passengers or picking up telephone bookings).
- Vehicle-related costs.

Direct costs (A) comprise only about 37% of total taxi operating costs, indirect costs (B) account for the remainder. Detailed calculations are given in spreadsheets supplied separately to IPART.

The direct cost function is approximately as follows:

$0.55 per live km
+$2.70 per telephone booking
+$9.60 per hour waiting time

For any tariff structure that is to have a cost-related basis, these should be regarded as the absolute minimum ('floor') rates to apply.

If a cost-based approach to setting taxi tariffs were to be pursued, the key remaining issue is how to allocate the indirect costs (over 60% of total costs). Any such allocation is essentially arbitrary, but a range of plausible alternative allocations were examined. The results are summarised in Table 4.1 (further details are given in separate spreadsheets).

4.3 Conclusions and Implications

As was expected before the start of the analyses, a large proportion of taxi costs cannot be uniquely attributed to any specific measure of taxi use, and thus there is no unique cost-reflective tariff structure. The contribution of such analyses of cost structures to setting taxi tariffs is thus somewhat limited, although certainly not insignificant.

The main indications from our analysis of direct costs and a range of plausible allocations of indirect costs are as follows:

- Distance-related tariffs should be a minimum of $0.55 per 'live' kilometre, but could sensibly be in the range up to around $1.50 per km. The current NSW rates are near the top of this range.
- Flag-fall tariffs could reasonably be within a very wide range, from zero up to $15-$20 per trip. (While the cost modelling has not identified any specific flag-fall costs, some small level of costs could be identified in a more detailed appraisal, eg for pick up/set down time and for fares transactions/accounting.)
- Telephone booking fees could reasonably be within a range from $2.70 up to $7.20 per booking. It is notable that current NSW booking fees ($1.25) are well below the bottom of this range.

Given that such a cost appraisal can give only be a very partial guide to setting tariff structures, some additional comments on tariff considerations may be useful:

(i) The costing model on its own does not provide useful information on the issue of Tariff 1 v Tariff 2 rates (or time periods). There appear to be (at least) three (inter-related) reasons behind the existence of the higher Tariff 2 rates:

- To compensate for the lower levels of demand in night etc periods, so as to bring taxi earnings (per hour or per km) in these periods up to a similar level to daytime etc periods.
- To raise taxi earnings in night etc periods to a higher level than in daytime periods, so as to compensate drivers for the 'unsocial' hours involved.
- To help ensure a reasonable level of taxi service supply in night periods.

Without more detailed data and analysis, it is not possible to reach an informed view on appropriate tariff differentials (and the periods over which these should apply), in order to achieve these objectives. (Such analyses are beyond the scope of this current work.)

(ii) The 'classical' approach to allocating joint costs to set tariffs in a situation such as this is through Ramsey pricing, ie setting the price excess over direct costs for each component in inverse proportions to the relevant demand elasticities. While demand elasticity information is very sparse, we would expect shorter trips to be the most price elastic. This would tend to imply making the flagfall component relatively low (given its direct costs are close to zero) and recovering most of the indirect costs through the distance rate.

(iii) In the regulated taxi industry, tariffs may be used as one means of encouraging minimum levels of supply at times of relatively low demand (as noted above). If tariffs are to be used in this way, this would influence in particular considerations regarding:

- Tariff 1 v Tariff 2 rates and time periods (in order to encourage more supply at times of low demand).
- Booking charges (in order to avoid excessive waiting times on phone bookings).
- Flagfall v distance rates (in order to encourage sufficient cruising taxis and encourage catering for shorter trips).

TABLE 4.1: ALTERNATIVE TAXI COST ALLOCATIONS AND TARIFF IMPLICATIONS				
Alternative	**Tariff Structure**			
	Distance $/km	**Flagfall $/trip**	**Booking Fee $/trip**	**Waiting Time $/hour**
Direct costs only[1]	0.55	0	2.70	9.60
A % mark-up on direct costs	1.45	0	7.20	26.00
B Indirect costs all allocated to flagfall	0.55	18.50	2.70	9.60
C 50% indirect costs allocated to flagfall, 50% as mark-up on direct costs (ie average A, B)	1.00	9.25	4.90	17.80
D Indirect kms and hours costs allocated to distance rate, indirect vehicle costs allocated to flagfall	1.15	7.80	2.70	9.60
Indirect vehicle costs allocated with vehicle hour costs, and then:				
E As in A	1.50	0	6.70	32.50
F As in B	0.70	15.40	3.20	15.50
G As in C	1.10	7.70	4.90	24.00

Notes: [1] Not a feasible tariff structure (covers only c 37% of costs).

5 TAXI FARES ELASTICITY – INTERNATIONAL REVIEW

This chapter reports and summarises the international evidence on taxi fares elasticities. This evidence is documented in Table 5.1 (full references are given at the end of this report).

Some comments should be made on the **quality and quantity** of this evidence:

(i) The **quantity** of evidence is very limited – by contrast with the public (mass) transport sector, for which hundreds of fare elasticity estimates are available world-wide. This relative lack of evidence reflects the structure of the taxi industry and limited systematic record-keeping.

(ii) The **quality** of much of the evidence is open to question:

- The major review study by Frankena and Pautler (1984) comments that:

  "These estimates have several shortcomings. The data and estimation techniques used fall considerably short of current standards for econometric work on demand functions. First, some of the estimates are based on very short time series for a single city. Some are based on data for a single firm in a city with more than one taxi firm; such estimates assume that market shares are constant. Some are based on the effect of a single fare change".

  "Second, the estimation techniques implicitly assume that fare changes are not accompanied by changes in the level of service and waiting times, which would affect the number of taxi rides demanded. This assumption is probably invalid."

  "Third, few of the estimates are accompanied by tests of statistical significance, and in other cases the estimates are not significantly different from zero at conventional levels. Thus, taken individually, the estimates carry little weight. However, the median of the estimates should be given some weight, subject to the qualifications listed above."

- We note that two separate appraisals of the early (1951-52) London evidence derived likely estimates of "-1.0 or less" and "around –0.35" from the same data.

- Several of the more recent estimates have been based on SP studies. While this approach has advantages, it suffers from the deficiencies that: (i) it estimates mode share elasticities rather than total market elasticities (ie. ignores trip generation/ suppression); and (ii) such surveys tend to over-state actual behavioural changes.

- We also note that different taxi sub-markets appear to exhibit widely-differing elasticity values (more so than for the urban public transport market in general). Hence interpretation of elasticity results requires understanding of the sub-markets represented: this information is often not provided.

In terms of the **elasticity results** themselves, we would make the following observations:

- For the overall market, elasticities found vary between +1.5 and –1.5 (Fravel and Gilbert, 1978). However, the majority of studies give values in the range –0.2 to –1.0.

- A common conclusion from similar reviews is that the typical fare elasticity for the overall market is around –0.8 to –1.0 (eg. the Frankena and Pautler 1984 review derives a median estimate of –0.8 and concludes that *"The available evidence is consistent with the hypothesis that the fare elasticity of demand for taxi rides is generally around –0.8 to –1.0".*

- While an overall value of around –0.8 is reasonably well supported by the literature, it appears on the high side (in absolute terms) of the majority of Australian and European evidence. This might suggest a typical value as low as –0.3 to –0.4. (Such a value would

be much closer to typical fare elasticities established for urban public transport services generally).

- There is little doubt that the elasticities for different market segments span a wide range, with some segments exhibiting elasticities significantly higher (in absolute terms) than –1.0 (eg. refer Mackie and Toner, Booz Allen Hamilton et al).
- Elasticities could also be expected to vary according to:
  - the absolute level of taxi fare (relative to prices of competing modes and elsewhere in the economy): elasticities tend to increase with absolute fare level
  - the closeness of other mode substitutes, eg. the standard of the public (mass) transport system.

We would also note that no evidence has been found on:

- Any differences between elasticities for passenger trips and for passenger kilometres. (With increasing fares, it might be expected that some taxi users would make shorter taxi trips, so that elasticities with respect to passenger kilometres, and hence revenue, would be greater than those with respect to numbers of trips taken.)
- Any elasticity differences between prices for different trip components, eg. flag-fall v distance charge v call-out fee.

At this stage, based on our review of the international evidence, we would conclude that:

- The quantity of evidence available internationally on taxi fare elasticities is relatively limited; and the quality of much of this evidence is open to question.
- Average taxi fare elasticities are most likely to be in the range –0.3 to –0.8.
- Elasticities are likely to differ substantially by market segment, particularly between business travel and other travel.

TABLE 5.1: TAXI FARE ELASTICITIES – INTERNATIONAL EVIDENCE				
Country/City	**Study**	**Date**	**Elasticity Results**	**Notes, Comments**
UK, London	UK Ministry of Transport (1953), cited in Frankena and Pautler (1984)	London, 1951-52	-1.0 or less (in absolute value)	Considerable doubt on validity of this estimate – see Beesley ME (1979) below . Report's author notes that estimate "needs to be supported by more evidence than is presently available"
UK, London	Beesley ME (1979)	Re-analysis of London taxi data, 5 large taxi companies, 1951-52 (as used in UK Ministry of Transport, 1953).	-0.35	'Base crude' estimate from data (cf UK Ministry of Transport, 1953).
USA, Washington DC	Wong (1971), cited in Frankena & Pautler (1984)		-1.4	
USA, Chicago	Kitch et al (1971), cited in Frankena & Pautler (1984)		-0.8	No test of significance given.
USA	Fravel and Gilbert (1978), cited in Frankena & Pautler (1984)	14 taxi companies nationwide, 1976-77	Median –0.2 Range –1.5 to +1.5	
USA, Pennsylvania	Brown and Fitzmaurice (1978), cited in Frankena & Pautler (1984)	21 PA cities with population 12,000 – 129,000	-0.8	Not significant at 10% level.
USA, Seattle	Applied Economics Associates (1978) cited in Frankena & Pautler (1984)	1977	-1.0	No test of significance given.
USA, Danville (ILL)	McGillivray (1979), cited in Frankena & Pautler (1984)	Danville (pop 143,000), 1975-77	-0.6	Shared-ride taxi service.
USA, New York	Schaller B (1997), Schaller (1999)	Econometric analysis of NY City data 1990-1996.	-0.22	Estimate highly significant (adjusted R^2=0.94, t-value on fare coefficient = 7.75). Note that elasticity estimate applies to situations of both increases and decreases in real fares.
France, Paris	Orfeuil and Hivert (1989), cited in BTRE Database	Travel Paris – Orly Airport	-0.5	Also assessed car v taxi time cross-elasticity.
Netherlands	Rouwendal et al (1998), cited in BTRE Database	SP survey of 356 potential taxi users in Netherlands in regard to mode choice for 3 trip types: - 7 kms business trip - 8 kms 'evening out' trips - 4 kms to railway station trip	Business travel -0.76 'Going out' -1.75 'Going to station' -0.69 Average -1.14	Mode choice elasticities only. SP approach may tend to overstate response. Also assessed elasticities wrt travel time and response time.

TABLE 5.1: TAXI FARE ELASTICITIES – INTERNATIONAL EVIDENCE				
Country/City	**Study**	**Date**	**Elasticity Results**	**Notes, Comments**
UK, 4 cities	Mackie PJ and Toner JP(1993)	SP and TP surveys of taxi users in 4 UK cities, to explore trade-offs between waiting time, walking time, vehicle type and fare. Involved on-street interviews with taxi users and self-completion postal questionnaire to people at taxi ranks.	'Captives -0.3 'Non-captives -1.9 Overall -0.8	Relates to results of 'best' of 4 surveys (SP on-street interviews). 'Captives classified as those travelling at night or with significant amounts of luggage. Results are mode choice elasticities only. Comments that "it seems reasonable to conclude that the price elasticity of demand is probably at about unity for the traffic in aggregate, although this will differ accordingly to the balance of trade in the district between day time and night time; the availability of alternative modes and the proportion of business travellers".
Australia, Canberra	Booz Allen Hamilton (2003)	SP survey of modal choice in ACT, to derive public transport demand elasticities. Involved in-cab interviews with taxi users: the interviewer travelled with a single cab for a full driver shift. Only those people not charging their fares to a third party were interviewed.	-0.36, average over all taxi users -1.4, taxi users not charging fares to a third party	Average figure assumes zero elasticity for people using company charge cards. Surveys exclude evening/night travel: it might be expected this market would be less elastic than average. Results represent total market elasticities: the model included an induced demand component to estimate the number of people who would switch to/from non-modelled modes (ie walk, cycle, hire car etc).
Australia, Queensland	Queensland Transport (2000)	Not known	-0.36 Brisbane -0.50 other centres	Source of estimates not given.

Annex A: References

Beesley ME. "Competition and Supply London Taxis". Journal of Transport Economics and Policy, January 1979.

Booz Allen Hamilton and Douglas Economics. "ACT Transport Demand Elasticities Study" Department of Urban Services, ACT, April 2003.

Frankena MW and Pautler PA. "An Economic Analysis of Taxicab Regulation". US Federal Trade Commission, Bureau of Economics Staff Report, May 1984.

Fravel RD and Gilbert G. "Fare Elasticities for Exclusive Ride Taxi Service". US Department of Transportation, Report No. UMTA-NC-11-0006-79-1, October 1978.

Kitch EW, Isaacson M and Kasper D. "The Regulation of Taxicabs in Chicago". Journal of Law and Economics, 14(2), October 1971, 285-350.

Mackie PJ and Toner JP. "The Economics of Taxicab Regulation: A Welfare Assessment". Proc 6th World Conference on Transport Research, Vol 3, Transport Policies, pp1733-1744, 1993.

McGillivray RG. "Fare Elasticities for On-call Paratransit Services", Working Paper 1186-3-1, Urban Institute, Washington DC 1979.

Orfeuil M and Hivert L (1989). "Understand and Estimate the Travel Demand: The Case of Orlyval a New Link between Orly and Paris." Selected Proceedings of the Fifth World Conference on Transport Research, Transport Policy, Management and Technology Towards 2001, vol 4, pp 185-193.

Pagano AM and McKnight CE. "Economies of Scale in the Taxicab Industry: Some Empirical Evidence from the United States". Journal of Transport Economics and Policy, September 1983.

Queensland Transport. "National Competition Policy Review: Transport Operations (Passenger Transport) Act 1994". September 2000.

Rouwendal J, Meurs H and Jorritsma P, (1998). "Deregulation of the Dutch Taxi Sector." Public Transport Planning and Operations, Proceedings of Seminar F, European Transport Conference, pp. 37-49.

Schaller B. "Issues in Fare Policy: Case of the New York Taxi Industry". Paper No. 98-1167. Transportation Research Record 1618.

Schaller B. "Elasticities for Taxicab Fares and Service Availability". Transportation, Vol 26, p283-297, 1999.

UK Ministry of Transport. "Report of the Committee on the Taxicab Service" (The Runciman Report). HMSO, London, April 1953.

Wong HK. "Some Demand Models for the Taxicab System in the Washington DC Area". Working Paper 708-39, Urban Institute, Washington DC, 1971.