



## **Studying Adelaide's taxis: lessons for researchers and policy-makers**

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### **1 INTRODUCTION**

Since 1996 Adelaide's taxi industry has been the subject of biennial statistical studies. These have been funded by the Passenger Transport Research and Development Fund, administered by the Passenger Transport Board (PTB), the relevant regulatory body in South Australia. Papers reporting on these studies have been presented to the ATRF on two previous occasions (Primerano, Radbone and Clement, 1997; Clement, Radbone and Primerano, 1999a). It is timely to continue the series of reports.

This paper discusses the methodologies used in gathering the data, the trends revealed by the surveys and how the taxi industry has responded to those trends. It has three broad objectives:

1. to inform researchers undertaking similar industry-sectoral studies of methodologies that can improve the performance of such studies;
2. to add to the body of knowledge about the delivery of taxi services in Australasia; and
3. to highlight the response of the taxi industry to changing industry conditions, and what this means for regulatory policy.

The three sources of data apparent in all four studies so far undertaken are the numbers of bookings made by telephone through the centralised booking service companies, worksheet records from the taxi drivers themselves and observations of activity at taxi ranks. Over the course of the studies some of the techniques for gathering this data have changed; some in response to changes in the operation of taxis within the industry itself and some to better capture the required information. Important factors contributing to change include the response rates to surveys and advice provided by a reference group established for the studies.

The statistics presented in this paper are from the three studies of 1996 (used as the Baseline for later studies), 1998 and 2000. A study was completed in 2002 and while the report on that study has not yet been released into the public domain, permission has been granted to use the results of reported rank activity at one location as an illustration of the benefits of a Reference Group.

Among many other trends, the studies reveal a clear and continuing decline in the use of Adelaide's taxis. The effect of this however, has been cushioned by real increases in fares (which themselves have probably contributed to the decline), and by a slight increase in average trip length. The studies also suggest that the industry has responded to this decline by reducing supply; licensed taxis are less likely to be on the road - especially in the quieter periods - than they were in the early nineties. This response has important implications for transport policy-makers who see the key to better service in the release of more taxi licences.

## 2 METHODOLOGIES

### 2.1 TELEPHONE BOOKINGS

Data for all telephone bookings has been provided by Adelaide's radio companies — or centralised booking services (CBS) as they are officially known. This portion of the industry has undergone considerable change since the Baseline Study of 1996 both in terms of the number of companies and the way that they operate. The changes and the reasons for those changes were reported in detail in Clement, Radbone and Primerano (1999a and 1999b) and in summary consisted of an amalgamation of services to three companies and a significant shift to computer-aided despatch and reporting mechanisms. The three CBSs have continued to improve the quality of despatching and reporting by investing in the development of their software (purchasing new modules etc), upgrading where necessary their hardware systems and improving the training of operational staff.

The immediate effect of these benefits are in services to customers, increased fairness in the distribution of work amongst the operational taxi fleet, an improved safety system for drivers, greater reliability by including redundancy and an increased range of reports available to CBS management staff. The benefits to customers include a more flexible and automated customer service requirement database and fulfilment system (VIP, special needs customers etc). The increased fairness to drivers is achieved by extending the time-honoured taxi queuing at rank and call despatch by area systems to the computer-based despatch system. The use of the GPS in taxis has meant that the activation of alarm buttons in taxis by drivers experiencing difficulties is responded to immediately by the CBS.

The improvement in reliability of the system and the increased range of reports has had a benefit to the teams carrying out the taxi studies in that the reports have become more mechanised, with fewer errors. For example, in 1998 some booking totals were estimated due to computer system failures; in 2000 there were no such problems. In 1996 only daily booking totals were requested of CBS staff by the study team. Hourly totals were possible but not without a lot of manual work by the CBS staff; such an imposition was not considered appropriate. By December 1998 hourly totals were possible with little impost on CBS staff – provided they were given appropriate advance notice – and hourly trends over the study week have since been collected.

### 2.2 WORKSHEET RECORDS

Worksheets and taxi meters are sources of information on taxi activity during working shifts. The South Australian Passenger Transport Act requires drivers to fill out worksheets of a type approved by the PTB. Both worksheets and meter printouts can reveal such information as the distance each job requires, the time taken for each job and the fare. The study used specifically-designed worksheets to obtain additional information such as the source of the job, the number of passengers and the method of payment. Primerano *et al* (1997) provides a detailed background to the culture behind the filling out of worksheets by drivers and operators in the industry from the period before 1990 up to and including the Baseline Study in 1996. It should be stated from the outset that there is a legal requirement for drivers to fill out an approved worksheet thereby recording every job undertaken during the shift.

The study team was given the power to 'require' that the worksheets be filled out by drivers with the onus on the operators to ensure this occurred. The implication of the granting of the power to legally request cooperation from operators and drivers is that officers in the PTB can carry out follow-up action in those instances of non-compliance by operators. The power to require cooperation was granted after earlier attempts at voluntary involvement proved clearly inadequate (Primerano *et al*, 1997).

Selection of taxis was performed using a structured sample to reflect (a) the various levels of affiliation to the CBS, (b) the types of operation (ownership or lease) and (c) whether the operator managed one or more taxis. Thus each taxi belonged to one category and within each of these categories the study team randomly picked the requisite number of taxis to be studied in each survey, being careful to see that no one taxi was surveyed more than once in any one year.

Return rates are presented in Table 1. While return rates of worksheets for the seven surveys of the Baseline Study of 1996 varied from 44 to 68 per cent, the percentage of usable worksheets varied from 35 to 58 per cent. In 1996 a set of worksheets was deemed 'usable' if any of the data from any of the sheets were used in some way to compile statistics of the industry. For example, all of the shifts could have the start and end odometer readings and times recorded but one or more of the shifts would not have complete details of each of the jobs carried out during that shift. Such a set of worksheets could be used to compile the mean number of working shifts per taxi over that week. In 1998 the sets of worksheets were categorised according to the quality of their data and the so-called 'A Grade' sets used to compile the statistics on usable data (Clement and Radbone, 1999; Clement *et al*, 1999a). This categorisation requires that all of the shifts have the start and end odometer readings and times recorded. In addition the data recorded for all of the jobs on every sheet had to consist of at least the start and end odometer readings and times, the fare and the number of passengers carried. This stringent requirement was also used for the 2000 study.

**Table 1 Worksheet mailout, return and usability statistics**

Study	Survey	# Requested	% Returned	% Usable <sup>a</sup>	
1996	3 <sup>b</sup>	85	44.7	42.4	
	4	93	52.7	40.9	
	5	93	67.7	58.1	
	6	94	44.7	35.1	
	7	88	50.0	47.7	
	8	90	44.4	37.8	
	9	88	48.9	47.7	
	1998	1	60	61.7	31.7
		2	82	61.0	17.1
3		108	44.4	16.7	
2000	1	105	29.5	20.0	
	2	170	36.5	17.6	

a See above for the changed definitions of 'usable' worksheets over the course of the three studies.

b Surveys 1 and 2 of 1996 are not included here. Survey 1 was a taxi rank survey only. Survey 2 was voluntary and was abandoned because of the very low response rate.

Primerano *et al* (1997) explain the difficulties in obtaining reasonable response rates, despite the compulsory powers. The issue of the low rate of returns of worksheets by operators is of particular concern to the industry. Follow-up action is the purview of the PTB and though some action was initiated during and after the 1996 study, no

potential prosecutions were actioned primarily because of objections by operators to the mailout and return system used. Prior to each of the 1998 and 2000 studies, representatives of the industry strongly advocated follow-up action by the regulatory body in those instances of non-compliance by an operator, but since 1997 there have been no attempts at prosecution despite the industry and the study team being willing to ameliorate the concerns of operators experienced in the 1996 study.

During the 1996 study there were a significant number of comments from operators made to the study team about the inconvenience of having to respond to the requests to participate in the week-long worksheet surveys. In response, the numbers of requests to participate in the 1998 surveys were reduced to the minimum possible in an effort to cause the least perceived disruption to the taxi industry. This was done despite the legal requirement that filling out an approved worksheet is mandatory.

For the first survey of 1998, 60 requests were mailed out, as it was estimated that this would lead to about 25 usable sets of worksheets. The number of 25 was statistically the least that would provide reliable data for all of the measures of worksheet activity (Clement and Radbone, 1999) though fewer sets of worksheets could result in reliable data for some of the measures. While no taxi was surveyed more than once in any one year, this did not mean that an operator was immune from a second call for participation: if this occurred it would be for a different taxi. The study team fielded some misplaced indignation from several operators who owned or leased more than one taxi as the operators failed to realise initially that different taxis in their operation were selected for the different surveys.

The compliance rate data of Table 1 shows an increasing number of mailout requests throughout the surveys of 1998. This was because all those taxis whose operators did not respond in one survey with either worksheet returns or by contacting the study team were included in the mailout for the next survey. The 'second request' letter to these operators was worded differently to the letter of request sent out for the first time. The second request letter emphasised the mandatory nature of the request and the possible consequences of failure to comply. It was found that despite a more strongly-worded letter of request, if a taxi operator did not respond in one survey they were unlikely to respond in the next survey. This results in a low percentage of usable sets of worksheets (16.7 per cent) for the third survey.

For the 2000 study it was decided to mailout many more requests for participation in each survey as the return rate for the 1998 surveys was so low that to enable reliable statistics to be drawn from the data, an inordinate amount of processing had to be performed. Despite the jump in mailouts for the first survey of each of the 1998 and 2000 studies going from 60 to 105, the return rate of 20.0 per cent in 2000 resulted in only 21 usable sets of worksheets. These worksheets contain just under 3000 trips for the survey week. The number of mailouts was ramped up to 170 for the second survey and these returned 30 sets of usable worksheets containing over 3500 jobs. These figures highlight the variation in the number of jobs undertaken by different taxis in the fleet. A detailed analysis of the number of shifts and the number of jobs in the different shifts has not been performed in any of the studies as the industry is primarily concerned with mean values of industry performance.

Clement *et al* (1999a) made the suggestion that a method of gathering much of the data about taxi operations in future studies would be to combine different technologies such as integrating the data from fareboxes, always-on GPS units, on-board cameras and from the booking records of the CBSs to give the information on each job. This suggestion was investigated before commencement of the study of

2000. While this is technically possible, the logistics of gathering the farebox data from the selected taxis, coupled with the requirements of developing a data-matching system, ensured that the survey of taxi worksheets remains the preferred method. The biggest barrier to using the meter as a source of information is simply that so much taxi work is 'off-meter'; that is carried out as part of a contract. There is also no doubt that for some jobs the meter is not turned on, thereby enabling the driver to pocket 100% of the fare revenue.

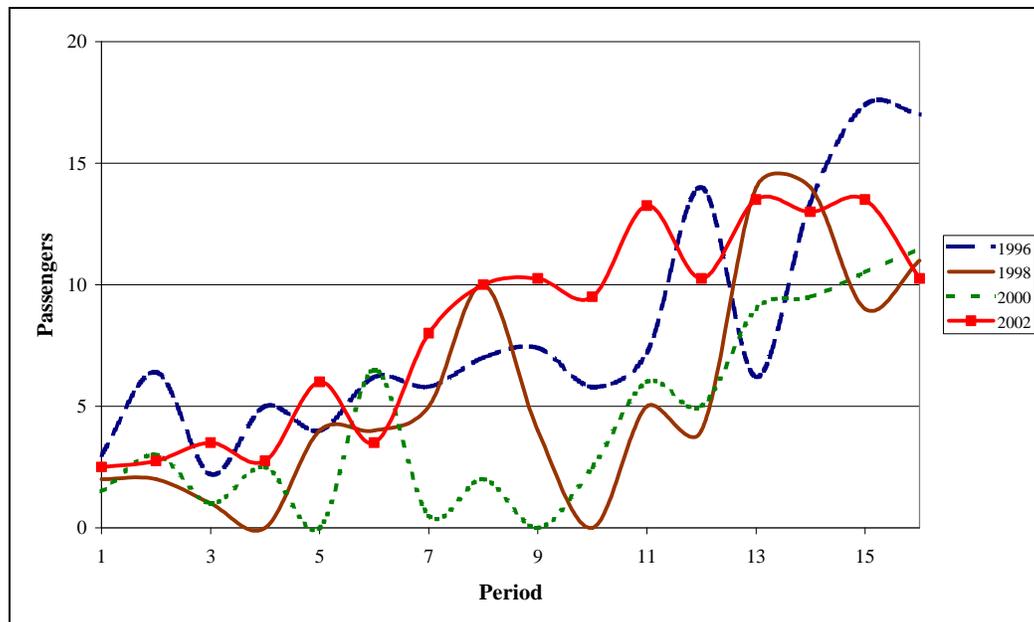
### 3 STUDY MANAGEMENT

#### 3.1 BENEFITS OF A REFERENCE GROUP

As reported in Primerano *et al* (1997), the formation and conduct of a reference group for the Baseline Study of 1996 was an outstanding success. The reference group comprised industry and government representatives as well as members of the study team.

For both the 1998 and 2000 studies it was felt that the management of the studies need not be as formal as in 1996. Industry and PTB representatives were informed of the scope and aims of those studies throughout and were invited to comment on its operation and findings at any time. And often did.

The reformation of the reference group for the 2002 study gave scope to amend some of the methodologies used and was particularly valuable in deciding where and when the taxi rank observations were to be conducted: some of the high-use ranks of previous studies were dormant and vice versa.



**Figure 1 Rank activity at the Grand Hotel showing the shift by two hours for 2002 (periods are 15-minute intervals)**

For example, it was due to the reference group that the starting time of the four-hour observation at the main hotel in the beachside suburb of Glenelg was shifted two hours from 2000 to 2200. Hence Period 1 for 1996, 1998 and 2000 started at 2000 (8

pm) while Period 1 of 2002 started at 2200 (10 pm). The reason for the shift was because it was felt that activity at the rank was basically two hours later than in previous years. This was brought about because changes in entertainment policies by the hotel and the local council had resulted in changes in life-style practices by the bulk of the people to whom the entertainment policies are aimed. Figure 1 shows this shift./

This was confirmed by the rank observations. The numbers of passengers and taxis and the usage patterns were very similar for the 1996, 1998 and 2002 studies, despite the later start date for 2002. This indicates that the movements of people through this rank are two hours later than they were in 1996. Without the intervention by the reference group, it would have been concluded that activity had declined at that particular rank.

In hindsight it would have been beneficial to have the reference group more directly involved in the studies of 1998 and 2000, as changes in industry patterns may have been detected and treated earlier.

## 4 RESULTS

### 4.1 BOOKED WORK

The taxi industry study of 2000 shows a continued decline in taxi work booked through the CBSs (see Figure 2). Clement *et al* (1999a) suggested that some of this decline is due to work engaged through personal calls to mobile phones, though reasoned that the amount of mobile-booked work would be unlikely to have changed since the early 1990s. The worksheets used for the 2002 study enabled drivers to indicate the means of engagement as from a mobile phone; analysis will reveal if the level of use will be close to the 15 per cent touted by several industry representatives.

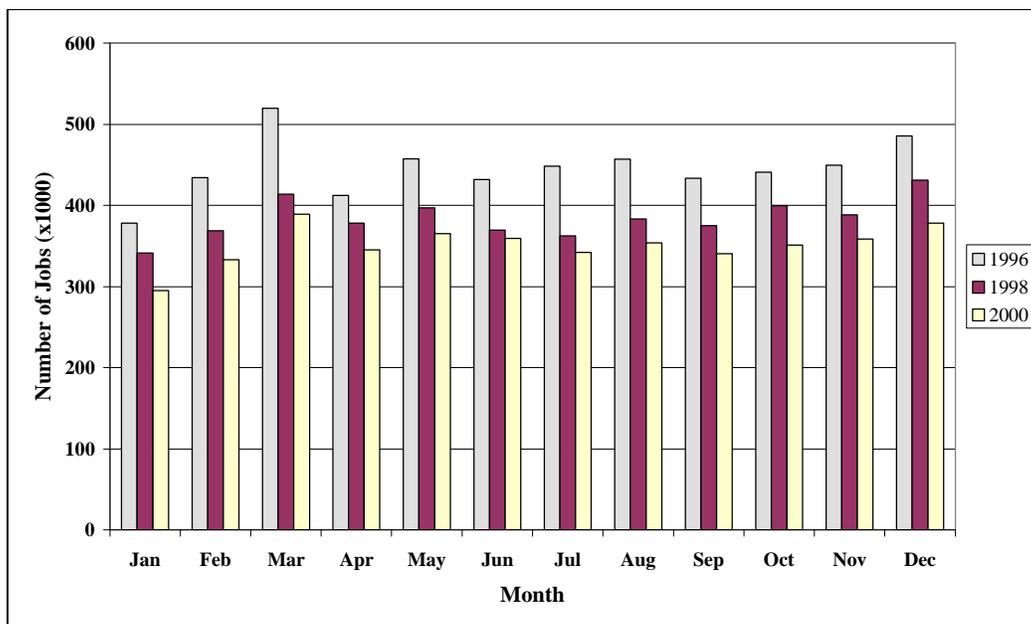


Figure 2 Monthly despatch totals for all study years (leap days not included)

It is possible that the apparently severe decline in booked work could be due in part to 1996 being a particularly good year for the taxi industry. The reason for this is that the Director of the Adelaide Festival of the Arts (held biennially in March) adopted a particularly high profile in the lead-up to and during the Festival and used taxis as one of the means to promote the Festival for an extended, concentrated period. The effect of this may well have been only short-term (lasting about a year) and in hindsight the booking figures for 1997 and 1999 should also have been gathered. The taxi industry studies have coincided with the holding of the Festival and as is shown in Figure 2, in 1996 and 2000 March recorded the most bookings of any month and in 1998 was second only to December. It would be interesting to see whether or not this trend was carried through into non-Festival years.

## 4.2 WORKSHEET DATA

Table 2 provides information gathered from the worksheet surveys of the studies of 1996, 1998 and 2000. Dollar figures are converted to constant (year 2000) dollars. The table also includes data on the cost of a typical seven-kilometre trip, calculated using the regulated tariffs as at September of the relevant study year.

The figures of Table 2 and Table 3 reveal that the fare increases and to a lesser extent the increased average distance per trip have cushioned the economic impact of the total drop in booked work referred to in Section 4.1 (this is discussed further in Section 5). The reason for choosing the 7 km fare as the benchmark is that historically this has been about the average distance per job undertaken by taxis in Adelaide. As shown in Table 3, the average distance travelled per trip has increased by 6.8 per cent. The proportions of time spent carrying a passenger ('live' time) compared with the total time in a cab, and the 'live' distance as a proportion of total distance travelled, have remained constant at around one third and one half respectively.

**Table 2 Comparisons of revenue statistics**

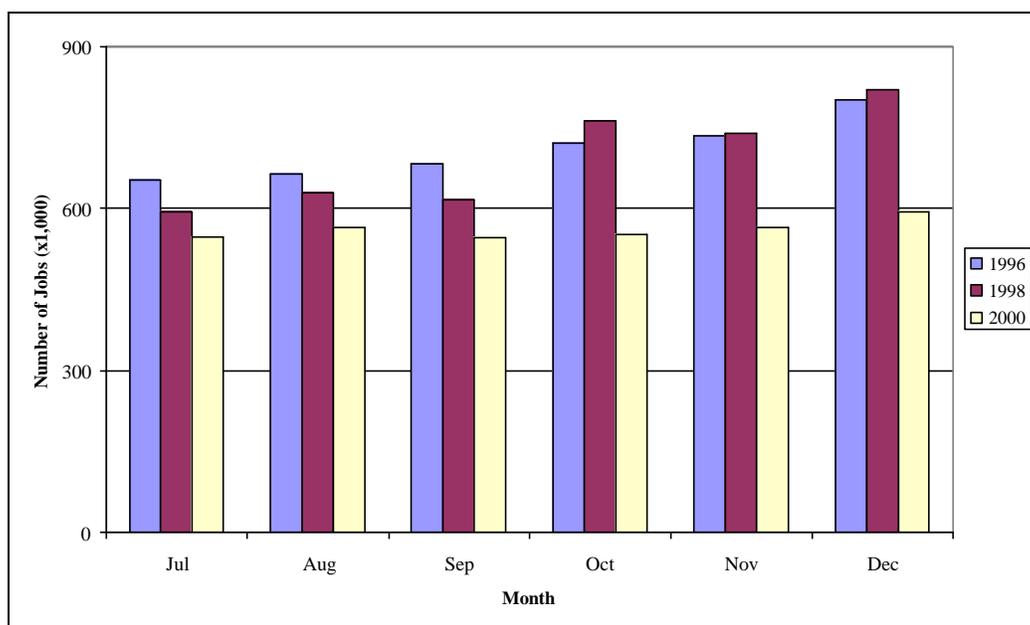
	Year 2000 Dollars				Increase on 1996 (%)		
	1996	1998	2000	2000 less GST	1998	2000	2000 less GST
\$ per total km	0.69	0.75	0.80	0.73	8.7	16.3	5.7
\$ per live km	1.40	1.50	1.59	1.45	7.1	13.9	3.5
\$ per working hour	16.07	17.02	18.59	16.90	5.9	15.7	5.2
\$ per live hour	46.86	49.05	52.73	47.94	4.7	12.5	2.3
\$ per shift	162.15	174.35	190.69	173.35	7.5	17.6	6.9
\$ per trip	10.20	11.60	12.43	11.30	13.7	21.8	10.8
7 km fare, tariff 1	8.30	8.70	9.90	9.00	4.8	19.3	8.4
7 km fare, tariff 2	9.70	11.10	12.60	11.45	14.4	29.9	18.1

The total amount of work (number of jobs) performed by the taxi industry can be estimated by taking the number of jobs booked through the CBSs and multiplying this by a factor calculated from the proportion of these jobs recorded on worksheets as originating through the CBSs. For example, if there are 100,000 jobs recorded through the CBSs and the sample of worksheets reveal that 50 per cent of the jobs originate through this means then it is reasonable to assume that close to 200,000 jobs are undertaken by taxis. While the full-year estimate for the 1996 and 1998 studies were calculated and subsequently reported in Clement *et al* (1999a), no full-

year estimate is possible for the 2000 study as only two surveys were conducted and these in the latter half of the year. The study team did not feel confident enough in applying the factor calculated from the means of engagement proportions from the September study back to the January booking figures. Figure 3 shows the estimated total work for the second half of the three study years, 1996, 1998 and 2000.

**Table 3 Comparisons of operational statistics**

Characteristic	1996	1998	2000	% Change (cf 1996)	
				1998	2000
live trips per shift	15.9	15.0	15.3	-5.7	-3.8
passengers per shift	23.5	23.2	23.6	-1.3	0.4
live km per shift	115.7	116.4	119.7	0.6	3.5
total km per shift	236.9	231.6	237.2	-2.2	0.1
working time per shift (h:min)	10:06	10:14	10:16	1.3	1.7
passengers per trip	1.49	1.55	1.53	4.0	2.7
live km per trip	7.3	7.8	7.8	6.8	6.8
ave trip duration (min)	13.1	14.4	14.2	9.9	8.4
% live km	48.8	50.3	50.5	3.1	3.5
% live time	34.3	34.7	35.3	1.2	2.9
telephone bookings (%)	62.1	57.7	63.1	-7.1	1.6
hail work (%)	10.5	12.1	11.0	15.2	4.8
rank work (%)	27.3	30.1	25.9	10.3	-5.1
SATSS voucher (%)	na	12.0	13.7	na	na
Cash (%)	71.4	67.2	65.9	na	na
Other (%)	28.6	20.8	20.4	na	na



**Figure 3 Estimated total monthly work for July to December**

Table 4 contains the estimated total work figures for the last six months of the Baseline study of 1996 and the percentage changes of the total work estimates for the same six months for the 1998 and 2000 studies.

**Table 4 Estimated total work figures for 1996 and percentage changes in 1998 and 2000**

Month	Jobs 1996	Change cf 1996 (%)	
		1998	2000
July	652	-8.7	-16.1
August	664	-5.3	-14.8
September	683	-9.8	-20.2
October	721	5.7	-23.4
November	735	0.7	-23.1
December	801	2.5	-25.7
Six-month total	4,256	-2.2	-20.8

The graph of Figure 2 shows a considerable decline in booked work from 1996 to 1998 whereas the graph of Figure 3 shows that between the same two years, the decline in total work was not as severe and was certainly within the limits of expected variation in estimates. This is a good illustration of the effect that a low proportion of booked work can have on the work estimate.

## 5 DISCUSSION OF FINDINGS

Using statistics from radio booking data and the proportion of total work represented by radio bookings as indicated on worksheets, we estimate that total work declined 20% from 1996 to 2000. There are a number of possible reasons for this. While one of these is a continuation of the long-term trend toward greater accessibility of the private vehicle, a more direct factor is the impact of a deregulated hire car (or small passenger vehicle) sector. There are few statistics available for the operations of the hire car sector. The numbers of hire cars operating as quasi-taxis is thought to be roughly constant during this period (approximately 100), but it may well be that the amount of work done by each hire car has increased. A third factor that has been used to explain the decline is an increase in unrecorded work generated through the mobile phone. We have argued elsewhere that there are real technical and financial barriers to the use of mobile phones as an alternative to a centralised telephone-based booking system (Clement *et al*, 1999a).

The real increase in fares, exacerbated by the introduction of the GST in year 2000, also would have contributed to a decline in taxi work. The household surveys that have been conducted for each study have always shown high fares as the main inhibitor to an increase in the use of taxis. In 1996 the typical seven-kilometre fare cost (in constant dollars) \$8.30 during the day and evening, and \$9.70 during the night and on weekends. (These fares were almost identical to those of 10 years before.) In 2000 the respective figures were \$9.90 and \$12.60 — real increases of 20 and 30 per cent respectively.

Table 2 indicates that this real increase in fares has cushioned the impact of the decline in work on taxi driver income, even after the GST has been accounted for. Table 1 also reveals that the number of taxi trips *per shift* declined only 3.8%. In fact because the average length of trips increased, the number of “live” kilometres (i.e. kilometres spent carrying passengers) increased by almost 4%.

How do we explain the differences between decline in total work and more satisfactory position recorded on worksheets? The hypothesis put forward is simply that there were fewer taxis on the road in 2000 when compared with 1996. The changes in driver returns are in a context of steadily increasing wages levels for employees as a whole and decreasing unemployment. It is not surprising then, to find claims that taxi owners are finding it very difficult to obtain drivers, and that as a result vehicles are not on the road in quiet periods. The same situation has been recently claimed for Sydney, where the proposed answer is to increase fares at certain times of the week (Morris, 2003; Saleh and Sofios, 2003).

This hypothesis should be investigated further, for example, by comparing changes over time in the distances travelled by taxis. It is important because it suggests that simply increasing the numbers of licensed taxis will not necessarily provide better service if the real constraint is the number of people willing to be drivers. The situation has reached the point in Adelaide that so many accessible taxi licences have been put on the market that they no longer have market value yet response times are still unsatisfactory (Kowalick, 2001).

## 6 CONCLUSIONS

The conclusions will be structured using the three objectives outlined in the introduction.

1. *To inform researchers who are undertaking similar industry-sectoral studies of the methodologies that can improve the performance of such studies.*

While the broad approach to obtaining information has remained constant through successive studies, there have been refinements that have made the studies more efficient and informative and that have eliminated some false steps.

The studies have been able to take advantage of technological improvements in recording capacities of despatch systems. While the capabilities of technological advances in the industry should be exploited where possible, researchers need to be mindful of limitations. For example, the information stored by taxi meters could provide more reliable information than that provided by worksheets, but has not been used because (among other things) there are many trips that are not recorded by meters.

When such a large number of trips are being recorded, response rates themselves are not as important. This however, is subject to two important qualifications. First, the data needs to be provided from a representative sample. In the current example, efforts need to be made to ensure that patterns of night-drivers are accounted for, given their lower response rates. The second qualification is that what may be an adequate supply of information for broad, industry-wide statistics may not be so for conclusions about specific aspects of the industry. While factors such as average trip length, proportion of time and distance carrying a passenger, etc can be readily ascertained from only a small sample of the industry, information on patterns for (say) a Tuesday night may be far less reliable because of the numbers of responses.

In the case of the taxi industry, compulsory powers are essential to obtain adequate and representative information. However the goodwill of the industry, including regulators, is also essential. The study has reinforced the need for a broadly-based reference group when undertaking a large-scale data gathering exercise into a

particular industry. This both promotes goodwill for the study and can provide key information that can improve the quality of the research.

2. *To add to the body of knowledge about the delivery of taxi services in Australasia.*

The dominant feature of Adelaide's taxi industry over the period of the studies has been a steady decline in demand. It should be noted that this is in a city that has continued to grow, both in terms of population and economic activity, throughout the period of the studies. Apart from the real increase in fares, the authors know of no endogenous factor to explain this decline. Exogenous factors can only be speculated upon. The removal of numerical limits on the number of hire cars may be a factor, though the numbers of hire cars that position themselves to compete with taxis has not grown over the period. Other possible exogenous factors are changing work and leisure patterns, which may invoke less need to travel. There has been an increase in the number of alternative public transport modes such as community bus services and courtesy cars (one now exists in Adelaide as a taxi for the patients of a GP's practice) though no study has been done to accurately report the activity of these vehicles nor to try to quantify the effect they have on the taxi market. Over the period of the studies there has also been a steady rise in access to the private car.

3. *To highlight the response of the taxi industry to changing industry conditions and what this means for regulatory policy.*

The other important feature of the taxi industry in Adelaide is that industrial conditions do not appear to have suffered. This is despite the decline in demand but no consequent shrinkage in the number of taxis. (Indeed, if 'accessible' taxis – for those people whose physical capabilities are to some degree impaired – are included, the numbers of taxis have steadily increased.) A more sensitive factor determining industrial conditions is the supply of drivers. This can fluctuate far more than the numbers of licensed taxis. There appears to have been a decline in the willingness of people to drive taxis. Once again, the reasons can only be speculated upon, but the steadily declining unemployment rate throughout the period has provided more alternative employment opportunities.

This has important implications for regulatory policy. It has been argued previously that existing taxi regulation operates within a false paradigm, shaped by the key factors of (a) a limited number of taxi licences, and (b) licences that can be bought and sold on the market. This particularly applies to the pre-booked sector of the market, which comprises about half of the taxi market and almost all of the accessible taxi market (Radbone, 1998; Radbone and Woolley, 1998). Simply issuing more licences will not provide a better service when the problem is not a lack of licences but a lack of drivers. This study has provided more evidence to support this argument.

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