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Surveying Sydney rail commuters' willingness to change travel time

Liesel Henn[1], Neil Douglas[2] and Keith Sloan[1]

[1]Southern Cross Business School, Southern Cross University, Lismore NSW

[2]Douglas Economics, Te Aro, Wellington, NZ

Email for correspondence: keith.sloan@scu.edu.au

Abstract

This paper reports an analysis of Sydney commuters' stated willingness to change their time of travel during the morning peak period in response to fare discounts and/or faster trip incentives. The aim of the study was to evaluate the peak spreading potential in an empirical case study of a Sydney urban rail corridor. Peak spreading is here understood to mean shifting the travel times of some passengers out of the most congested part of the peak. Survey results confirmed that differentiated service and fare policy measures offer peak spreading potential. In addition findings which are helpful in shaping peak spreading policies emerged, including the need for targeted measures, given that peak spreading potential sharply declines as displacement intervals increase. Work commitments emerged as a major barrier to peak spreading. Finally, it was found that a policy that would focus on morning peak demand management is also likely to address afternoon peak issues.

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Keywords: Travel time displacement, differentiated peak fares, stated intentions, peak demand management, peak spreading, peak smoothing, peak period, crowding.

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1. Introduction

Overcrowding of peak period rail services has become a problem in major cities which in turn has prompted studies of travel flexibility and demand management measures to help smooth passenger loads.

This paper presents the results of a survey into the willingness of Sydney rail passengers to change their time of travel in the morning peak to take advantage of a hypothetical fare discount or faster train trip.

The survey was part of a wider study that researched peak smoothing instruments, best practices and models in commuter rail and other relevant industries (CRC for Rail Innovation (forthcoming)). This paper presents and discusses the results of the questionnaire survey. The paper does not use the results to forecast the crowding impact on individual trains of introducing fare discounts, since this task was undertaken in an associated study that used a 'rooftops' approach to forecast passengers choice of train given their desired arrival time, actual timetabled times of trains and the availability of fare incentives on particular trains (Douglas, Henn and Sloan 2011).

Section 2 summarises a review of fare discount trials and associated market research undertaken in Sydney, Melbourne and London. Section 3 describes the displacement passenger survey undertaken in Sydney in 2010, while sections 4-10 present the main findings of the survey.

2. Literature review

A literature review supported by rail expert consultations of demand management policies and instruments in urban passenger rail was undertaken. The key findings are presented in Henn, Karpouzis and Sloan (2010).

A short review of recent fare discounts trialled in Sydney and Melbourne is provided below as well as market research surveys undertaken in these cities and also London.

2.1 Sydney

In February 2008, in preparation for a trail of the *"Smartsaver"* which offered a fare discount of 50% on trains arriving in the CBD before 7.15am and also between 9:15am and 10:15am, additional questions relating to travel time flexibility were added on to the regular customer satisfaction survey (RailCorp 2008).

One question was *"are you able to change your travel arrangements?"* Approximately two thirds of just over 1,000 respondents had some flexibility in their daily travel routine, with the biggest potential for changing the time of travel being arrivals in the CBD before 7.45am (41%) and departing after 6.00pm (43%).

In response to *"regarding trips where you are able to change your time of arrival or departure to/from the CBD: what would make you change your travel arrangements?"* just over one half of respondents considered improved service frequency to be the main motivation with improved seat availability (35%) and a change in fares (32%) also significant. It should be noted, however, that faster journey times (e.g. express trains) was not offered as an incentive.

In response to *"regarding trips where you are not able to change your time of arrival or departure to/from the CBD: what are your main constraints?"* work commitments emerged the dominant constraint with family commitments second.

The market research also found that combining peak fare surcharges with off-peak discounts increased the willingness to travel in the off-peak from 43% to 53%.

2.2 Melbourne

In Melbourne, an Early Bird fare initiative that offered free travel before 7am was introduced in 2008.

Nature undertook market research surveys on behalf of MetLink in 2009 using hypothetical Stated Preference questionnaires to investigate the ability of fare discounts and surcharges to change passengers' time of travel (Nature 2009). The research found that a 20% peak surcharge could motivate 13% of high peak rail passengers to consider travelling earlier or later and a 20% off-peak fare discount combined with a 20% high peak surcharge could motivate 20% to change. However, service frequency was not found to be a significant motivator in changing passengers' time of travel.

2.3 London

In London, market research undertaken by Consolidated on behalf of Passenger Focus in 2006 found that 40% of respondents could be persuaded to travel outside of the morning peak (Consolidated 2006). The research also found that fare discounts in excess of 25% were required to 'displace' passengers. Work and educational commitments were established as major trip retiming constraints, whilst "getting out of bed" earlier was also a significant barrier.

User surveys were also conducted by Faber Maunsell on behalf of the Department for Transport, Transport for London and Network Rail (Faber Maunsell 2007). The market research found that there were strong linkages between morning and afternoon peak travel. If commuters changed their morning travel time then changes were likely in the evening. The survey also found that thirty minutes was an important threshold with less than half the number of passengers able to shift over half an hour as under half an hour. A third finding was that morning commuters were more likely to travel earlier than later, which was considered to reflect the need to arrive at work by a certain time.

2.4 Summary

In summary, the fare experiments and market research undertaken in Sydney, Melbourne and London established a potential for spreading the peak by offering fare incentives to travel outside the high peak. Express shoulder peak services also offered potential but the potential of service frequency changes was mixed.

Studies indicated that peak spreading declined as time displacement increased. Morning peak spreading policies resulted in a bigger shift to the early peak shoulder than to the late peak shoulder.

Peak smoothing instruments applied in the morning were also found to affect the afternoon peak with work and family commitments the major barriers.

3. Displacement survey of Sydney rail passengers

A questionnaire survey was developed to assess the willingness of passengers to travel earlier or later in the morning peak to take advantage of fare and travel time incentives. An example of one of the displacement questions is provided below:

11. Would you use a train that departs 30 minutes EARLIER than now, if you received a 10% discount? *Please tick one only*

1. ☐ Yes	4. ☐ No- fixed appointment	7. ☐ No- discount not large enough to make up for time shift
2. ☐ No- train too crowded	5. ☐ No- too hard to get out of bed earlier	8. ☐ No– other *Please specify* ....
3. ☐ No- other family commitments	6. ☐ No- no flexibility in work/ study hours	

The example question asks whether the passenger would travel thirty minutes earlier if a 10% fare discount was offered. The passenger was then asked whether they would travel earlier in the afternoon. The question was then repeated, but with the respondent asked whether they would travel thirty minutes later.

A set of five questionnaires was developed that varied the nature and extent of the incentive, Table 1.

Table 1: Displacement Incentives

Set	Incentive	Displacement (Travel Earlier or Later)
1	10% fare discount	30 mins
2	30% fare discount	30 mins
3	30 % fare discount	60 mins
4	5 minute faster train trip	30 mins
5	10 minute faster train trip	30 mins

By design of the survey, passengers were asked to respond to only one type of incentive, but by comparing the response to sets one and two it was possible to assess the effect of the fare discount (10% versus 30%). Likewise by comparing the response to sets four and five it was possible to assess the impact of varying the trip time (five or ten minutes) and by comparing sets two and three it was possible to assess the impact of the degree of displacement (30 minutes versus 60 minutes).

Furthermore, by comparing the differential response to sets two and three with the differential response to sets one and two and also to sets four and five it was possible to derive the relative value of displacement in dollars and also in train time.

Only fare discounts were offered. Fare surcharges were not included for reasons of customer sensitivity, although it is recognised that the responsiveness to fare increases may differ as was found in associated Stated Preference surveys (Douglas et al 2011) and also in other studies e.g. Ramjerdi & Dillen (2007).

The questionnaire also collected information on travel time flexibility, ideal travel times and the link between morning and afternoon travel. Travel time flexibility was especially important since it allowed the response to the incentive questions to be constrained to those able to change their time of travel.

The questionnaire was a self completion form that was handed out and collected on trains by fieldworkers. All passengers except school children and RailCorp employees were surveyed.

The survey was conducted on the Illawarra / Eastern Suburbs Railway (ESR) in September 2009. In total, 43 train services were surveyed with just over 1,800 completed questionnaires obtained.

The Illawarra line was chosen because it experiences high peak passenger loading with an average morning peak hour inbound cordon load factor (passengers / seats) of 130% observed in March/April 2008 (RailCorp 2010). Passenger loadings also vary by stopping pattern with express services experiencing higher loads (140%) than local all-stop services (120%) (RailCorp 2010).

The ESR was included because it is operationally interlinked with the Illawarra line and although it has lower morning peak passenger loads of around 60% in 2008 (RailCorp 2010) it caters for short distance trips into the city, which were harder to intercept on the Illawarra line.

Responses were aggregated by time period and by distance. Three time periods were defined: Early peak (trains arriving at Central station between 6.00am and 7.59am), peak hour (8.00am - 9:00am) and late peak (9.01am - 10.30am). Three trip lengths were also defined: Short trips (up to 25 minutes), medium (26 - 50 minutes) and long (over 50 minutes).

Combining the trip length and time periods gave a total of nine cells for each of the five questionnaire sets. Thus, there were 45 cells in total. For each cell, a minimum of 20 interviews was targeted.

Table 2 sets out the samples. The returns were roughly evenly balanced with around 360 questionnaires per questionnaire set although there was a slant towards peak hour medium distance trips and against early peak - short distance and late - long distance trips.

Table 2: Sample Sizes by Questionnaire Set, Time Period and Distance

		Questionnaire Set					
		1	2	3	4	5	
Period	Distance	10%F|30D	30%F|30D	30%F|60D	5M|30D	10M|30D	ALL
Early 6-8am	Short <26 mins	24	30	28	20	34	136
Early 6-8am	Med 26-50 mins	56	56	53	48	56	269
Early 6-8am	Long >50 mins	20	21	23	21	17	102
Peak 8-9am	Short <26 mins	42	39	38	43	55	217
Peak 8-9am	Med 26-50 mins	68	72	66	70	61	337
Peak 8-9am	Long >50 mins	30	26	24	24	23	127
Late 9-10.30	Short <26 mins	44	38	38	49	30	199
Late 9-10.30	Med 26-50 mins	50	53	50	55	55	263
Late 9-10.30	Long >50 mins	27	31	33	30	36	157
Total		361	366	353	360	367	1,807

Note: see text for full description of incentive and displacement for each set and also sample segments.

The questionnaire included a set of socio-demographic and trip profile questions to assess the sample profile. More females (57%) than males (43%) responded; 70% of respondents were aged 25 to 55; 80% were employed and a similar portion were commuting to work. Two thirds were travelling on multi use tickets (e.g. weekly tickets) with the other third using single or return tickets. These demographics were comparable to the peak hour patronage profile for Sydney urban rail passengers used by RailCorp (2010).

4. The willingness to displace

Table 3 presents the percentage of passengers who were willing to displace early or later to each incentive (sample sizes are given in Table 2). Column 11 gives the average fare per trip calculated using the ticket prices and ticket types stated by respondents and trip multipliers adopted by CityRail. The average fare per trip was estimated at $3.31 thus a 10% reduction would be worth 33 cents and a 30% reduction would be worth 99 cents.

Table 3: Willingness to Displace for a Fare or Travel Time Incentive

Willingness to travel 30 minutes (or 60 minutes) earlier or later for a fare discount or faster train

		Fare Discount Incentive						Faster Trains				
		1	2	3	4	5	6	7	8	9	10	11
Peak	Trip	10% Disc|30m Disp		30% Disc|30m Disp		30% Disc|60m Disp		5min|30min Disp		10min|30min Disp		Av
Period	Dist	Early	Later	Early	Later	Early	Later	Early	Later	Early	Later	Fare
Early	Shrt	38%	17%	40%	14%	36%	22%	30%	20%	26%	41%	2.92
Early	Med	27%	16%	55%	36%	19%	10%	26%	23%	50%	36%	3.23
Early	Long	25%	20%	43%	24%	35%	23%	19%	19%	35%	35%	4.18
Peak	Shrt	57%	19%	49%	15%	34%	11%	16%	12%	33%	26%	2.97
Peak	Med	31%	16%	51%	23%	42%	14%	16%	14%	33%	39%	3.19
Peak	Long	33%	10%	62%	23%	29%	17%	21%	17%	43%	26%	3.97
Late	Shrt	39%	16%	61%	29%	55%	16%	35%	20%	33%	17%	2.59
Late	Med	42%	10%	57%	19%	40%	8%	25%	22%	40%	33%	3.00
Late	Long	44%	8%	48%	35%	21%	9%	33%	33%	56%	44%	4.81
All		37%	15%	52%	25%	35%	13%	24%	19%	39%	34%	3.31

The results show a high willingness to displace for the fare and faster train incentives. Willingness was especially high for travelling earlier. Overall, 37% were willing to travel 30 minutes earlier for a 10% fare discount offering an average saving of 33 cents per trip. By contrast, passengers were much less willing to displace later with only 15% willing to shift 30 minutes later (columns 1 and 2). Increasing the fare discount to 30% increased the displacement to 52% earlier and 25% later (cols 3 & 4).

For peak hour passengers, the percentage ranged from 31% for medium distance trips to 57% for short distance trips for a 10% discount. Raising the discount to 30% increased the percentage to 51% for medium trips and 62% for long trips. However for short trips, the percentage fell to 49%.

The results imply high demand sensitivity. For a 10% discount, the early displacement ‘elasticity’ was 3.7 for medium distance trips (-37%/-10%) which reduced to 1.7 for a 30% discount.[1] Stated response was therefore high given the fare discounts involved.

The sensitivity was half as strong for travelling later. 16% of medium distance peak hour passengers were willing to travel 30 minutes later for a 10% discount. The percentage rose to 23% for a 30% discount. Long distance respondents were more responsive with the percentage more than doubling from 10% to 23%. Again, short distance respondents were least responsive to the size of the fare discount, which probably reflects the low fare on which the percentage reduction was applied.

Columns 5 and 6 give the willingness to displace by an hour for a 30% fare discount. Compared to 30 minutes (cols 3 & 4) increasing the displacement to an hour reduced the percentage willing to travel 60 minutes earlier from 52% to 35%. Likewise the percentage willing to travel later fell from 25% to 13%.

For the peak hour, the percentages willing to travel an hour earlier ranged from 29% for long distance passengers to 42% for medium distance respondents. The most responsive were long distance passengers with the percentage falling 32% points from 62%.

For travelling an hour later, the peak hour percentages ranged from 11% for short distance trips to 17% for long trips. Medium distance trips were the most responsive to the 30 minute increase in displacement with a 9% point reduction.

The strongest reaction against travelling an hour earlier was by passengers travelling in the early peak period. For medium distance respondents, the percentage fell from 55% for a 30 minute displacement to 19% for an hour displacement. Least bothered were passengers who travelled in the late peak with 55% of short distance passengers willing to travel an hour earlier. Conversely, passengers already travelling in the late peak period were least willing to travel an hour later (8% for medium and 9% for long distance respondents).

Just under one quarter of respondents were willing to travel 30 minutes earlier to take advantage of a five minute faster train time (columns 7 & 8). Increasing the saving to ten minutes increased the percentage to 39%. Thus a five minute faster train trip was less motivating than a 10% fare reduction (37%), whereas a ten minute reduction was comparable.

Faster trains provided an inducement to travel later. For a five minute saving, around a fifth of passengers were willing to travel 30 minutes later which increased to around a third for a ten minute saving. Thus, compared to a fare discount, faster trains encouraged travelling later. In some part, these results probably reflect the asymmetrical effect of faster trains on

[1] The elasticities are effectively ‘cross-elasticities’ since the fare change applies to earlier or later trains.

arrival times: a 10 minute faster trip increases the 'early' arrival displacement to 40 minutes, but reduces the 'late' arrival displacement to 20 minutes.

For peak hour passengers, the percentage willing to travel thirty minutes earlier for a five minute faster train trip was 16% for short and medium distance trips and 21% for long distance trips. Increasing the time saving to ten minutes doubled the percentages to 33% and 43% respectively (for some short distance passengers, the ten minute reduction might have been viewed with some scepticism).

The questionnaire allowed respondents to indicate a willingness to travel earlier but not later (or vice versa) or respond 'yes' to both travelling earlier and later (which would obviously not be possible in practice). Table 4 combines the response to the early and later displacement questions to derive a figure of total displacement. Only peak hour passengers have been included in the table with short, medium and long trips added together.

Table 4: Combined Early & Late Displacement

Peak Hour Respondents

Set	Incentive	Total Displaced		Displaced				Would Not Travel	Sample
		Early	Later	Early Only	Later Only	Early & Later	Total	Earlier or Later	Size
1	10%Disc & 30min Disp	40%	16%	28%	4%	12%	45%	55%	137
2	30%Disc & 30min Disp	53%	21%	37%	4%	16%	58%	42%	135
3	30%Disc & 60min Disp	37%	13%	29%	6%	8%	43%	57%	126
4	5min Faster & 30min Disp	16%	14%	11%	8%	5%	25%	75%	130
5	10min Faster & 30min Disp	35%	32%	21%	18%	13%	53%	47%	136
1-5	ALL	36%	19%	25%	8%	11%	45%	55%	664

numbers may not sum due to rounding

The middle columns disaggregate the response into passengers who would displace 'early only', 'later only' and both "early and late'. The three responses are then summed and as can be seen, this 'total' is less than the sum of the individual early and late displacement questions. The difference is the percentage willing to travel early and later.[2]

The total percentage willing to displace was highest at 58% for a 30% fare discount followed by 53% for a ten minute faster train trip. Increasing the displacement to an hour reduced the percentage to 43%. The lowest percentage was 25% for a five minute faster train trip.

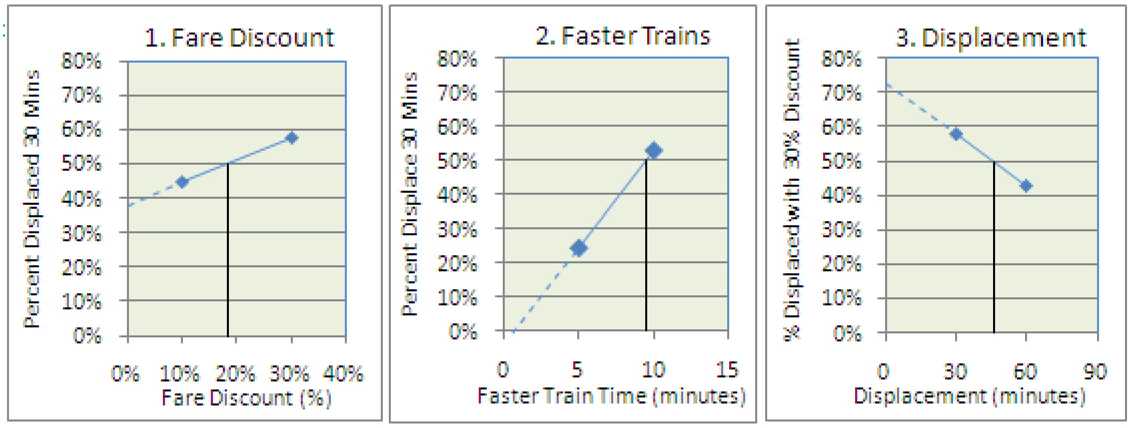
Total displacement is presented in Figure 1 using three graphs. In graph 1, the response to the 10% and 30% fare discounts (for a 30 minute displacement) is presented. In graph 2, the response to the five and 10 minute faster trains is shown and in graph 3, the response to the 30% fare discount for a 30 and 60 minute displacement is plotted.

As response straddles the 50% mark, it was possible to predict the incentive that would encourage exactly one half the respondents to shift, thus providing an 'average' response. The predictions were that a fare discount of 18% would be required or trains speeded up by nine minutes for a thirty minute shift. Alternatively, for a 30% fare discount, one half of passengers would be willing to displace 45 minutes.

[2] This is best illustrated by the response to incentive 4 where the sum of early and late response was 30%, 5% points higher than the 25% total displaced. The difference was the 5% willing to displace early and later.

Given the average fare of $3.27, a discount of 18% would save 60 cents per trip. The graphs show that this fare saving produced the same displacement as offering a nine minute travel time saving. Therefore, the implied value of time was $3.77 per hour. The estimate is low compared to the value of $12.85 per hour used by RailCorp for peak travel.

Figure 1: Total Displacement for Peak Hour Respondents



A higher value of time was produced from comparing the ‘slopes’ of the response lines. For fare, the slope is given by the difference in response of 13% points (58%-45%) divided by 65 cents (20% of $3.27) which is 0.204. For time, the gradient is 28% (53%-25%) divided by five minutes which is 0.057. The ratio of the time over the fare slopes therefore gave a value of time of $16.76 per hour (60*0.057/0.204) which is higher than the RailCorp figure.

The cost of displacement was low. Graph 3 shows that one half of respondents would displace 45 minutes for a 30% fare discount and Graph 1 showed that one half would divert 30 minutes for an 18% fare reduction. The difference in fare discount was therefore 12 percentage points (30%-18%) or 40 cents and the difference in displacement was 15 minutes. Thus 40 cents was equal to 15 minutes of displacement ($1.60 per hour).

The graphs also extrapolate the relationships backwards (shown as the dashed lines). For ‘faster trains’, the prediction was sensible with a close to zero percentage forecast to be willing to displace if there was no time saving. However for fare and displacement, the predictions were unreasonable: for a zero fare discount (graph 1) around 40% were willing to displace instead of 0%; for a 30% fare reduction (graph 3) only 70% would ‘displace’ zero minutes instead of 100%.

What these graphs suggest is that passengers responded to the idea of a fare discount and to shifting their travel time, but did not fully calculate the magnitude of the fare saving compared to the minutes of travel time displacement. If such incentives were offered, passengers would do ‘their calculations’ and it is likely that the resultant behavioural response would be less than the stated intentions presented here. Further work and possible pilot trials of differentiated fares may be required to establish the actual sensitivity of commuters for fare differentiation.

5. Factors reducing displacement

Passengers unwilling to ‘displace’ were asked why they would not take advantage of the incentive. Table 5 aggregates the reasons over the five different incentive questions for early displacement and Table 6 for late displacement. At 30%, “*sleep*” was the most often cited reason for not travelling earlier; the percentage was highest for early peak passengers making medium distance trips (40%) and lowest for passengers in the late peak (15%) making medium distance trips.

A lack of flexibility in work/education hours was given by 15%; *"fixed appointments"* by 10% and *"family commitments"* by 12%. Train crowding was given by 12% of respondents. 13% considered the fare discount or travel time saving was insufficient.[3]

The most often cited reason for not travelling later was *"could not leave later in the PM" at 37%.* Lack of travel time flexibility accounted for 28%.

The market segment profiles were similar apart from a higher percentage of early peak passengers not travelling later because of trains being *"too crowded".*

Table 5: Reason for Not Travelling Earlier

Peak Period	Trip Dist	Train too Crowded	Family Commitm'ts	Fixed Appointm't	Sleep	Work/Educ Inflexible	Incentive too Small	Other	Sample Size
Early	Shrt	6%	4%	13%	33%	24%	12%	7%	90
Early	Med	4%	7%	7%	40%	17%	16%	8%	171
Early	Long	4%	3%	7%	39%	20%	14%	13%	70
Peak	Shrt	15%	14%	8%	27%	15%	13%	8%	136
Peak	Med	14%	15%	7%	35%	12%	12%	5%	220
Peak	Long	5%	10%	14%	27%	15%	22%	8%	79
Late	Shrt	11%	14%	14%	25%	15%	14%	7%	111
Late	Med	25%	17%	12%	15%	14%	11%	7%	155
Late	Long	16%	14%	12%	29%	10%	10%	10%	93
All		12%	12%	10%	30%	15%	13%	8%	1,125

Table 6: Reason for Not Travelling Later

Peak Period	Trip Dist	Train too Crowded	Family Commitm'ts	Fixed Appoint	No Flexibility	Incentive too Small	Can't Leave Later PM	Other	Sample Size
Early	Shrt	19%	2%	5%	25%	3%	41%	6%	101
Early	Med	18%	7%	7%	22%	8%	33%	5%	202
Early	Long	31%	4%	6%	22%	5%	27%	4%	77
Peak	Shrt	7%	3%	5%	35%	3%	42%	4%	175
Peak	Med	9%	7%	3%	25%	10%	44%	2%	260
Peak	Long	10%	5%	6%	26%	10%	40%	4%	103
Late	Shrt	3%	8%	13%	33%	6%	34%	5%	160
Late	Med	9%	8%	9%	30%	7%	34%	3%	211
Late	Long	7%	4%	10%	30%	12%	32%	6%	114
All		11%	6%	7%	28%	7%	37%	4%	1,403

6. PM travel response

Passengers willing to depart earlier in the morning were asked whether they would depart earlier in the afternoon. A similar question was asked about departing later.

12. If you departed EARLIER in the morning, would you leave the city EARLIER in the afternoon? 1.☐Yes 2.☐No

[3] There was little variation in the percentage that gave "the incentive was too small" across the five incentive questionnaires.

Table 7 shows that overall, 45% of passengers willing to depart earlier in the morning would depart earlier in the afternoon. For departing later, the percentage reached nearly 60%.

The percentage departing earlier in the afternoon increased with trip length from 30% for short peak hour trips to 57% for long peak hour trips. For departing later, there was no consistent relationship by distance or time period.

Table 7: Percentage Changing PM Travel Time

Passengers Departing Earlier (Later) in the AM who would depart Earlier (Later) in the PM %

Period	Dist	Depart Earlier in PM %	Depart Later in PM %	Sample Size Early	Sample Size Later
Early	Short	36%	54%	42	26
Early	Med	51%	63%	90	62
Early	Long	63%	65%	27	23
Peak	Short	30%	60%	76	35
Peak	Med	46%	58%	106	64
Peak	Long	57%	41%	47	22
Late	Short	37%	58%	79	33
Late	Med	47%	70%	102	46
Late	Long	52%	55%	60	42
ALL		45%	59%	629	353

7. Ideal travel time

Passengers were asked whether their train service was at the ideal time; if not, they were asked to give the main reason for not travelling at the ideal time:

5. Does the train service get you to your destination station at the most <u>IDEAL</u> time for you? *Please tick one box only*

1. ☐ Yes
2. ☐ No – I would rather travel 15 mins earlier
3. ☐ No – I would rather travel 30 mins earlier
4. ☐ No – I would rather travel 15 mins later
5. ☐ No – I would rather travel 30 mins later
6. ☐ Other *Please specify* ....

6. If you don't travel at your ideal time, what is the main <u>reason</u>? *Please tick one box only*

1. ☐ There is no train at this time
2. ☐ The trains are too crowded at this time
3. ☐ I cannot get to the departure station at the required time
4. ☐ Other *Please specify* ....

Table 8 presents the response and shows that for nearly 80% of passengers, the train service was at the ideal time and for a further 17%, it was within 15 mins of their ideal time (with 13% preferring a train earlier and 4% later). Therefore, 97% were travelling within 15 minutes of their ideal time and only 3% were travelling outside of 15 minutes of their ideal time. Thus for most passengers, the take up of a fare discount or faster train trip incentive would displace them from their ideal travel time.

Passengers making short trips were the most likely to be travelling at their ideal time; long distance passengers were the least likely. Peak hour and early peak period passengers were also more likely to be travelling at their ideal time than passengers travelling in the late peak.

Table 9 shows the reasons given for not travelling at their ideal time: 37% responded that there was no train service, 24% because the train would be too crowded and 23% because they could not access the departure station at the required time.

Across the market segments, the lack of a train service at the ideal time was most often stated by long distance passengers. Crowding was more important as a disincentive amongst passengers making short and medium distance trips in the early and late peaks at around 40%. Thus crowding causes some passengers to displace from their ideal time. The overall percentage based on combining Tables 8 and 9 was not large however at 5% (24% of 391 ÷ 1,790). The percentage was highest at 8% for passengers travelling in the late peak and lowest at 3% for early peak passengers. Therefore, although crowding has been estimated to cause a significant additional cost on travel (Douglas and Karpouzis 2009) it does not seem to motivate much change in behaviour.

Table 8: Passengers Travelling at their Ideal Train Time

			Ideal Time would be					
Period	Dist	Train is at Ideal Time	15 Mins Earlier	30 Mins Earlier	15 Mins Later	30 Mins Later	Other	N
Early	Short	86%	7%	1%	3%	1%	3%	137
Early	Med	82%	10%	1%	4%	2%	1%	269
Early	Long	76%	12%	2%	4%	0%	6%	101
Peak	Short	86%	10%	0%	2%	0%	1%	216
Peak	Med	78%	14%	3%	3%	0%	1%	334
Peak	Long	71%	15%	4%	7%	1%	2%	127
Late	Short	77%	14%	4%	2%	2%	2%	194
Late	Med	68%	22%	8%	2%	0%	0%	259
Late	Long	55%	24%	8%	7%	4%	3%	153
All	All	76%	14%	3%	3%	1%	2%	1,790

Table 9: Reason for not travelling at Ideal Time

Period	Length	No Train	Too Crowded	Accessing Station	Other Reason	N
Early	Short	24%	41%	18%	18%	17
Early	Med	30%	13%	38%	20%	40
Early	Long	42%	8%	17%	33%	24
Peak	Short	20%	40%	28%	12%	25
Peak	Med	39%	30%	21%	10%	67
Peak	Long	44%	9%	31%	16%	32
Late	Short	30%	23%	35%	13%	40
Late	Med	32%	33%	18%	17%	78
Late	Long	56%	18%	13%	13%	68
All	All	37%	24%	23%	16%	391

8. Travel time flexibility

Passengers were asked about their travel time flexibility:

4. Do you <u>have</u> to make your journey into the city at THIS particular time? *Please tick one box only*

1. ☐ Yes – I have no flexibility in the time at which I travel
2. ☐ No – I could travel up to 15 mins earlier/ later
3. ☐ No – I could travel up to half an hour earlier/ later
4. ☐ No – I could travel up to an hour earlier/ later
5. ☐ No – I could travel up to two hours earlier/ later
6. ☐ No – I could travel at anytime I please

Table 10 presents the response profile and shows that 37% had no flexibility in their travel time with a further third only able to vary their travel time by up to 15 minutes. Adding these percentages together gives a combined percentage of 70% unable to vary their travel time by more than 15 minutes.

The response to this question somewhat contradicts the willingness to travel earlier (or later) for a fare discount or travel time saving. Table 11 illustrates the mismatch by tabulating the willingness to travel 30 minutes earlier and later for a 10% fare discount against travel time flexibility.

Table 10: Passengers Ability to Vary their Morning Travel Time

		Can't	Can Vary Time of Travel by up to					
Period	Purpose	Vary	15 Mins	30 Mins	1 hr	2 hrs	Any	N
Early	Short	46%	33%	9%	6%	1%	5%	136
Early	Med	39%	28%	15%	12%	3%	3%	268
Early	Long	49%	25%	15%	7%	2%	2%	102
Peak	Short	35%	42%	17%	2%	1%	3%	217
Peak	Med	39%	41%	12%	4%	1%	2%	336
Peak	Long	42%	37%	14%	6%	1%	1%	127
Late	Short	29%	28%	16%	11%	8%	8%	196
Late	Med	36%	27%	17%	12%	3%	5%	263
Late	Long	28%	23%	21%	12%	5%	12%	155
All	All	37%	33%	15%	8%	3%	5%	1,800

Table 11: Willingness to Displace & Travel Flexibility

Response to 10% fare discount & 30 minutes displacement

	Travel Time	Travel Earlier		Travel Later	
Period	Flexibility	%	N	%	N
Early	Vary < 30 mins	28%	74	13%	75
	Vary ≥ 30 mins	32%	25	30%	23
Peak	Vary < 30 mins	38%	110	14%	107
	Vary ≥ 30 mins	43%	30	25%	28
Late	Vary < 30 mins	37%	65	13%	62
	Vary ≥ 30 mins	46%	52	12%	50
ALL	Vary < 30 mins	35%	249	14%	244
	Vary ≥ 30 mins	42%	107	20%	101
ALL	ALL	37%	356	15%	345

Passengers with flexibility were more willing to displace but not markedly. For the peak hour, 43% of passengers able to vary their travel time by 30 minutes or more were in fact willing to travel 30 minutes earlier for a 10% fare discount. The percentage fell to 38% for passengers unable to vary their travel time by more than 30 minutes.

The difference was more marked for late displacement with 25% of ‘flexible’ passengers willing to travel 30 minutes later, compared to 14% for ‘inflexible’ passengers.

9. Constraining displacement to flexible passengers

The response to the incentive questions was constrained to travel flexible passengers. Travel inflexible passengers defined as respondents only able to vary their travel time by up to 30 minutes were assumed not to displace. This rule was applied to the four incentive questions requiring a 30 minute early or late displacement.[4] The constraint was raised for the incentive requiring a 60 minute displacement so that passengers only able to vary their travel time by an hour or more were able to displace.

[4] No adjustment was made for the 5 and 10 minute faster train incentives affecting the arrival time displacement.

Table 12 presents the results and shows that for a 10% fare discount, 13% were willing to travel 30 minutes earlier and 6% later. The percentages are therefore around a third those of the unconstrained percentages shown in Table 3. For a 30% discount, the percentage willing to travel 30 minutes earlier was 19% and was 13% for travelling 30 minutes later. Increasing the displacement to 60 minutes lowered the percentages to 7% and 4% respectively.

For faster trains, 13% would travel 30 minutes early and 8% later for a five minute faster service and 17% and 12% respectively for a ten minute faster service.

Passengers travelling in the peak hour tended to be less willing to displace than passengers travelling in the early and late peak periods. There was no clear relationship with trip distance.

Table 12: Travel Time Flexibility Early & Late Displacement

Willingness to travel earlier or later by Incentive constrained by Travel Time Flexibility

		Fare Discount Incentives						Faster Trains			
Peak	Trip	10% Disc|30m Disp		30% Disc|30m Disp		30% Disc|60m Disp		5min|30min Disp		10min|30min Disp	
Period	Dist	Early	Later	Early	Later	Early	Later	Early	Later	Early	Later
Early	Shrt	4%	0%	7%	3%	7%	4%	5%	5%	12%	12%
Early	Med	13%	9%	20%	25%	6%	8%	10%	8%	14%	15%
Early	Long	0%	10%	19%	19%	4%	9%	10%	5%	12%	12%
Peak	Shrt	17%	7%	13%	5%	6%	6%	11%	2%	13%	5%
Peak	Med	7%	6%	13%	7%	3%	2%	10%	3%	11%	7%
Peak	Long	3%	0%	19%	8%	0%	0%	13%	13%	30%	17%
Late	Shrt	14%	5%	29%	16%	17%	3%	18%	10%	17%	10%
Late	Med	22%	4%	26%	13%	8%	2%	15%	9%	18%	13%
Late	Long	28%	8%	29%	23%	9%	6%	20%	17%	31%	20%
All		13%	6%	19%	13%	7%	4%	13%	8%	17%	12%

Table 13 combines the early and later response to derive a total displacement percentage for peak hour passengers. One in eight passengers was willing to displace 30 minutes for a 10% discount which compares with an unconstrained 45% (Table 4). 7% were willing to travel earlier, 3% later and 2% both earlier and later. For a 30% fare discount, the percentage willing to displace 30 minutes earlier or later increased to 15%. Raising the displacement to an hour reduced the percentage to 4%.

A five minute faster service had the same impact as a 10% fare discount with 12% willing to displace. At 17%, a 10 minute faster service produced the greatest displacement with 9% willing to travel thirty minutes earlier, 3% later and 5% earlier and later.

Table 13: Travel Time Flexibility Constrained Total Displacement

Peak Hour Respondents

Incentive	Total Displaced Early	Total Displaced Later	Displaced Early Only	Displaced Later Only	Displaced Early & Later	Displaced Total	Would Not Travel Earlier or Later	Sample Size
10%Disc & 30min Disp	9%	5%	7%	3%	2%	12%	88%	141
30%Disc & 30min Disp	14%	7%	9%	1%	5%	15%	85%	137
30%Disc & 60min Disp	3%	2%	2%	1%	2%	4%	96%	125
5min Faster & 30min Disp	10%	4%	7%	2%	2%	12%	88%	134
10min Faster & 30min Disp	14%	8%	9%	3%	5%	17%	83%	139
ALL	10%	5%	7%	2%	3%	12%	88%	676

10. Conclusions

The market research explored the travel profile of passengers over the morning peak period and compared the ability and willingness of peak hour passengers to travel earlier and later with that of passengers who travel in the early and late peak period. The survey also allowed the effect of trip distance to be assessed.

The survey, undertaken on a corridor that experiences high passenger loads, found that most passengers still travelled at their ideal time with only a minority 5% not catching their ideal train because of crowding. The ‘cost’ of on-train crowding was therefore not a major factor in passengers' choice of train. Nevertheless passengers did respond that they would be willing to displace from their ideal time for a fare incentive. For a 30% fare discount, 21% of peak hour respondents were willing to travel an hour earlier and 37% thirty minutes earlier. Passengers were also willing, albeit less keen, to travel later. For the same fare discount, 21% were willing to travel 30 minutes later and 13% an hour later.

Most passengers had some flexibility in their travel. Thus although they had an ideal time, around 60% were able to travel up to 15 minutes earlier or later. There was some inconsistency however in the response to the survey in that some ‘inflexible’ passengers were willing to displace for a fare discount. This inconsistency was removed by treating inflexible passengers as ‘non-displacers’. The introduction of this constraint reduced the percentage willing to travel 30 minutes earlier to 19% and to travel later to 13% for a 30% fare incentive. For an hour displacement, the constrained percentages fell to under 5.

Some passengers were willing to travel earlier or later. This ‘double counting’ was removed so that the effect of a discount on early and late peak trains could be assessed. For a 30% discount and with the flexibility constraint imposed, 15% of peak hour passengers would be willing to displace 30 minutes and 4% by an hour with most travelling earlier.

The ‘flexibility constrained’ displacement percentages were similar to the Melbourne Stated Preference displacement findings of 13% displacement to a 20% off-peak fare discount (Nature 2009). The steep reduction in willingness to displace an hour was also consistent with the research undertaken in Sydney and London as was the preference to displace earlier rather than later.

Work commitments, followed by sleep and family commitments were the major constraints why passengers were unwilling to displace, which agrees with other research.

Faster express trains were also found to encourage passengers to travel outside the peak hour, with the survey response reflecting an asymmetrical effect on arrival times.

A link between morning and evening displacement was established, with 45% of passengers willing to depart earlier in the AM peak willing to depart earlier in the PM peak. For departing later, the percentage reached 60%. This suggests that when applying a peak spreading fare discount in the morning, some displacement would occur in the PM. For example, a 10% morning travel time displacement could produce an afternoon displacement of around 5%. Given that the afternoon peak tends to be flatter than the morning peak, lower levels of displacement could be sufficient to achieve comfortable train and station loadings.

The study did not investigate the practicalities of implementing time based fares or of the operational issues of introducing fast express trains.

The study was based on the stated willingness of passengers to change their time of travel in response to fare and travel time incentives. The results provide an indication of the possible behavioural response.

In conclusion, Sydney rail commuters had some flexibility in their travel time and were "in principle" responsive to incentives to shift their travel times. The research therefore supports the use of fare differentiation as a demand management tool along with service differentiation.

References

Consolidated (2006) *Edge of morning peak travel* London: Passenger Focus

CRC for Rail Innovation (forthcoming) *Report R1.107: Urban rail demand management Strategies* Queensland: CRC for Rail Innovation

Currie, G (2009) Exploring the impact of the 'Free Before 7' campaign on reducing overcrowding on Melbourne's trains *Papers of the 32nd Australasian Transport Research Forum 32* Auckland: ATRF

Douglas, N J, Henn, L, and Sloan, K (2011) Modelling the ability of fare to spread AM peak passenger loads using rooftops. *Australian Transport Research Forum 34,* Adelaide September 2011.

Douglas, N J, Karpouzis, G (2009) Estimating the passenger cost of train overcrowding *Papers of the 32nd Australasian Transport Research Forum 32* Auckland: ATRF

Faber Maunsell (2007) *Demand management techniques – peak spreading*, London: Department for Transport, Transport for London and Network Rail

Henn, L, Karpouzis, G and Sloan, K (2010) A review of policy and economic Instruments for peak demand management in commuter rail *Papers of the 33rd Australasian Transport Research Forum 33* Canberra: ATRF

Nature (2009) *An investigation into a variable ticket pricing strategy for train travel* Melbourne*:* Metlink

RailCorp (2008) *SmartSaver trial online survey results December 2008* Sydney: RailCorp

RailCorp (2010) *A Compendium of CityRail travel statistics – seventh edition* Sydney: RailCorp

Ramjerdi, F, Dillen, J L (2007) Gap between Willingness-to-Pay (WTP) and Willingness-to-Accept (WTA) measures of value of travel time: Evidence from Norway and Sweden *Transport Reviews*, 27 (5),637–651

TNS Social Research (2008) *SmartSaver trial evaluation report of findings September – October 2008* Sydney: RailCorp