Do restaurant precincts need more parking? Differences in business perceptions and customer travel behaviour in Brisbane, Queensland, Australia

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Abstract

Restaurateurs in Australian cities often resist local government car parking management regimes and advocate for increased parking provision in restaurant precincts. But are restaurateurs' views of the importance of car parking to their trade in line with reality? To explore this question this study surveyed restaurant businesses and customers in parallel at three major restaurant precincts in inner-city Brisbane, Queensland, Australia. The novelty of this paper is in being able to cross-analyse business' perceptions with customers travel behaviour to evaluate the validity of restaurateurs' perceptions about the importance of car travel and parking, and perceptions about transport infrastructure need. Survey data is adopted to constructed discrete choice models that are used to estimate the restaurant customers' preference of transport mode for dining in restaurants and simulations on transport cost subsidy used to identify the impact of different policy outcomes. The findings indicate that, unlike restaurateurs' perceptions, customers who prefer walking, cycling and public transport are more likely to contribute significantly more revenue to the restaurant trade than business owners and managers perceive. The results should help local authorities make better planning decisions about transport infrastructure supply and parking control in conjunction with the restaurant sector as well as help businesses understand that the promotion of sustainable transport options may be more beneficial to their bottom line.

Key words: restaurants; car parking; travel behaviour; business perceptions

1 Introduction

The physical location of a restaurant within the competitive landscape of the city has long been known as a major factor in its likely success or failure. As such, urban restaurants often

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cluster together in a specific restaurant strip in order to attract more customers to a particular precinct (Parsa *et al.*, 2005, pp. 306-307). Such precincts increase both customer traffic and, in our motorized world, vehicular traffic. Once restaurants are established within such environments they can do little about their location other than working to improve customer access to their premises. They often do this by engaging in battles with local authorities about car parking, particularly as they see themselves as competing with out-of-town or suburban centres with large parking structures where parking is often provided free to the customer. Parking is typically managed around restaurant strips in a number of ways including on-street parking controls (paid parking; time limits) with enforcement, planning codes that require parking spaces be built into new developments, and by the allocation of road space within the precinct (Marsden, 2014, pp. 19-20).

Contemporary transport and land use planners are charged with providing for, and working with, the community in consultative or participatory approaches to help shape built environments and transport systems. Stakeholders are engaged, often via dialogue, to identify needs, explore options and find 'solutions'. Loud voices tend to dominate in these processes and people's level of involvement peaks only in terms of matters that affect their house or business (Zehner & Marshall, 2007, pp. 254). This certainly happens with restaurateurs with the issue of parking provision near their premises evoking strong reactions.

However, perceptions commonly differ to reality. Stakeholders participating in planning activities often have incomplete knowledge, are unable to appraise the value of unfamiliar alternatives, and may advocate for sub-optimal outcomes. Planners occasionally commission studies that try to clarify stakeholder perceptions, hear from multiple voices and/or better measure urban phenomena in areas where there is discord. The intent of such studies is not to 'correct' but instead to empower the community with improved understandings. This paper reports on a study of this nature out of the academy, not government. It looks at the perceptions of restaurateurs about car parking and its importance in three major restaurant precincts in Brisbane, Queensland, Australia, compared to what is actually happening in terms of modes used by customers and their spending habits.

Accessibility for its customers is fundamental to any restaurant business. Restaurants, cafes and small bars are an especially entrepreneurial trade with a large proportion of small businesses, especially along streets where independent restaurants have become the dominant land use. In such restaurant precincts the owners and managers seek to position their restaurants to enhance customer satisfaction and to encourage return patronage.

Restaurant patrons are located in specific catchments delimited by the transport and land use system surrounding a restaurant. Conceptually these catchments differ by mode, with small local walk-up catchments (in 2003/04 household travel data) for Brisbane, Australia, revealed as around 1.5km in radius (Burke & Brown, 2007, pp. 25),a larger bicycle catchment, given

bicycles can travel further than pedestrians in a limited time; a public transport catchment restricted by the routes connecting to the restaurant, and the levels of service (frequencies, hours of operation, travel times) offered and the wider catchment for cars defined by street access and travel times across the city and the parking availability near the restaurant. Taxis (and taxi-like services such as real-time ridesharing services (e.g., Uber and Lyft[1])) also service the restaurant travel market, but are not limited by parking availability.

There are trade-offs in the urban design and traffic management at restaurant strips and other activity centres in allocating road space across these different modes and in providing parking for drivers and cyclists. These tensions are exacerbated in dense, gentrifying inner-city precincts and in thriving central business districts, such as found in Australian cities. Other claims for road space, such as keeping through traffic moving (congestion management), other public transport functions and other land uses in the vicinity, all compete with space for parking close to economic activity. The contest for road space becomes acute in cities with narrow streets not originally designed for vehicular traffic, traditional main street designs and areas with negligible off-street parking.

The paper is structured as follows. First, the literature on parking, main streets and the restaurant trade is assessed, highlighting gaps and developing the research questions. Second, the study areas of this paper are introduced, including their parking and transport facilities. This is followed by details of the survey, data acquisition and the presentation of descriptive statistics. The penultimate section delivers the data analysis and model results along with policy simulations. The paper concludes with discussions and avenues for further research.

2 Literature review

Local economies evolved around businesses and residents located side-by-side long before planning emerged as a necessary response to the popularity of car travel and the development of the city fringe (Tranter, 2005). Pedestrian friendly-environments and availability of transport connections – stagecoach, train, tram, bus – provided synergetic environments for businesses and their customers. The ease of access made these places both attractive to businesses wanting to co-locate with other businesses who provided access to patrons, and convenient to customers who were able to access a cluster of businesses by foot or public transport. As society's mobility behaviour transformed with the opportunities provided by the private car – so did business expectations about the importance of having car parking (Moutou, 2013a).

Restaurants are a major contributor to developing the local night-time and weekend economy

[1]Uber and Lyft are on-demand ride share services which operate in conjunction with community drivers to deliver a platform that allows its users to request rides from the ease of a smart phone app.

(Balsas, 2004; Roberts & Eldridge, 2007), and support the attractiveness of the area as a place to co-locate office-based and other day trading business (Arentze & Timmermans, 2001; Reimers & Clulow, 2004; Taylor & Newton, 1985). Restaurant businesses can attract a high flow of customers throughout the day, and contribute positively to the look and appeal of local centres as destinations. Optimal restaurant location is understood to be that which is accessible to customers, near other restaurants, with high quality transport connections with good frequency, and within convenient walking distance of the restaurant location (Iacono *et al.*, 2008; Moutou, 2013b; Reimers & Clulow, 2009). Clustering restaurants in the core and requiring customers to walk past businesses located on the intermediate and periphery helps to spread the agglomeration benefits (Reimers & Clulow, 2004). Moreover, locating cultural and tourist precincts near public transport hubs help to shift the focus of restaurateurs from parking provision to public transport accessibility. With increasing movement towards more sustainable transport policies becoming the norm, good public transport access avoids problems associated with retrofitting established centres to be less dependent on car parking.

From an urban planning perspective the space allocated for parking can reduce space allocated to higher value activities – including cultural and business activities, open spaces for pedestrian movements, lingering and relaxing spaces and green transport modes. Best practice planning solutions including transit oriented developments (TODs) and pedestrian-friendly retail precincts are predicated on including a thriving restaurant sector, though convincing established businesses of this is a challenge. Resistance from the business sector can be driven by a number of factors. Businesses often view parking directly outside their businesses as their own – a viewpoint often shared by residents. The perception of car parking loss equating to lower flows of passing customers stems from a belief, not always well founded, that customers prefer travelling by car, and that businesses will lose customers to nearby districts which continue to retain their parking (Rye *et al.*, 2008; Whitehead *et al.*, 2005). Waiting for customers to adapt their travel behaviour, or finding new customers is not an option for businesses with low profit margins or indeed for businesses which are already struggling, with resistance to parking changes viewed as a matter of survival. Skepticism and low levels of trust that policy promises can be delivered can also be a factor in business resistance (Taylor, 2004; Whitehead, 2005), though when businesses see the delivery of policy improvements this can provide momentum for businesses seeking further policy development (Shoup, 2005).

There is some evidence that ample parking may lift a restaurant's performance across cities and cultures. The provision of car parking by restaurants in both Seoul, Korea, and in Toronto, Canada, was found to have a significant positive relationship with average bill size (Susskind & Chan, 2000, pp. 63; Yim *et al.*, 2014, pp. 17-18). Diners surveyed in Gwalior, India rated parking higher than either ambience or the popularity of the chef in their selection of a

restaurant (Upadhyay *et al.*, 2007, pp. 10). And parking and accessibility were important in impacting the affective quality and intent to re-patronize restaurants in Turkey(Kincaid *et al.*, 2010). Responding to such findings, larger chain restaurants have worked with designers and planners to determine the size and improve the layout and functioning of parking bays and related access on site (i.e. see Jaynes & Hoffman, 1994). Transport and land use analysts have embedded parking availability in the surrounding area as a variable in theoretical work on restaurant location choice problems (Tzeng *et al.*, 2002) and online applications merging restaurant bookings with parking reservations have been proposed (Lo *et al.*, 2011). Beyond the primary effect of changes to parking supply resulting in a change of use from car storage to space for pedestrians, public transport, cycling and public space, parking can also have secondary and tertiary effects on the economy. Changes in traffic flows and modal shift are secondary effects that can redistribute economic activity, which in turn has a flow-on effect to benefit or to the detriment of businesses and public transport revenue (European Union (Technical Committee on Transport (COST), 2005). Research aimed at cultivating a paradigm shift in creating more sustainable environments has sought to demonstrate, through case-study examples, how businesses can benefit from less car parking dependence. Examples include the European Union Technical Committee on Transport (COST) (2005) which collated evidence of the effort of parking policies on the economy and mobility in European jurisdictions; the information website portal 'City Parking in Europe' (http://www.city-parking-in-europe.eu/); and, Litman (2015) who provides a comprehensive guide on implementing parking policies from a Canadian perspective.

Collecting data on parking utilisation and transport mode choice can be done through intercept surveys of shoppers and surveys of distribution, use and turnover frequency in existing parking. These studies can be an important source of information to challenge business perceptions of the economic value of car parking – by collecting data from shoppers on where they shopped and the amount they spent and comparing these by travel mode. Excluding local businesses from this data collection phase is not recommended as it reduces business confidence that the decision-making process will be fair and considerate of the business community's needs.

The economic contribution of shoppers travelling by foot, bike and public transport is often overlooked by businesses while the contribution of car drivers and the distance customers travel is often over-estimated (see, for example,(Clean Air Partnership, 2010; Jones *et al.*, 2007; Rye *et al.*, 2008; Stantec, 2011). Literature reviews of these studies, many found in the 'grey' literature generated by consultants show that the phenomena of business over-estimation exists worldwide – with the exception of Auckland. A selection of these are shown in Table 1.

Table 1: Comparison of actual mode share versus business expectations in various studies

City	Actual	Business expectations	Reference
Graz, Austria	Foot 44%, Bike 8%, Bus 16%, Car 32%	Foot 25%, Bike 5%, Bus 12%, Car 58%	Sustrans (2003) cited in Fleming (Allatt) *et al.* (2013)
Bristol, England	Foot 55%, Bike 10%, Bus 13%, Car 22%	Foot 42%, Bike 6%, Bus 11%, Car 41%	Sustrans (2003) cited in Fleming (Allatt) *et al.* (2013)
Auckland, New Zealand	Car 66%, Foot 22%, Bike 2%, Bus 9%, Train 2%, Other 2% (including skateboards and scooters)	Car 58%, Foot 29%, Bike 2%, Public transport 9%, Other 2% (including skateboards and scooters)	Fleming (Allatt) *et al.* (2013)
Edinburgh, Scotland	Shopper surveys identified only 29% drove and parked in nearby street	44% of business respondents thought 50% customers drove and parked in nearby street	Rye *et al.* (2008)

While it may be less convenient to purchase a large number of goods or purchase large sized goods if a shopper is walking, cycling or taking public transport, this is not an issue of concern to restaurateurs. An Australian study found, using an intercept survey, the amount spent varied by the shoppers' mode of transport in the restaurant and retail precinct of Lygon Street area of Melbourne (Lee & March, 2010). The study compared expenditure per hour and found those who travelled by car spent the most ($65/hr), followed by foot ($58/hr), bike ($47/hr), and public transport ($41/hr) – however car drivers made fewer trips during the week compared to the greener modes of travel.

This paper uses a somewhat similar approach to that of Lee and March (2010) and builds on the literature by providing a further empirical observation in looking at the importance of parking to restaurants in different areas in Brisbane, Queensland, Australia. Moreover, the paper explores differences between the actual and business perceptions for the importance of car parking to customers of restaurants and compares this with the expectations of customers.

3 Study

This section describes the study area which consists of a survey of restaurant owners and managers undertaken in Boundary Street, West End; Eagle Street, Brisbane; and Caxton Street, Petrie Terrace, all within inner-city Brisbane, as shown in Figure 1.

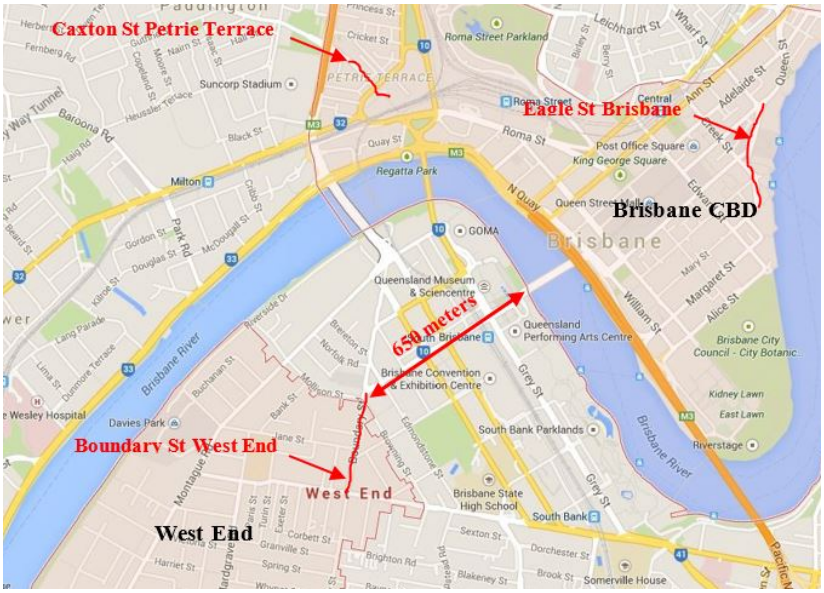


Figure 1: Location of three restaurant precincts in inner-city Brisbane

There are five different types of restaurants in these precincts, including fast food (orders are made at the counter with fast service food part prepared off-site); fast casual (the cost is higher than the fast food and the food is mostly prepared on-site); casual dining (table services are provided, cost is moderate with possible bar services); family style (table services provided, cost moderate and may not provide bar services) and fine dining (full services provided with waiters, fine décor and bar services). Table 2 reports the proportion of restaurant types in each precinct. Fast food restaurants are a very small proportion across all the precincts. Eagle Street has a larger number of fine dining restaurants than the other precincts.

Table 2: Restaurant types in study areas

Restaurant type	All		Boundary street		Eagle street		Caxton street	
	Number	%	Number	%	Number	%	Number	%
Fast food	6	6.0	5	12.0	0	0.0	1	5.5
Fast casual	22	21.5	12	29.0	9	21.0	1	5.5
Casual dining*	28	27.5	8	20.0	11	26.0	9	50.0
Family style	23	22.5	12	29.0	10	23.0	1	5.5
Fine dining	23	22.5	4	10.0	13	30.0	6	33.5
Total	102	100	41	100	43	100	18	100

* Provide full bar services with alcoholic.

There are generally also five different types of parking facilities that can service restaurant precincts. This includes on-street parking as well as forms of off-street parking(at-grade outdoor parking; at-grade covered parking; multiple-level parking; and underground parking). Figure 2 (a) shows the on-street and off-street parking areas/facilities and parking fees per 3 hour visits in each precinct. Eagle Street has the highest parking charge at around AUD$30-75, reflecting its location in the heart of Brisbane's central business district where

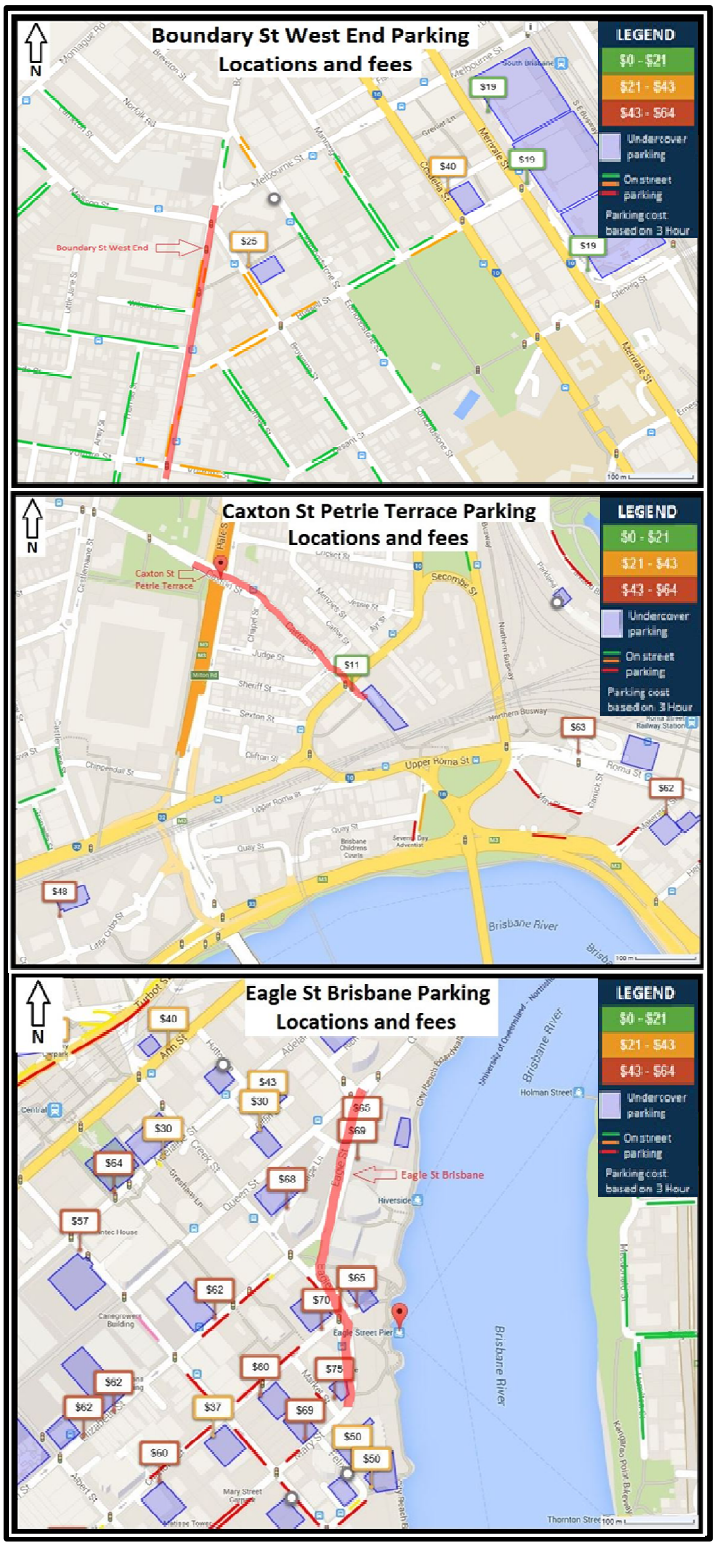
parking availability is tightly managed by the local government. Caxton Street has the lowest charges of the three sites with off-street parking around AUD$11. Figure 2 (b) shows the public transport availability for the restaurant precincts. All are served by train, ferry, bus, and active travel services including Brisbane's CityCycle public bicycle hire system. In addition, Eagle Street benefits from a free City Loop bus service provided by Brisbane City Council.

4 Data acquisition

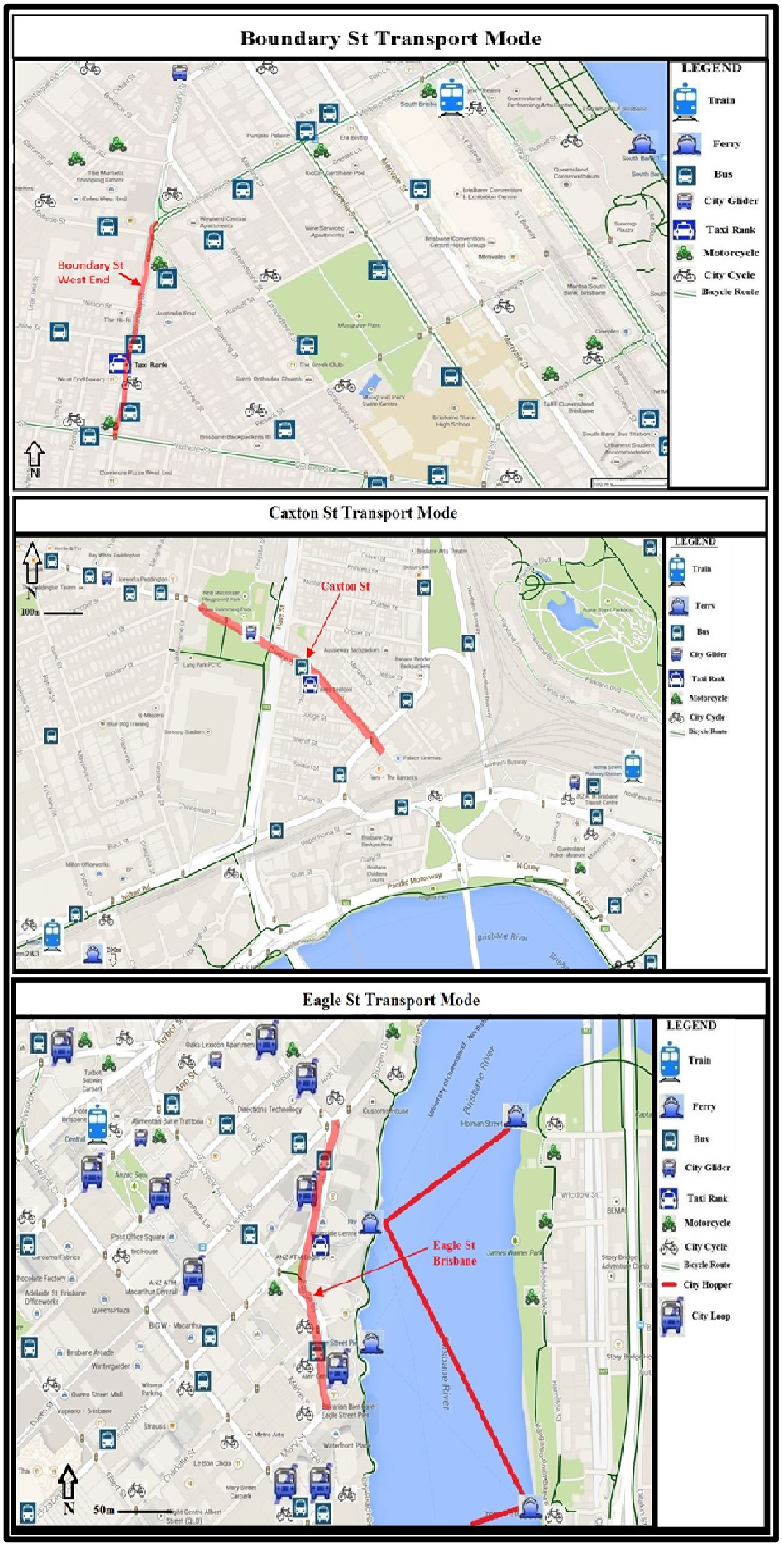
Building on the literature, the data collection sought the perceptions of restaurant businesses and their customers in parallel with a restaurant transport survey. An intercept survey method was chosen and delivered in the three restaurant precincts, starting on March 1, 2015 and lasting for seven days. A total of 394 customers and 44 restaurants responses were received and 76% of customers and 91% of restaurants provided complete responses.

There are four parts to both the restaurateur and customer surveys. The difference between the restaurateur and customer survey is that customers answered questions on their actual behaviour whereas restaurants answered questions according to their perceptions of customer behaviour. The survey also collected trip characteristics (e.g. travel time, travel distance, travel mode, etc.) of each respondent as well as perceptions of transport facilities (e.g. parking provision, infrastructure improvement, etc.).Furthermore, customers' dining habits were surveyed in terms of the type of meal purchased and this is linked to the social demographic characteristics of the respondent.

Table 3 provides an overview of the survey respondents. The survey sample has exactly 100 respondents in each precinct (N=300). 64% of the survey respondents had access to a car. Almost all of the survey respondents are employed and have finished at least high school education. Approximately equal numbers of men and women answered the survey.



(a) Parking facilities and fee in each precinct



(b)Public transport availability in each precinct

Figure 2: Parking facilities and public transport availability in each precinct

Table 3: Descriptive statistics of restaurant customers (N=300)

Variables	%	Variables	%
Socio-demographic variables			
Occupation		*Employment status*	
Manager	15	Full time	48
Professional	24	Part time	21
Technician	10	Casual/ On call	21
Administration	18	Not employed	4
Sales	10	Retired	4
Labour	14	Nil response	2
Student	5	*Education level*	
Stay at home parent	1	Primary school	1
Retired	2	High school	19
Other	1	Trade / Technical	18
Gender		College graduate / Certificate	21
Male	51	Under/ Post Graduate degree or higher	36
Female	49	Not completed anything	3
Car accessibility		Nil response	2
Yes	64	*Average no. of family members in household*	2.23
No	29	*Average no. of children (under 18)*	0.45
No answer	7	*Average age of respondent*	37.73
		Average annual income before tax (AUD$)	60,264.39

Table 4 summarizes customers' trip characteristics, their perceptions about transport and their dining habits. Trip characteristics were captured by asking the travel time and the travel cost of each transport mode. Most customers had short travel times (34% were under 10 minutes) and low costs (54% are under AUD$5). Only 18% of respondents travelled by car and the rest were public transport users (i.e. bus, train and/or ferry) or active travellers (i.e. walking and/or cycling). To summarise the customers' perceptions on transport, the survey had two questions – the reasons the respondent travelled by car and reasons for visiting this restaurant. From these, the predominant reason for travel by car was "convenient" and this reason was therefore expected to have a positive impact on car selection in the modelling. In urban areas and particularly in city centres, there is strong competition for the use of space betwen different urban activities: walking, cycling, green space, traffic and parking (Golias et al., 2010; Vries et al., 2010). Around 20% of customers recognized active transport infrastructure (i.e. footpath, bicycle accessibility and pedestrian space) as incentives that encourage them visit a restaurant more. More than 40% of customers identified an increase in visits to restaurants if the public transport service is improved and if car traffic is reduced. Dining habits were also collected in the survey from questions asking about visit duration, money spent, and restaurant type.

Table 4: Descriptive statistics of variables in the model (N=300)

Trip characteristics	%	***Perception***	%	***Dining habit***	%
Travel time		*Travelled by car*		*Visiting time*	
under 10 minutes	34	Lack of public transport	23	0-30 minutes	4
11-20 minutes	31	Convenient	46	31-60 minutes	13
21-30 minutes	16	Don't like public transport	10	1-2 hours	22
31-60 minutes	12	Dropping &/ or picking up items	2	2+ hours	49
1-2 hrs	3	Travelling with kids	11	Not sure	12
2+hrs	2	Passenger mobility impairment	6	*Visiting expense*	
Not sure	2	Own mobility impairment	2	$0	2
Travel cost		*Ways to encourage visits**		$1~$15	29
under $5	54	Wider footpath	16	$16~$25	30
$6-$10	30	Improved bicycle accessibility	20	$26~$50	22
$11-$20	12	Pedestrian only space	16	$51~$100	7
$21-$50	3	Reduced car traffic & parking	41	$101+	8
$50+	0	Improved car parking	18	Nil response	2
Nil response	1	Improved bus service	41	*Restaurant type*	
Travel mode		Improved train service	29	Fast food	8
Car	18			Fast casual	13
Walk	23			Casual dining	42
Cycle	7			Family style	22
Bus	19			Fine dining	14
Train	17			Nil response	1
Ferry	5				
Taxi	6				
Scooter/ Motorcycle	5				

* Multiple choice

Table 5 reveals an important effect in terms of modal choice. One third of the customers were walking and/or cycling to the restaurant precincts, especially to Boundary Street. Almost half the customers came by public transport, including bus, train, ferry and this was especially the case for Eagle Street. Together with the highest parking fee ($30-75 for 3 hours), the destination of Eagle Street was expected to have a negative impact on choosing car for travel to restaurants by customers in the modelling. On the other hand, Boundary Street was expected to have a positive impact on active travelling customers(i.e. walking and cycling) partly because it has eight hotels within 200 meter walking distance that can accommodate more than 700 visitors (equivalent to 10% of West End's resident population). Although more than one third of restaurant customers in Caxton Street travelled by public transport, this street has the lowest parking fee ($11 for 3 hours) and, as a result, the effects on travel modes of Caxton Street is uncertain.

Table 5: Modal split in each precinct (%)

Mode	Restaurant Precinct			
	All	Boundary St	Eagle St	Caxton St
Car	18	25	16	12
Walk	23	30	22	18
Cycle	7	6	0	14
Bus	19	16	24	19
Train	17	10	20	22
Ferry	5	8	8	0
Scooter/Motorcycle	4	1	5	7
Taxi	6	4	5	8

5 Results

5.1 Data analysis

In this section, a perceptions cross-analysis is conducted. Figure 3 shows the difference between the customer's actual travel mode share and the restaurant's perception of mode share. There is a clear gap in perception. Restaurateurs over estimated by more than double the actual importance of customers who came by car and neglected the contributions of customers who travelled by public transport (i.e. bus and train). However, the perception about walking and cycling customers was very close to their actual mode shares.

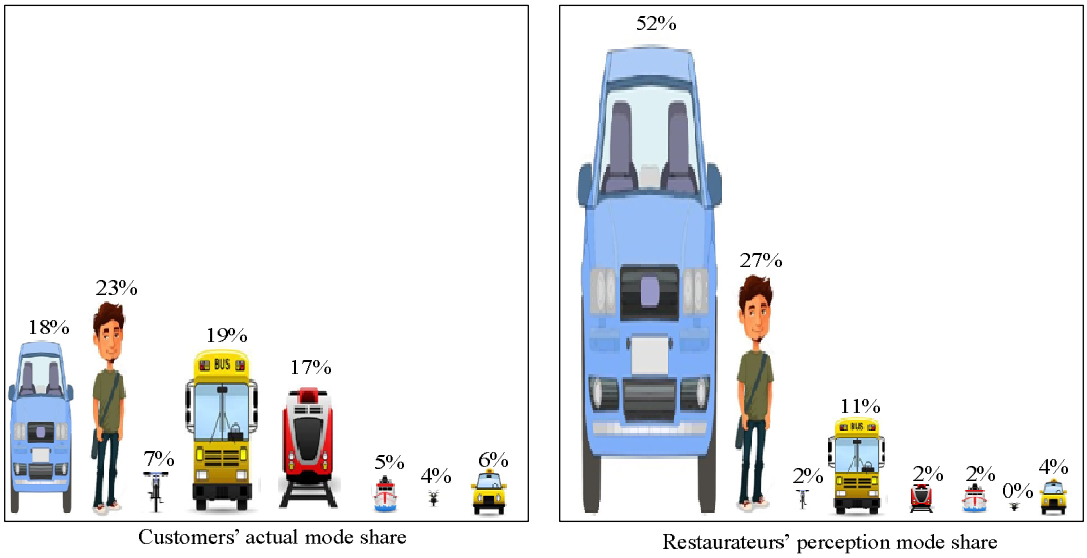


Figure 3: Mode share for customer travel and restaurateur perceptions, sized as to contribution

Moreover, the survey shows customers and restaurateurs have different points of view on the importance of parking supplied. Figure 4 shows the ranking of parking supply by customers and restaurateurs, where the ranking ranges from 1 (always available) to 10 (never available). Figure 4 shows 26% of customers who drive to the restaurant precincts rank parking availability lower than 5, suggesting just over one quarter of customers think they will find available parking most of the time. In contrast, 85.7% of the restaurateur respondents ranked parking availability higher than 5 suggesting they believe parking is often not available for their customers.

Figure 4: Parking availability ranking by customers and restaurateurs

Figure 5 presents another critical issue, the revenue share by mode. The revenues brought in by customers who travelled by car are also lower than perceived by the restaurateurs. Based on our sample, customers who drove provided less than 20% of the revenue for the restaurants they were frequenting. The biggest potion of restaurant income (66%) was coming from customers who walked (25%) or took public transport (19% for bus, 16% for train and 6% for ferry). This is at variance with the study by Lee and March (2010) which identified public transport users as the lowest spenders and may reflect the better access of the Brisbane restaurant precincts studied to public transport than their Lygon Street, Melbourne, case.

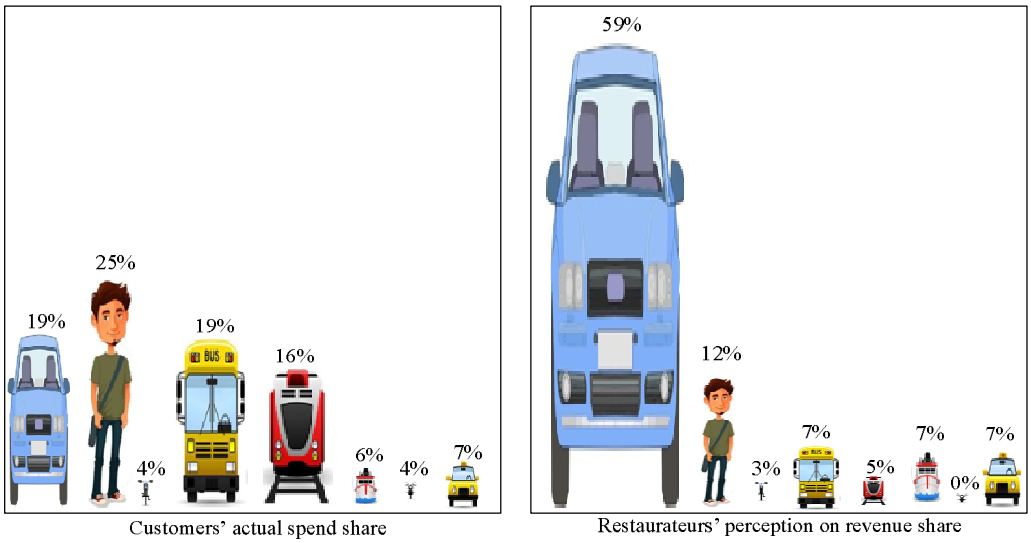


Figure 5: Revenue share from actual customers' spend as compared to the restaurateurs' perception of that spend

5.2 Standard MNL and NL models

In order to understand customer's travel behaviour and their mode choice in particular, a multinomial logit model and (MNL) and nested models (NL) are used. These allow values of

travel time/travel cost to be estimated to better understand the obvious gap between customer behaviour and restaurateur perceptions of that behaviour. A key question is “if customers were to behave as the restaurateurs' perceive, would they bring the revenue expected by the restaurateurs’ perceptions (59% in this case)? What kind of policies need to be put in place to improve transport facilities/services? For example, might decreasing the parking fee encourage customers who drive to visit more often, thus increasing the car mode share to meet restaurateurs' perception? Alternatively, if public transport access was to be made less costly (either in time or in money) would this be a better policy?

In the modelling, customers travel behaviour is determined by the trip characteristics, customers' perceptions of transport facilities, dining habits, location and social demographic variables. There are 4 different model selections (alternatives), including ‘car’ (including both car and Scooter/Motorcycle), public transport (including bus, train and ferry), active travel (including walk and cycle) and taxi. Based on the survey data, three models are constructed with MNL and NL respectively. Although different functional forms were tested, this section presents the preferred models, which are shown schematically in Figure 6.

The MNL model assumes that all error terms are independent from each other. However, this assumption, which is referred to as the independence of irrelevant alternatives assumption, is invalid because two or more alternatives in a choice set are similar so that their utilities are correlated(e.g. public transport model selections are put in the same nest in NL model 1). In these cases, the NL modelling is more appropriate because each nest in the NL model consists of similar alternatives. After analysing various nested structures that provide sensible behavioural interpretation (see Figure 6) the results of two different NL models, NL Model 1 and NL Model 2, with dissimilarity estimates within a logical range are provided. NL Model 1 does not separate out those modes with money costs associated with their use whereas NL Model 2 consists of one nest with cost travel modes including public transport, car and taxi, while active travel is included as a single alternative.

For model fit, the NL models had statistically significantly different from unity dissimilarity estimates, at a 99% level of significance. The NL Model 2 has the better fit and is the preferred specification, with the higher likelihood ratio. The model result for NL Model 2 with different specifications is shown in Table 6, and was used in the following analysis.

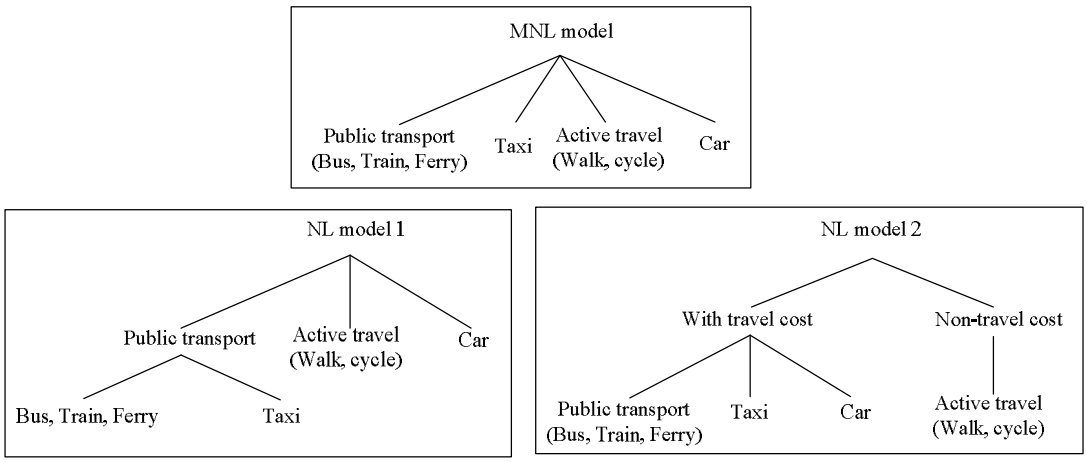


Figure 6: Model structure for preferred choice model

The revealed preference (RP) data from the intercept survey were used to estimate dining customers' travel mode choice models. The taxi passenger alternative was selected as the reference mode because of its low percentage market share (6% only) in the sample. Five categories of explanatory variable including trip characteristic variables, perception variables, dining habit variables, location variables and social demographic variables (Table 3 and Table 4) were used to explain customers' preference of travel mode choice.

Trip characteristic variables are treated as generic variables that have the same coefficients for all alternatives. As expected, negative coefficients are associated with the average travel cost (travel cost/travel time (minutes)), mode speed (travel distance/ travel time (minutes)) has a positive effect on the utility of travel mode alternatives and so has a positive coefficient. This result suggests that customers would prefer to choose at ravel mode with lower average travel cost and higher mode speed (or, lower generalised cost).

The other four categories of explanatory variables are treated as alternative-specific variables that have different coefficients for all alternatives. The negative value of a parameter coefficient indicates that an increase to the value of this variable will decrease the utility for the travel mode and thus decrease the probability of that travel mode being chosen, provided all else remains unchanged. For the perception variables, the positive parameter coefficients indicate the utility of car travellers is increased when customers consider convenience as the main reason to drive and this parameter is significant at the 95% level. In addition, improving the public transport service can encourage dining customers to visit by public transport and this parameter is also significant albeit at the 90% level.

Table 6: Estimation results for NL model 2

Variables	NL model 2
Constants for access mode	
Car	5.345(0.387)
Active	7.399(0.946)
Public	9.268(1.484)*
Tripcharacteristic	
Average travel cost[a]	-0.621(-6.347)***
Mode speed[b]	1.312(2.543)***
Perception	
Convenient_ Car	6.684(4.467)***
Improve public service_ Public	0.881(1.946)**
Dining habit	
Average expense[c]_ Car	2.582(1.456)*
Average expense_ Active	1.158(1.716)**
Average expense_ Taxi	4.098(3.693)***
Visiting frequency_ Active	0.906(1.722)**
Family dining restaurant _Car	1.966(2.064)***
Family dining restaurant_Public	-1.151(-1.840)**
Location	
Eagle St._ Public	0.880(1.824)**
Social demographic	
Age_ Active	-0.262(-1.969)***
Family_ Car	2.606(3.437)***
Dissimilarity (t-value vs. 1)	1.362(3.665)***
Final log-likelihood	-230.2732
Likelihood ratio	0.4238
Adjusted likelihood ratio	0.4129

Note: t-value in parentheses; *** indicates 0.05 level of significance; ** indicates 0.10 level of significance; * indicates 0.15 level of significance.
a: average travel cost = travel cost (AUD dollar) / travel time (minutes).
b: mode speed = travel distance (km) / travel time (minutes).
c: average expense = visiting expense (AUD dollar) / visiting time (minutes).

The dining habit variables are also used to measure the influence of customers' dining behaviours on the dining customers' travel mode choice. The results show that the coefficients for the average expense(visiting expense/visiting time (minutes)) for car, active and taxi travellers are all positive, indicating that the utility of car, active and taxi travellers will be increased, with increasing average dining expense. Furthermore, the variable of visiting frequency is positively associated with the utility of active travellers, suggesting that customers who visit more are more likely to select active travel as their mode. Another important dining variable is restaurant type, especially for family dining restaurants. The negative coefficients associated with this family dining restaurant type suggests the utility of public transport users is decreased by those customers who go to this type of restaurant, presumably due to their appeal to groups with children. In contrast, the interaction of family dining restaurant type has positive effects on the utility of car travellers when dining in family dining restaurants.

The results also indicate the importance of location characteristics on dining customers' travel mode choice. The utility of public transport travellers is influenced positively by the location of Eagle Street where there is a wide array of bus and ferry services and with Brisbane's Central rail station within a reasonable walking distance. Finally, in respect of the social demographic variables, there is a positive impact on utility when a family car is used suggesting that the probability of travelling by car is increased if there is a family with more dependents dining. On the other hand, as might be expected, the utility of active travel declines with age as shown by the negative value of the age coefficient.

5.3 Perception gap

The survey results show that a gap exists between the perceptions of restaurateurs and customers' actual mode choices (Figure 4). Table 7 shows a simulation of dining customers' mode choice to investigate whether restaurateurs are correct in believing that more parking will deliver them increased profits. Please note, there is an assumption that despite the travel saving, spend per customer who travel by particular mode will remain the same. According to the simulation results, the percentage of car customers can be increased to 46% by reducing travel cost by 30% which would be equivalent to AUD$2.89 per person for those customers who travel by car. However, if there were to be only 300 customers per day this would lead to a 2% decrease of total restaurant revenue because the mode shift towards car use would come from higher spending active and public transport travellers. However, making a similar intervention to reduce public transport cost by 55% would lead instead to an increase of 3% in total restaurant revenue.

Table 7: Travel mode choice simulation results

Mode	Car	Active	Public	Taxi	Total revenue
Mode share					
Restaurant perception	52%	29%	15%	4%	
Actual customer choice	19%	32%	44%	6%	
Reducing 30% of travel cost (Car)	52%	20%	24%	4%	
Reducing 55% of travel cost (Public)	15%	34%	46%	5%	
Revenue mode share					
Restaurant perception	59%	15%	19%	7%	
Actual customer choice	23%	29%	41%	7%	
Reducing 30% of travel cost (car)	52%	16%	27%	5%	-2%
Reducing 55% of travel cost (Public)	20%	30%	45%	5%	3%

6 Conclusions and discussions

This paper has investigated the perception differences between customers and restaurants, especially in relation to parking supply in the restaurant precincts of Brisbane, Australia. The novelty of this paper is in being able to cross-analyse business perceptions with customers travel behaviour to evaluate the validity of perceptions about the importance of car travel and parking, and perceptions about transport infrastructure need. It provides another example to

the literature of use of a parallel survey of both customers and businesses to explore parking demand, with this study focused explicitly on restaurants for the first time. The results of this approach at three major restaurant precincts in inner-city Brisbane confirms a real gap in perception between the restaurateurs, as businesses, and their customers. The discrete choice model results also imply that restaurateurs would do better advocating for more public transport supply than parking supply to increase the share of higher-spending public transport users at their restaurants, boosting their total revenues. Customers arriving by walking, cycling and public transport all contribute significantly more to the restaurant trade than business owners and managers think.

This study reveals strong differences in viewpoint but there is one major limitation. The survey was conducted in restaurant precincts only, surveying existing customers. It did not capture potential customers who decided not to visit those precincts and so the methods may not reveal fully the nature of suppressed demand for parking in these precincts. A survey of potential customers in a broader area to investigate suppressed demand by modes such as car, cycling and public transport appears a useful avenue for further research. This could explore relevant variables such as public transport frequencies, service coverage, connections, pricing structure, land use types, parking supply, customers' spatial characteristics and built environment attributes that may help to explain and control for differences in service level of transport infrastructure.

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