

Analysing retail travel behaviour using an Australian data set

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Abstract

Large cities in Australia, like many cities around the world, are grappling with traffic congestion and air pollution caused by the use of the car as the dominant means of transport. Considerable transport planning research has been done on the impacts of substituting car trips with more sustainable alternatives such as walking, cycling and public transport, particularly focusing on travel to and from work and school. Despite the fact that a large volume of personal travel directly or indirectly originates from retail activities, this type of trips have been largely ignored by researchers. Retail is considered as a major trip destination, for the non-peak hours. Australian cities are challenging with the expansion and changing form/structure of the retail sector which has a considerable potential to impact upon travel behaviour, air pollution and the amount of consumed fuel to access these destinations.

This paper explores the way people travel to retail destinations by using South East Queensland Household Travel Survey (SEQ-HTS) data. These data were analysed to explain retail travel behaviour in Brisbane. Statistical analysis was performed to examine trip frequency, trip complexity, destination choice, and mode of transport. While beyond the scope of this paper, future research directions are described, particularly the role that retail form/structure and urban form play in determining retail travel behaviour.

Key words: Retail Trip, Shopping trip, Travel behaviour, Urban form, Trip frequency, Retail destination

1. Introduction

Australian travel demand management programs have largely neglected retail travel. This is a concern as retail travel is a major component of both weekday and weekend travel in Australian cities. Retail trips are more flexible in comparison to journey to work/school trips, which are usually restricted to one destination and a set schedule. Today's more extended opening hours and the wide distribution of shops allow a household's retail travel to vary significantly in trip timing, duration, length, destination and mode. Households also have opportunities to plan and prepare their retail travel. This gives planners a chance to influence shopping and related non-work trips by modifying urban form and structure (Handy, 1996a). But influencing Australian retail travel behaviour is challenging, due to the decades-long expansion of car-based retail types (shopping centres, big box stores, supermarkets, etc.) located on major roads and highways, which rely on and in turn reinforce car ownership and use.

The last fifty years have seen dramatic shifts in the geography and form of retail land uses in Australian cities. From the late 1960s to the late 1990s, Australian planning policy has allowed car-based shopping centres to grow in number and seen new forms expand (Scott, 2002). Car-based suburban shopping malls such as Chermside in Brisbane in 1957 and Chadstone in Melbourne in 1960, have from modest beginnings become a dominant element

of the retail hierarchy in Australian cities at the expense of previous rail-based strip shopping centres (Davison, 2004). Today some of these centres offer a challenge to the conventional central-business district in terms of their retail offerings. Supermarkets emerged to offer more than just groceries as motorcars, refrigerators and freezers offered households the chance to shop weekly, with the 'Coles New World' branding of one chain in Australia highlighting that this was a new (car-based) way of life (Humphery, 1998). Supermarkets are the main element of almost every Australian shopping centre (Pritchard, 2000), and are concentrated in hands of two major players (Coles and Woolworths). They provide a range of commodities from food ingredients and ready-to-eat food, personal care and household goods. More recently a number of Big Box retailers' such as Bunnings, IKEA and BCF (Boating, Fishing Camping), have emerged offering low prices but limited accessibility. These may vary in size from a smaller sports or leisure category store through to a furniture mega-store. The largest of these retail outlets provide acres of parking to service their customers and locate mainly near highway interchanges. The geographic catchments of such stores can be very sizeable, with only one Ikea in South East Queensland.

There is concern about the dominance of the car in Australian retail travel behaviour. But there has been little attention given in travel demand management (TDM) initiatives – an example being the last two decades of Travel-smart programs. Current urban planning regulations typically do not support alternative distribution and forms of retail outlets. And the future expansion and locations of these car-based retail forms in the city are likely to 'lock-in' continuation of motorised travel for this trip-task in future. What can be done?

This paper aims to contribute to this debate by exploring travel to retail destinations in South East Queensland by using 7-day South East Queensland Household Travel Survey (SEQ-HTS) data from 2009. This dataset is analysed to describe and explain trip frequency, trip complexity, destination choice, and mode of transport. Differences are explored between weekday and weekend travel, and between adult men and women. Travel differences are explored between trips to purchase different types of goods. Car travel does indeed dominate, even though a large proportion of trips are of short distances. This research opens the potential for planning initiatives to achieve more sustainable travel behaviour by influencing the geography and form of retail outlets in Australian cities.

The paper begins with a brief review of the previous research on retail trips and the influential factors impact on them. This is followed by a description of applied data and methodology for the study. This is ensued by the data analysis to investigate the trip characteristics for different groups and various types of retail trips. The last section draws conclusions based on the results of analysis and discusses areas for future research.

2. Background

It has been generally accepted by planners that the spatial distribution of land-use is a key factor influencing the travel behaviour of residents (Limanond and Niemeier, 2004). Thus accessibility becomes the main thing that connects sustainable transport policies to land-use planning. Accessibility, defined as the ease of reaching desirable destinations (Hansen, 1959), is a key concept in transportation planning that is made up of mobility and proximity (Cervero, 2005). Over the past several decades a number of different planning approaches (New Urbanism, Transit Oriented Development (TOD), Smart Growth, Neo-traditional development, Urban consolidation) have advocated compact, mixed-use development in an attempt to shorten travel distances and encourage travellers to walk instead of drive (Cervero, 2005). Studies of such approaches such as Aldous, 1992; Calthorpe, 1993; Ryan and McNally, 1995; Urban Task Force, 1999 aimed to use land-use policy and urban design to promote more sustainable patterns of travel (Stead and Marshall, 2001).

Unfortunately, only a small portion of research on transport and land-use focuses on shopping trips. Neighbourhood retail has been an important urban structure component in much of the early research in this field (Owens, 1993; Rapaport, 1987; Whyte, 1988) and

has been shown to influence whether people walk (Krizek & Johnson, 2006). Robinson and Vickerman (1976) and Hanson (CITE) found relationships between trip frequencies and access to retail opportunities, albeit socio-demographic factors are often more influential than spatial factors. Handy (1996b) found that as the diversity and the number of local stores increase in Austin, Texas neighbourhoods, the number of car trips by households will decrease and consequently, walking will increase (Niles and Nelson, 1999). Maat (2000) found that the retail trip mode share for cars in Houten, the Netherlands, was significantly lower than that of comparable Dutch towns, primarily due to differentials in pedestrian and cycling accessibility versus (reduced) car accessibility in the town's transport network (Stead and Marshall, 2001). Krizek & Johnson (2006) showed that distances to shops are statistically significant predictors of people's choosing active modes of transport at close distances, but that the relationships do not appear to be linear (Krizek and Johnson, 2006). Koenig's (1980) concluded from his study of five French cities that accessibility is the key measurement to evaluate non-work trips (Hanson and Schwab, 1987). Agyemang-Duah et al. (1996) and Lee (1997) have examined home-based shopping trips (including 30-40 % of overall shopping trips) using disaggregate data and the discrete choice models showed the strong impact of land-use on people's travel decisions. But, the results could not be generalized to the remainder 60% of shopping trips (Limanond and Niemeier, 2004). Ghosh and McLafferty's (1984) in their multipurpose shopping trip frequency model affirmed that "the rate of multipurpose shopping depends on the consumer's location (transport cost) in relation to shopping opportunities". Their model was hinged on the assumption that higher accessibility and lower cost will result in higher number of trips in the similar socio-economic groups. (Hanson and Schwab, 1987). Recker & Kostyniuk (1978) looked at urban grocery shopping trips and the impacts of the individual's perception of the destination, the individual's accessibility to the destination and the relative number of opportunities, on people's decisions on destination choice. Their study acknowledged that "accessibility is the primary aspect influencing destination choice and its effect is nonlinear" (Recker and Kostyniuk, 1978).

But there is other research that refutes the strength of this relationship. Frank and Pivo (1994) found that land-use mix or density can be a good representation for the number of work trips, and that there is no significant connection between shopping trips and these elements of urban form (Frank and Pivo, 1994) (Crane and Crepeau, 1998). Holtzclaw (1994) also alleged that changing the quantity of neighbourhood shopping will have no major impact on using private car or the transportation costs for communities (Crane, 1996). Limanond & Niemeier (2004) developed an activity-based shopping model to analyse the impacts of land-use pattern on three different aspects of a shopping tour which are shopping tour frequency, tour scheduling and mode choice. While no impact was reported on the overall shopping tour frequency, the results showed that accessibility levels will largely affect the type of shopping tour suggesting one-stop shopping or multi-purpose shopping. It means that lower accessibility levels will result in less one-stop shopping, while high accessibility levels suggest an increase in the number of non-car modes trips for one-stop shopping tours (Limanond and Niemeier, 2004).

Several models have also been used to predict shopping destination choice from the perspective of the shopper. These models include: distance to the centre, the size of the centre, characteristics of the possible destinations (quality and convenience of the centre), the range of services provided by each store, age and income of the shopper, and the affordability and availability of an automobile. Richards and Ben-Akiva (1975), Adler and Ben-Akiva (1976) and Schuler (1979) suggest that the choice of shopping destination is a more complex matter than a simple exchange between distance and size (Handy, 1996).

Previous studies looking at the relationship between land-use factors such as accessibility, mixed use, etc. with shopping trips have produced mixed findings. Some believe that access to retail destinations can impact trip frequency, destination choice and trip complexity (Hanson and Schwab, 1987) and improve the quality of life (Iacono, et al., 2010), while

others are arguing the opposite based on their case studies. For Australian cities, there are few studies on retail travel behaviour and the need for this research cannot be ignored.

3. Data and Methods

Household travel survey data was provided by the Queensland Department of Transport and Main Roads. We used the 2009 South East Queensland Travel Survey (SEQTS) data covering 7-day travel of people in South East Queensland, Australia. These data were collected from 20 April to 28 June 2009. The SEQTS used a multi-stage, variable-proportion, clustered sampling of households. The survey achieved a 52% response rate and obtained information on the travel behaviour of 27,213 respondents living in 10,335 households. Week-long diaries were completed by respondents aged 5 and over and the travel of persons aged 0-4 reconstructed from diaries provided by other household members. The survey comprises residential households within the Brisbane Statistical Division (BSD), the Gold Coast City Council and Sunshine Coast Regional Council areas. However the scope of this study only included the BSD (4,240 households).

The SEQTS recorded all trips made by respondents during their survey week. Each trip is further divided into 'trip stages', which includes all parts of a trip that may be made by different modes (for example, a public transport trip from home to a shop may involve three stages: a walk stage to a bus stop, a bus stage and then a final walk stage from the public transport to the shop). In total 86,549 trip stages were recorded for the BSD out of a total of reported 79,790 trips.

The exact route travelled by respondents was not captured within the SEQTS. Trip distances were calculated using GIS (geographic information systems) to determine the shortest path on the street and path network. Within the SEQTS, motor vehicles were defined as either a car, 4WD, van or truck (The Urban Transport Institute, 2010). To account for non-reporting, weightings for both non-response and selection bias, derived from household characteristics and Australian Bureau of Statistics census data, were included within the SEQTS dataset. These weightings were applied to the sample results to estimate the travel behaviour for 641,061 households in the SEQ region (The Urban Transport Institute, 2010).

Following the analysis of all trips, the dataset was manipulated to identify all retail trips made, excluding trips to purchase petrol. Retail trips were defined by those trips which had a 'destination place' of 'shopping' and a 'destination purpose' of 'buying something'. This excluded those trips made to shopping centres that were for non-retail purposes, such as trips for personal services (banking, mail collection), to libraries or to eat¹. A total of 3,354 retail trips were identified within the sample, representing 1436,533 trips made by the regional population.

Finally, the analysis was done with SPSS (Statistical Package for the Social Sciences) and the results were examined in order to illustrate a better understanding of the current retail travel behaviour in Brisbane.

4. Data Analysis

As it has been explained above, the SEQ travel survey was carried out for a sample of 4,240 BSD households. After applying the weightings, the total number of trips taken by these households increased from 20,440 to 7,519,823 trips². Retail trips represent an important part of everyday travel. They comprise 15.6 and 29 percent of total trips on weekdays and

¹ There is one limitation in that which is an unknown but presumably small proportion of all retail trips that may not actually involve a purchase, and it is not certain that these are correctly captured either in respondent's diaries or the coding provided by the data providers.

² It represents all the trips excluding the ones with the purpose of survey home and changing mode in the regional scale.

weekends, respectively, accounting for the second biggest category on weekdays (after the journey to work) and the largest one for weekend trips.

Figure 1: Trip Frequency by Trip Purpose during Weekdays & Weekends

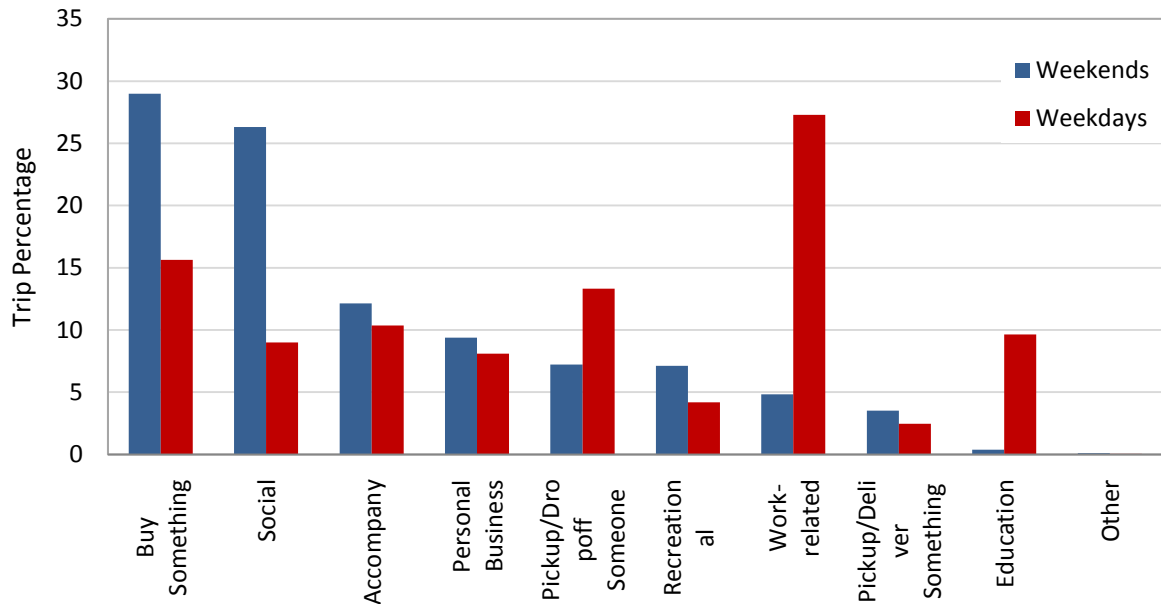


Table 1: Trip Frequency by Trip Purpose and Mode-share during Weekdays & Weekends *

	Vehicle Driver	Vehicle Passenger	Walking	Bicycle	Taxi	Public Transport ¹	Other	Total
Accompany	9.02 (6.68)	76.99 (84.36)	11.04 (7.00)	0.61 (0.49)	0.25 (0.00)	1.72 (1.47)	0.37 (0.00)	100 (100)
Buy Something	68.08 (60.00)	16.51 (29.49)	10.11 (7.93)	0.53 (0.54)	0.29 (0.07)	3.87 (1.22)	0.61 (0.75)	100 (100)
Pickup/Deliver Something	60.48 (63.35)	24.93 (29.19)	8.75 (6.21)	1.59 (1.24)	0.00 (0.00)	4.24 (0.00)	0.00 (0.00)	100 (100)
Pickup/Drop-off Someone	93.58 (86.56)	4.25 (11.29)	1.27 (0.27)	0.00 (0.00)	0.00 (0.00)	0.80 (0.54)	0.09 (1.34)	100 (100)
Education	6.08 (40.00)	53.44 (20.00)	15.01 (15.00)	2.86 (5.00)	0.22 (0.00)	12.96 (20.00)	9.44 (0.00)	100 (100)
Work-related	71.62 (68.49)	6.24 (16.89)	7.75 (5.94)	1.47 (0.91)	0.17 (0.46)	11.06 (6.39)	1.69 (0.91)	100 (100)
Personal Business	46.31 (46.9)	32.20 (39.61)	13.11 (9.85)	0.62 (0.64)	0.78 (0.43)	5.59 (1.28)	1.40 (1.28)	100 (100)
Social	48.34 (43.16)	26.83 (43.48)	17.29 (8.03)	0.41 (0.72)	1.18 (1.27)	5.67 (2.62)	0.28 (0.72)	100 (100)
Recreational	43.73 (37.77)	27.35 (34.24)	21.23 (18.75)	1.85 (6.25)	0.00 (0.00)	3.28 (2.45)	2.56 (0.54)	100 (100)
Other	40.00 (66.67)	20.00 (33.33)	10.00 (0.00)	0.00 (0.00)	0.00 (0.00)	30.00 (0.00)	0.00 (0.00)	100 (100)

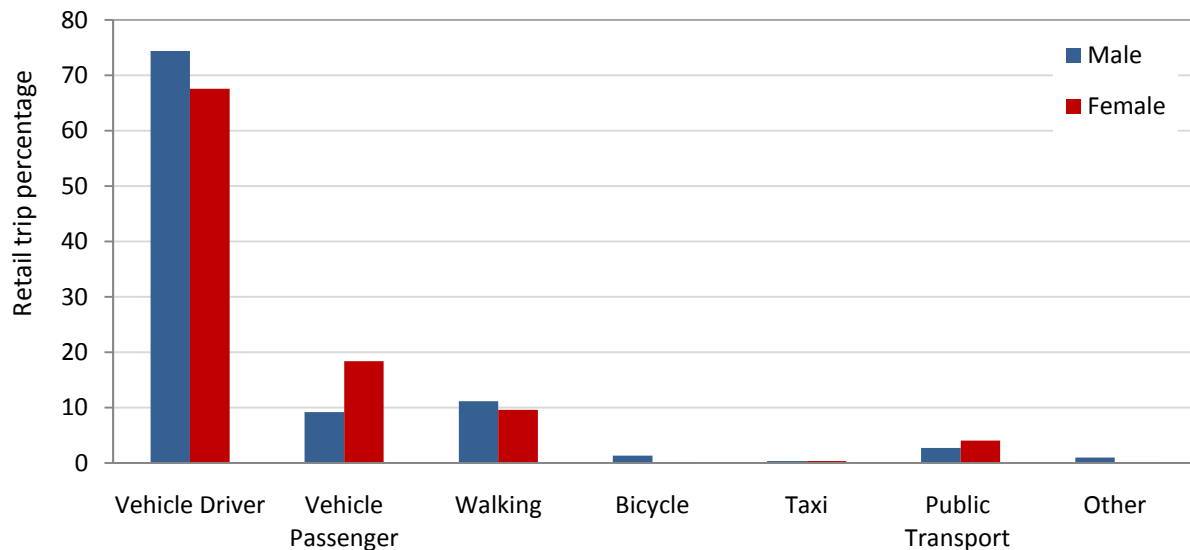
¹ Public Bus, Ferry, Train

* Weekends percentage are presented in parenthesis

As table 1 shows for the trips with the purpose of “buying something”, 68.1 percent and 16.5 percent trips were taken by a vehicle driver or passenger, respectively, while the percentage of walking trips was 10.1 percent. The trip mode-share on weekends is even higher, with car trips accounting for 90 percent of both vehicle driver and passenger followed by just 7.9 percent walking trips. “Buy something” trips taken by private cars are among the highest after “pickup/drop-off someone”. Other means of transport such as cycling and taxi are very low, except in case of public transport which amounts 3.9 percent of all shopping trips on weekdays.

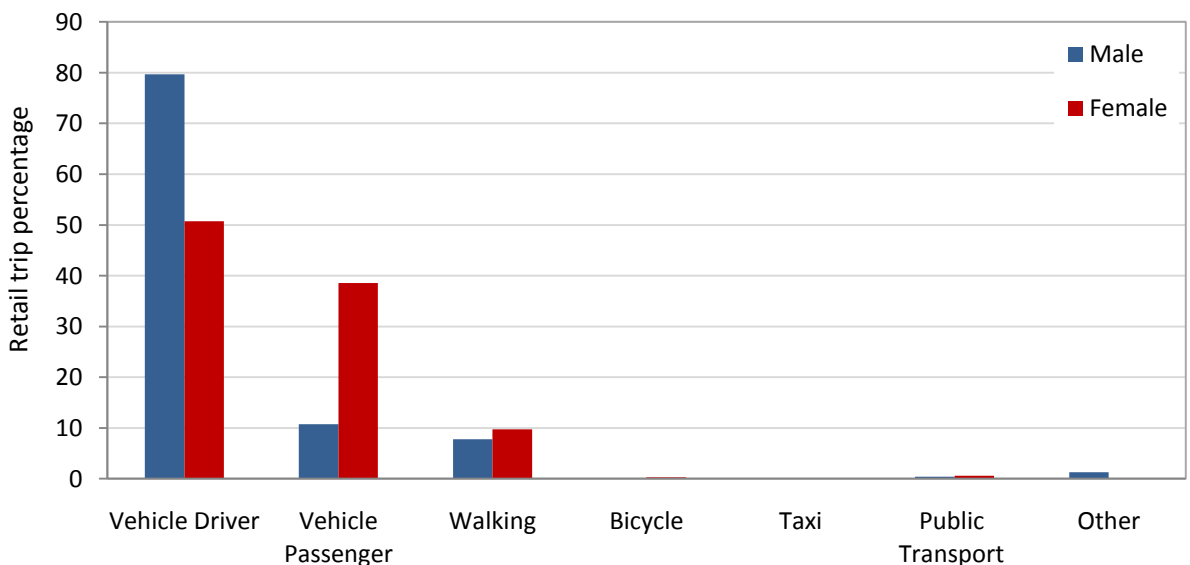
During the working week, 195,872 and 302,056 trips are made by women and men over 18, respectively, to shopping destinations. These trips increase to 411,316 and 466,819 on weekends.

Fig 2: Retail Trip Frequency by Mode-share for 18+ Residents _ Weekdays



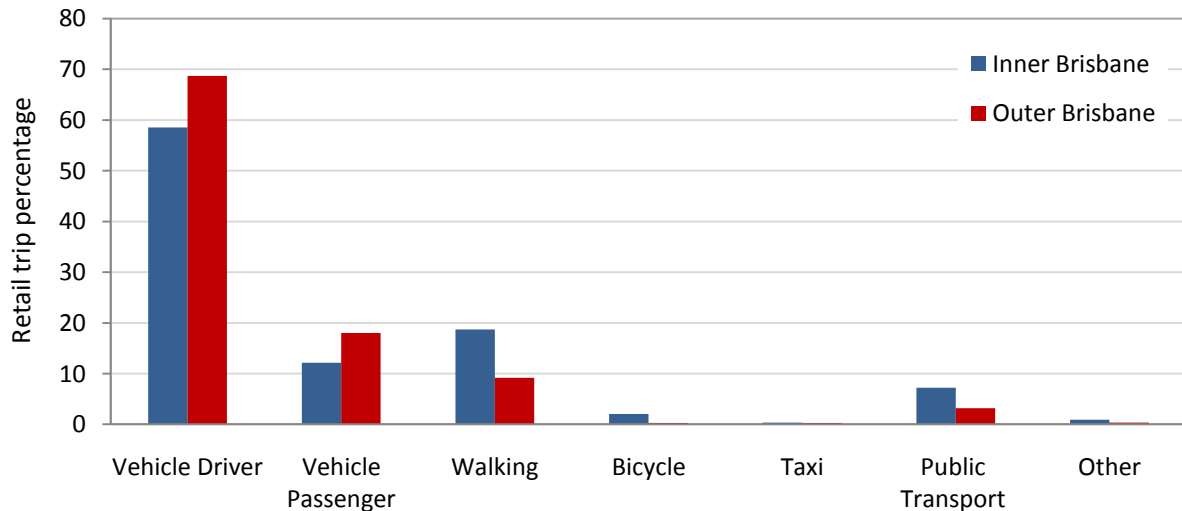
* public transport includes public bus, ferry & train

Fig 3: Retail Trip Frequency by Mode-share for 18+ Residents _ Weekends



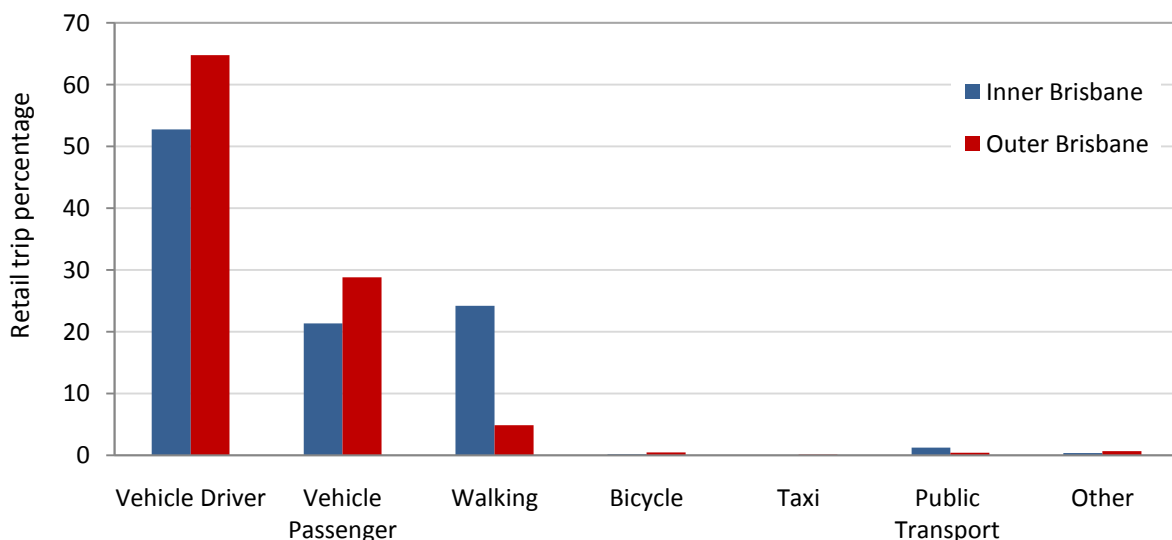
On weekends, a higher rate of car usage (either as a driver or passenger) is apparent among both women and men, but the noticeable point is that about 17 percent of female drivers shift to be weekends' female passenger, giving it a total rise of 20 percent in number. There is about a 3 percent increase in male walking trips during the working week in comparison to weekends, but this percentage doesn't change for females. This is due to the shopping trips that occur when males are on the journey to or from work. In terms of using public transport for retail trips, there is a rise of up to 3.5 percent during the weekdays, while women have a bigger share in this type of trips. Taxis comprise less than 0.3 percent for both groups which is somewhat at odds with the role of taxis for retail trips.

Fig 4: Retail Trip Frequency by Mode-share in Inner & Outer Brisbane_ Weekdays



Going one step further in realizing shopping travel behaviour in Brisbane, we need to understand people's travel behaviour in different urban contexts based on the level of accessibility to retail destinations. The inner Brisbane area, inner north suburbs and inner south suburbs (region 1 & 2) including the CBD, is experiencing a higher density of retail establishments and is mostly thought-out to be more sustainable in terms of using active means of transport (walking and cycling) in comparison to the outer Brisbane suburbs formed on the base of scattered distribution of land-use. A simple examination of weekday mode-share for retail trips shows that the car is used for 86.7 percent of trips in Outer Brisbane, but only 70.7 percent of trips in Inner Brisbane.

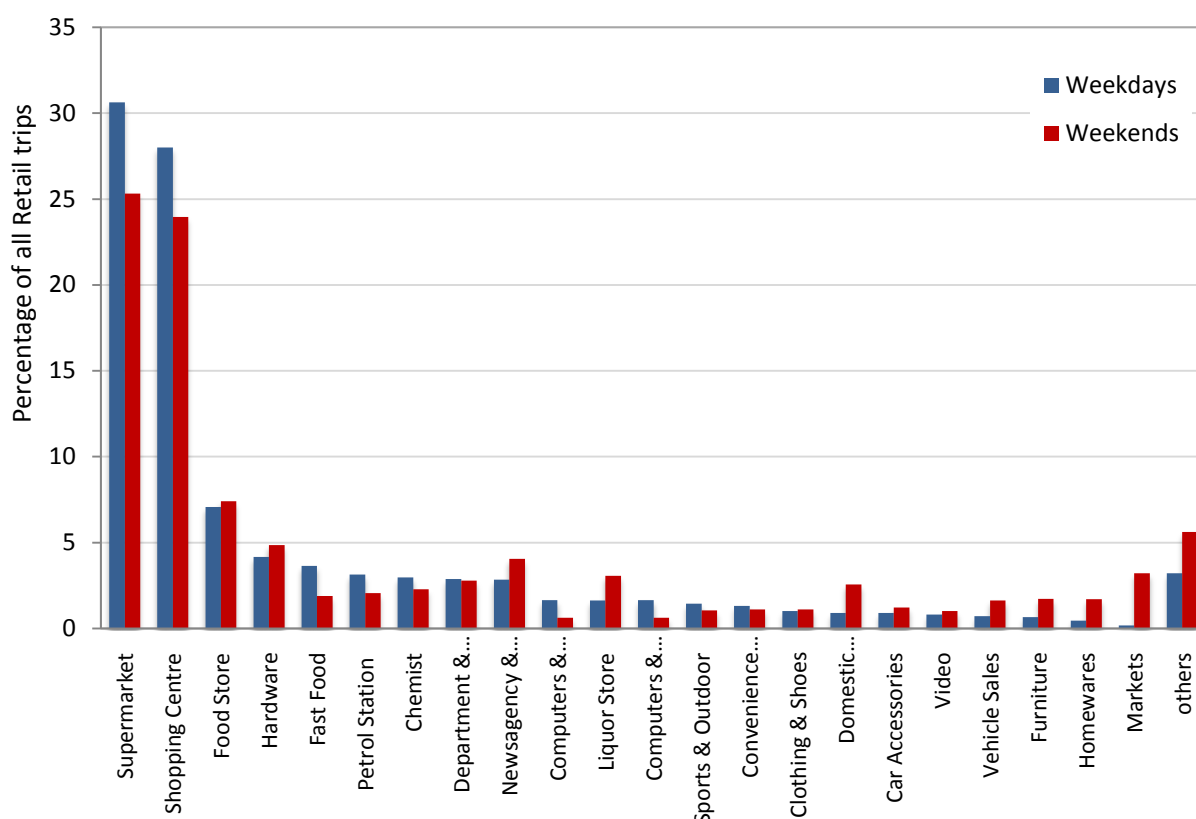
Fig5: Retail Trip Frequency by Mode-share in Inner & Outer Brisbane_ Weekends



On weekends total auto trips account for 93.6 percent of trips in Outer Brisbane and 74.1 percent in Inner Brisbane. During weekdays, walking has a considerable mode share in shopping trips for Inner Brisbane of 18.7 percent, but in Outer Brisbane walking drops to 9.2 percent. Figure 4 shows that public transport plays a minor role in weekday shopping trips accounting for only 7.2 percent of trips in Inner Brisbane and 3.2 percent in Outer Brisbane. Based on the figure 4 and 5 the use of other means of transport such as taxi and bicycle are so insignificant that can be ignored especially on weekend.

Figure 6 provides a summary of the trip frequency by shop type. Among all shopping trips with the purpose of “buying something”, supermarkets and shopping centres are the destination for more than 58 percent of weekday trips and about 50 percent of weekend trips. The next most important destination is food stores, accounting for approximately 20 percent of trips. This could be a good indicator for understanding the typically two purveyor’s households’ life style regarding huge shopping precincts including almost all the daily and weekly needed products in a multipurpose one stop shopping trip.

Fig 6: Trip Frequency by Shop Type during Weekdays & Weekends



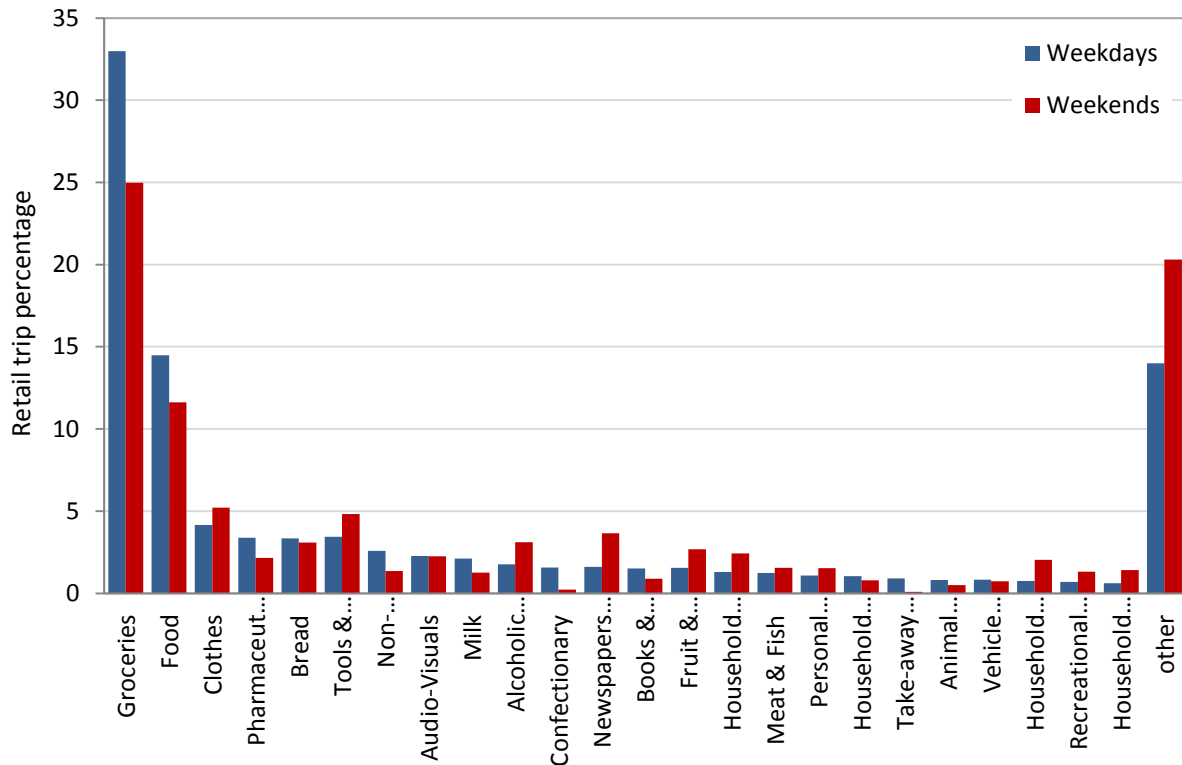
As it has been explained in the SEQTR report “multipurpose stops within regional undercover shopping centres have been simplified to a single trip to the shopping centre, irrespective of the number of different activities undertaken while at the shopping centre” (The Urban Transport Institute, 2010). Therefore, we don’t have the access to the shop type that people have travelled to inside the shopping centre. But still the large percent of trips to these destinations in comparison to the number of trips to the other shop types, outside the shopping centre, attest to the diversity of goods available in these regional shopping centres.

Hardware, fast food, petrol station excluding the trips for buying petrol (convenience shopping) and department and discount stores, as well as chemists, newsagency and bookshops constitute the next most popular shopping destinations. While the same trend is perceptible in shopping centres and supermarkets on weekends, the numbers of shopping trips for hardware, domestic appliances and furniture which are primarily take place at big

boxes and warehouses (e.g., Bunnings, IKEA, Kmart, Amart) suggest that this is clearly a weekend activity.

Markets, as would be expected, experience an increase of 2 percent on weekends in comparison to weekdays since most go to these places at weekends to buy their necessities for the whole week.

Fig 7: Trip Frequency by Expenditure Code during Weekdays & Weekends



The SEQTS 2009 has made it possible to provide information about the types of products being paid for as a result of the retail trips to different destinations from a shopping centre to a supermarket, convenience store or a small local shop. As it is expectable, groceries and food are the most significant shopping products during weekdays and weekends, facing a reduction of about 18 percent and 13 percent on weekends, respectively. Other categories including alcohol drinks, tools and hardware, newspapers and tobacco, household furnishing and even fruit and vegetables that are mostly supplied at warehouses and markets are often purchased at weekends.

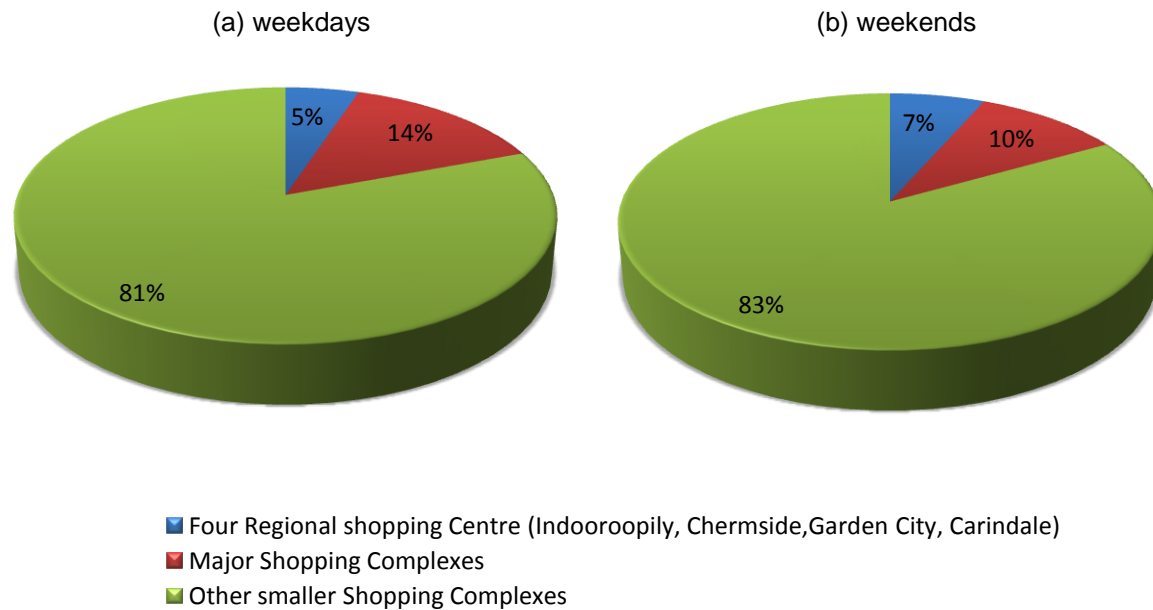
The Shopping Centre Council of Australia in its 2011 report “Productivity Commission Inquiry into the Economic Structure and Performance of the Australian Retail Industry” alleged that 35 percent of all retail trips happen at shopping centres (Shopping Centre Council of Australia, 2011). This includes not only the regional and major shopping malls but also smaller shopping centres made up of a collection of small shops and a major supermarket.

In Brisbane, based on the SEQTS 2009, the major shopping centres include about 19 percent and 17 percent of retail trips during weekdays and weekends, not including trips to the CBD which stands for a considerable amount of separate trips.

It's worth noting here that only the four major shopping malls, namely, Westfield Garden City (Upper Mount Gravatt); Indooroopilly Shopping Centre (Indooroopilly); Westfield Carindale (Carindale); and Westfield Chermside (Chermside), comprises 5-7 percent of the retail trips number which is about one third of the share of the weekday trips to major shopping complexes and two-fifth of weekend trips. The major shopping complexes

considered in this analysis and within the BSD include: Brookside Shopping Centre (Mitchelton); Capalaba Central Shopping Centre (Capalaba); Capalaba Park Shopping Centre (Redland Bay); Centro Lutwyche (Lutwyche); Centro Taigum (Taigum); Centro Toombul (Nundah); Logan Hyperdome (Shailer Park); Morayfield Shopping Centre (Morayfield); Mount Ommaney Shopping Centre (Mount Ommaney); Redbank Plaza (Redbank); Riverlink Shopping Centre (North Ipswich); Toowong Village (Toowong); Westfield North Lakes (North Lakes) and Westfield Strathpine (Strathpine); Grand Plaza (Browns Plains); Ipswich City Square (Ipswich); Orion Shopping Centre (Springfield Lakes); Park Ridge Village; Peninsula Fair; Kippa- Ring; Stafford City; and Sunnybank Plaza.

Fig 8: Major Shopping Complexes' share of the total Retail trips



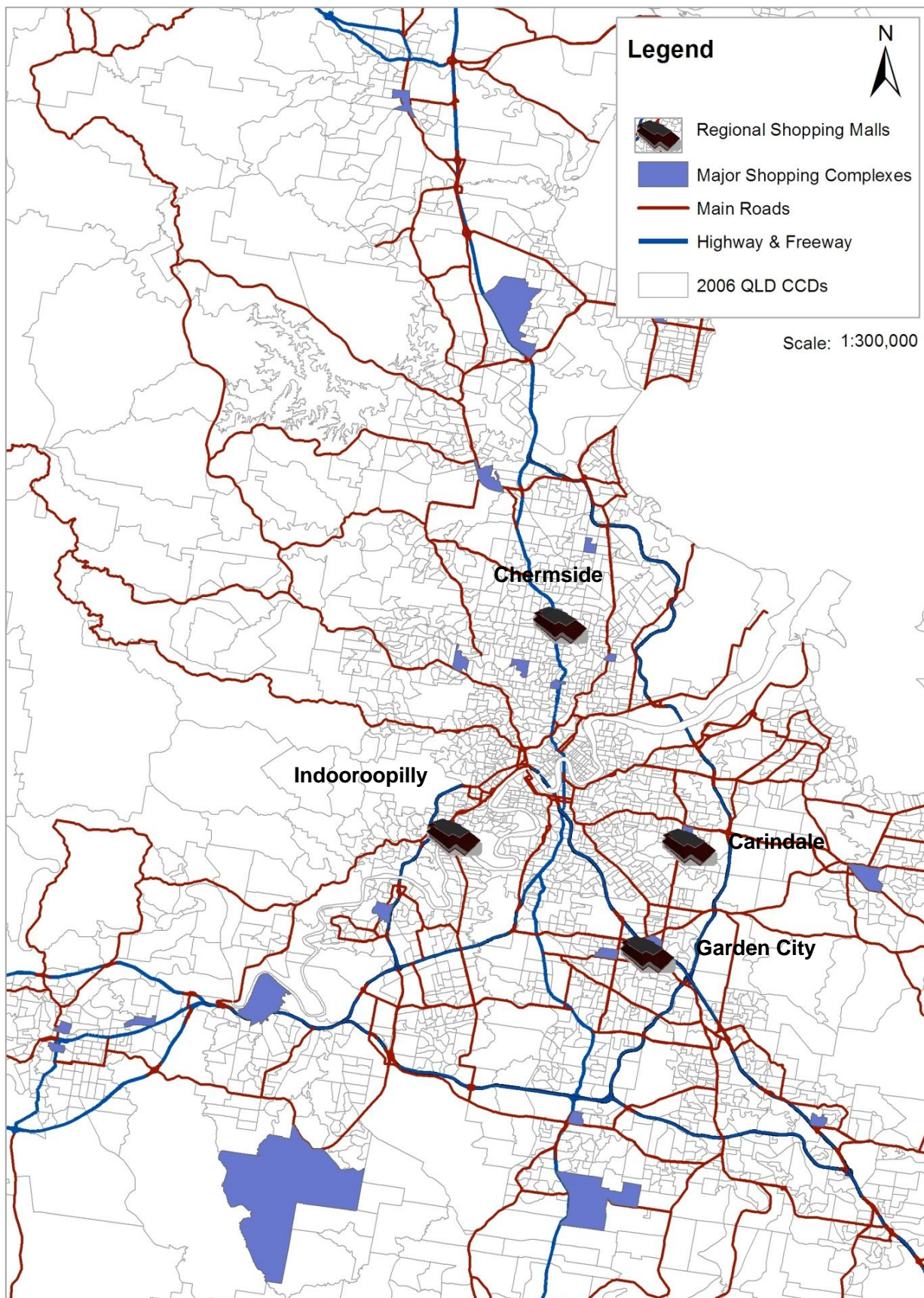
Since the trips taking place to shopping centres and supermarkets, as the two major destinations for many retail trips, are mostly considered to happen for multipurpose and one stop shopping, they are expecting to be carried on by cars, therefore walking and public transport seems not to be an appropriate substitute for them. A more detailed examination of Brisbane shopping trips shows that travel mode is dependent on the trip length. Figure 10 shows that 8 percent and 16.5 percent of total retail trips to shopping centres, on weekends and weekdays, respectively, are within the length of less than 1 km, which is clearly a walkable distance. Of all these trips 6.6 percent is made by walking on working week.

The number of trips by walking drops by one-sixth (about 1.6 percent) on weekends which shows the high preference for cars for retail travel. For trips of more than 1 km, travel is primarily limited to cars with little use of any other modes. The role of public transport is getting more noticeable by the increase in the trip distance and comprises 4 percent of shopping trips on weekdays for trips greater than 5 km.

In the case of supermarkets (Figure 11), shopping destinations within distances less than 3 km comprise more than 55 percent of retail trips. There is a large difference for the percentage of retail trips to closer distances less than 1 km rather than shopping centres. While the number of trips within distances less than 3 km is increasing to 28.1 and 24.5 percent for weekends and weekdays, respectively, walking is playing a more evident role in this type of trips. For distances less than 1 km, walking constitutes about 7.5 percent of trips during the week and 9.1 percent on weekends. For trips of 1 to 3 km, walking accounts for 3.7 percent of weekday trips and 1.1 percent of weekend trips.

Public transport is not an important factor, except in trips that were greater than 5 km where there is a slight rise to 2.2 percent for the mode share.

Fig 9: CCDs* including Regional and Major Shopping Complexes



* CCDs: Census Collection Districts

Fig 10: Trips to shopping centres by Mode-share & Distance during Weekends & Weekdays

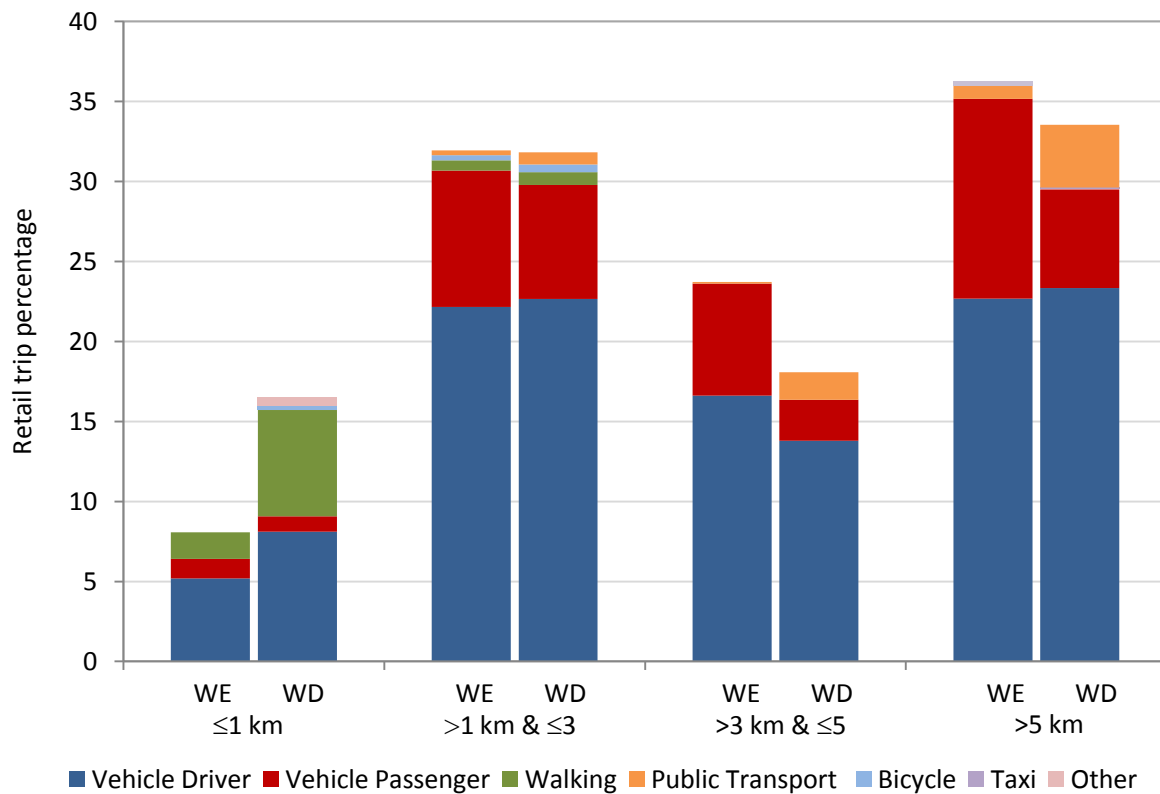
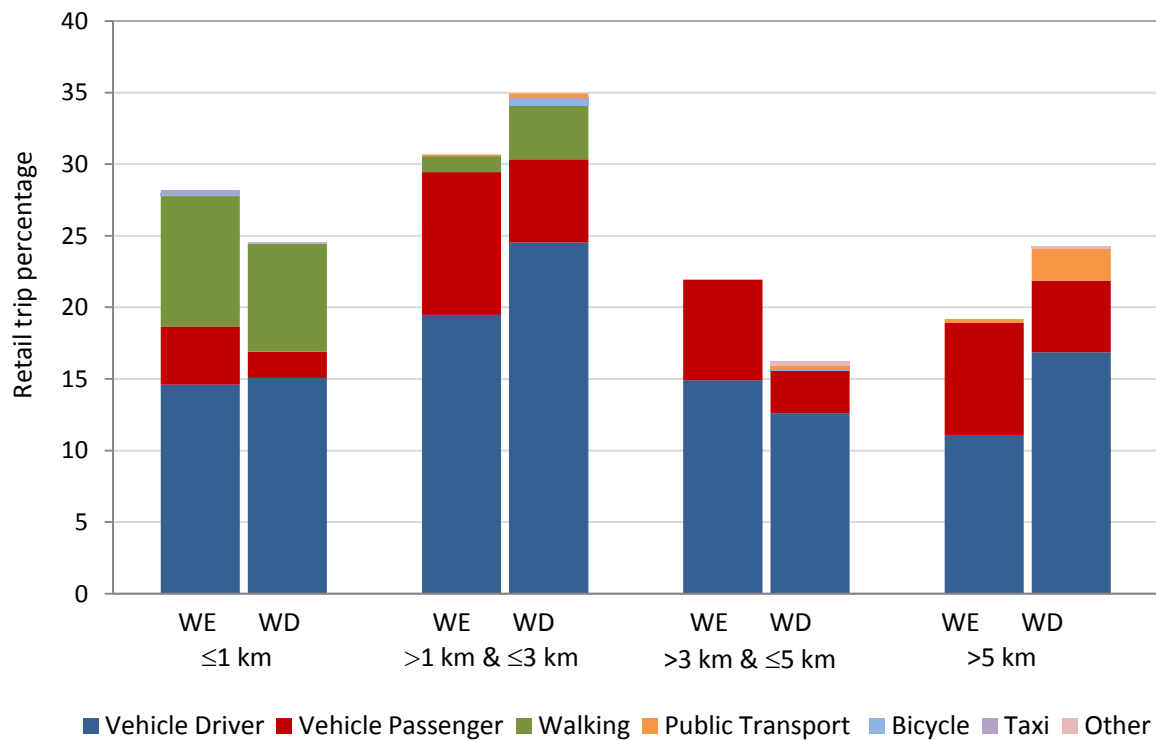
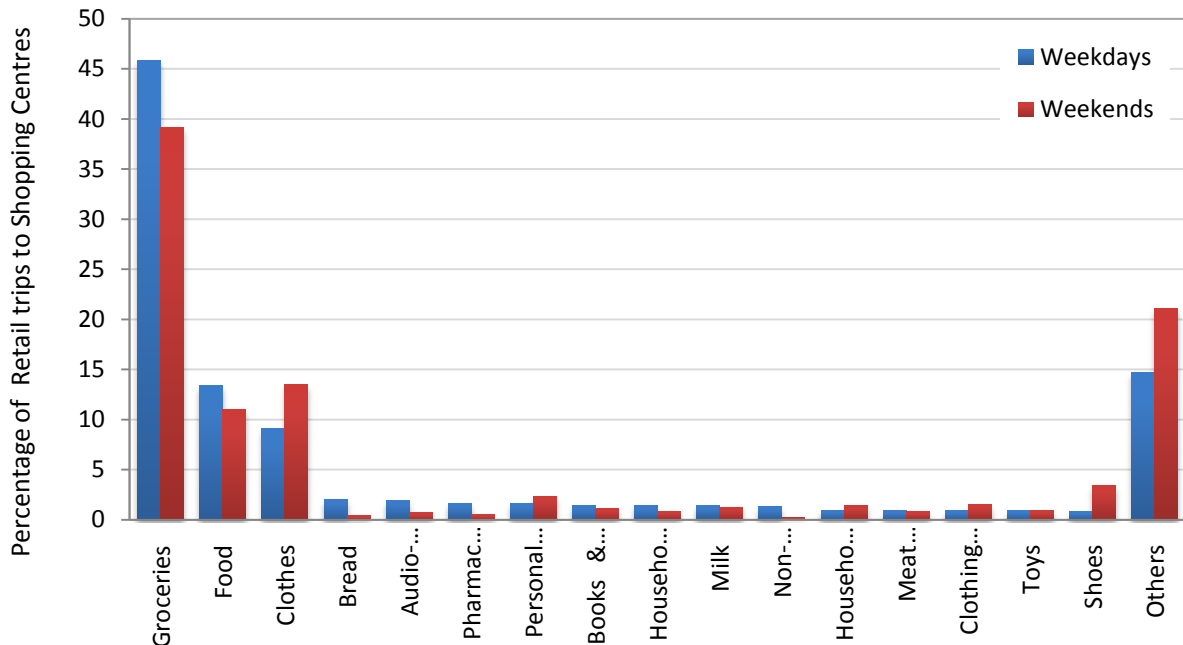


Fig 11: Trips to Supermarkets by Mode-share & Distance during Weekends & Weekdays



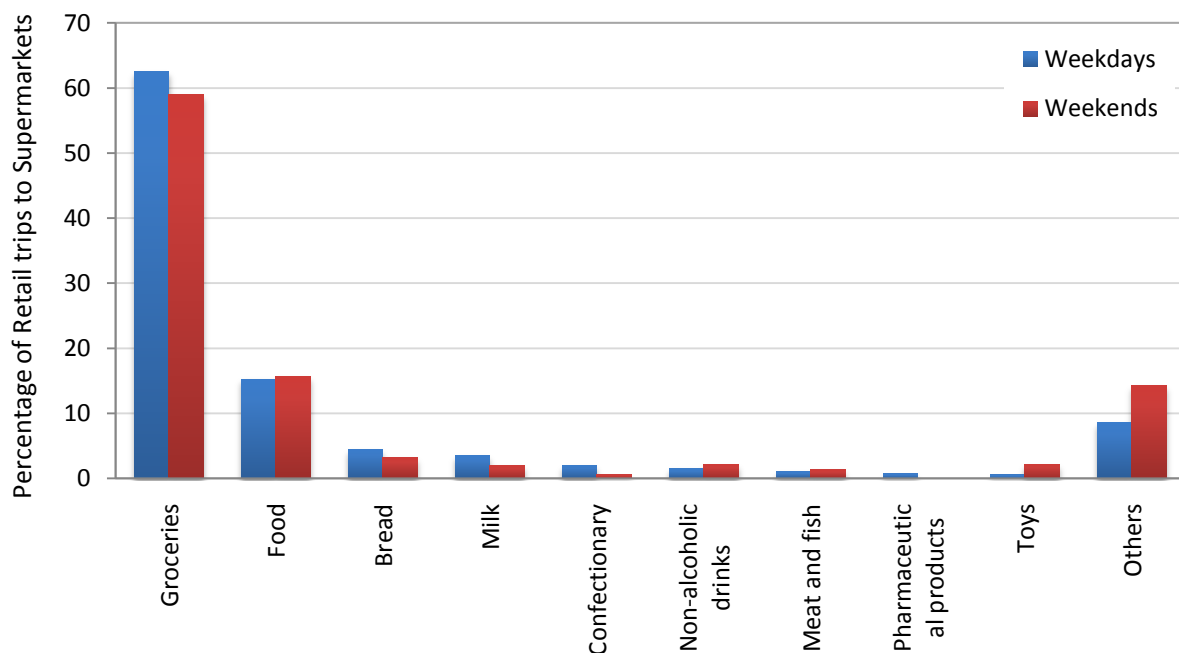
Shopping centres and supermarkets were the destination of about 55 percent of trips during the week, so it would be important to determine what products were bought at each destination. From all the trips to shopping centres about 46 percent (weekdays) and 39 percent (weekends) are for buying groceries. The next major category of products was food and clothes.

Fig12: Trips to Shopping Centres by the Expenditure code



For supermarkets grocery shopping increases to 62.6 percent and 59.0 percent, respectively for weekdays and weekends. After food, which contains about 15 percent of trips during the week, it comes to other edible products such as bread, milk, confectionary, etc. as the next important shopping trip category. These results suggest that grocery shopping should be a focus of any future efforts to reduce car-based retail travel.

Fig 13: Trips to Supermarkets by the Expenditure code



5. Discussion

The results suggest a number of key directions for making retail travel more sustainable. First, retail travel is the most unsustainable travel in terms of the proportion of trips made by car. Only trips to drop off or pick up a passenger were more likely to be made by car. Less than 4 percent of weekday retail trips and less than 1 percent of weekend retail trips were made by public transport. Less than 0.4 percent of weekend retail trips were made by bicycle and/or taxi.

Second, there is a large disparity between inner and outer Brisbane in terms of using sustainable transport (about 20 percent). The urban pattern may appear to be the most plausible explanation for this disparity, but based on the literature, other factors such as the socio-economic characteristics of the travellers should be investigated as possible important factors in the mode share decision.

Third, about 85 to 90 percent of all shopping trips made by men and women over 18 are by car, while males make up a majority of the vehicle drivers, especially on weekends.

Fourth, the large proportion of trips (>15 percent) that are made to 26 shopping malls within the region highlights the importance of malls as a focus of any attempt to encourage more sustainable retail travel behaviour. One cannot solely focus on supermarkets and local shopping centres. This will be a considerable challenge; however some malls in the region are changing their transport orientation to include public transport, especially busways. The Garden City shopping mall in Upper Mt. Gravatt is an example, being located on the Southeast Busway.

Fifth, retail trips experience considerable changes in terms of means of transport regarding the distance between origin and destination. Walking and public transport still comprise important part of shopping trips to shopping centres and supermarkets based on how far the trip will go.

Sixth, grocery and food shopping should be studied more closely given their importance/frequency in retail travel. Modifying travel habits to these destinations could result in large differences in mode share.

Acknowledgements

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