Income and Journey to Work Patterns – Investigations for Melbourne 1996, 2001 and 2006

Edward Shin, Christina Inbakaran, Gavin Alford

Department of Transport, Melbourne, Australia

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1 Introduction

There have been a number of recent studies examining journey to work patterns in Melbourne based on ABS Census statistics (VicRoads 2009, Dept of Transport 2008, Mees, Sorupia and Stone 2007). These studies analyse, in particular, mode share and travel volumes by origin and destination and are a useful primary data source that assist transport planning and other similar activities. Journeys to and from work make up about a quarter of the ~11.5m trips made by Melburnians each weekday, and are mostly made in the AM and PM peaks. They are a substantial part of the load placed on a city's transport system, and a leading contributor to peak-hour congestion and overcrowding (about 45% of non-walking trips in the AM peak are to work[1]).

This study compares Census journey-to-work data with income data. It provides a new addition to the research in this field by making this comparison at the Census unit record level and then, for reasons of confidentiality, presenting the results by labour force region (LFR). Results were produced for 1996, 2001 and 2006. The analysis is part of a wider joint project between the Victorian Department of Transport (DOT), the Australian Bureau of Statistics (ABS), and VicRoads called the *ABS Experimental Journey to Work Income and Expenditure Tables.* By providing a direct link between income and journey to work data at the unit record level, the results of this study will assist provide more depth to our understanding of the Melbourne travel market.

This paper examines the relationships between origin, destination, mode of journey to work, and a worker's income. A more detailed analysis of the Inner LFR is provided in §4: this LFR stands out from the others because of given its relatively high income levels and public transport mode share.

When considering changes over time, we concentrate on the differences between the 1996 and 2006 Censuses, mentioning the 2001 statistics only if they suggest the 1996–2006 trend is much stronger in one than the other.

2 Travel in Melbourne – Transport modes, car-driving distances, and incomes of commuters, 1996 to 2006

2.1 Where Melburnians live and work

The data in the *ABS Experimental Journey to Work* is divided into nine labour force regions. One of the main limitations of this work — at the moment — is the limited spatial resolution available.

[1] DOT, preliminary results of the Victorian Integrated Survey of Travel and Activity 2007 (VISTA 07)

Of the 1.68 million employed people in Melbourne on Census night 2006, approximately 45% worked in the LFR in which they also live. Almost all of those who do not work in their own LFR work in a neighbouring LFR (there are few journeys between, say, the Southern and North-Western regions). Also, large proportions of those who work in each LFR also live in that LFR. Indeed, in the Mornington Peninsula, Outer Western, Outer Eastern, and North Eastern regions, clear majorities of workers lived in the same region.

Inner Melbourne is the exception. A little over one-quarter of total jobs in Melbourne, or 420,000 jobs as at 2006, are in the Inner Melbourne LFR. Of the 420,000 journeys to Inner Melbourne, 100,000 journeys to work start from within Inner Melbourne, with most of the remainder shared between the five LFRs that border Inner. For residents of these five regions, Inner Melbourne is the biggest (external) destination for journeys to work.

2.2 Transport Mode Shares

The majority of journeys to work are by car. In 2006, 61% of journeys were by driving, and a further 4.5% were made as car passengers. Driving is the most common mode in every region (whether counting by origin or destination), including Inner Melbourne. Some 12% of employed Melburnians took public transport to work (park and ride made up 1.4%, kiss-and-ride 0.56%). It should be noted that a large number of employed persons, approximately 240,000 persons, did not travel to work on Census Day and a further 62,000 persons worked from home.

It is only of journeys to Inner Melbourne that public transport has a share comparable to that of the car, as shown in Figure 1. Of all journeys to work made by public transport 79% are to the Inner Melbourne LFR. Further, 88% of all park-and-ride journeys are also to Inner Melbourne LFR. This might be expected in a city with a public transport network that is primarily radial. 'Other' modes, as listed in Figure 1, include walking, cycling, did not go to work, and worked at home.

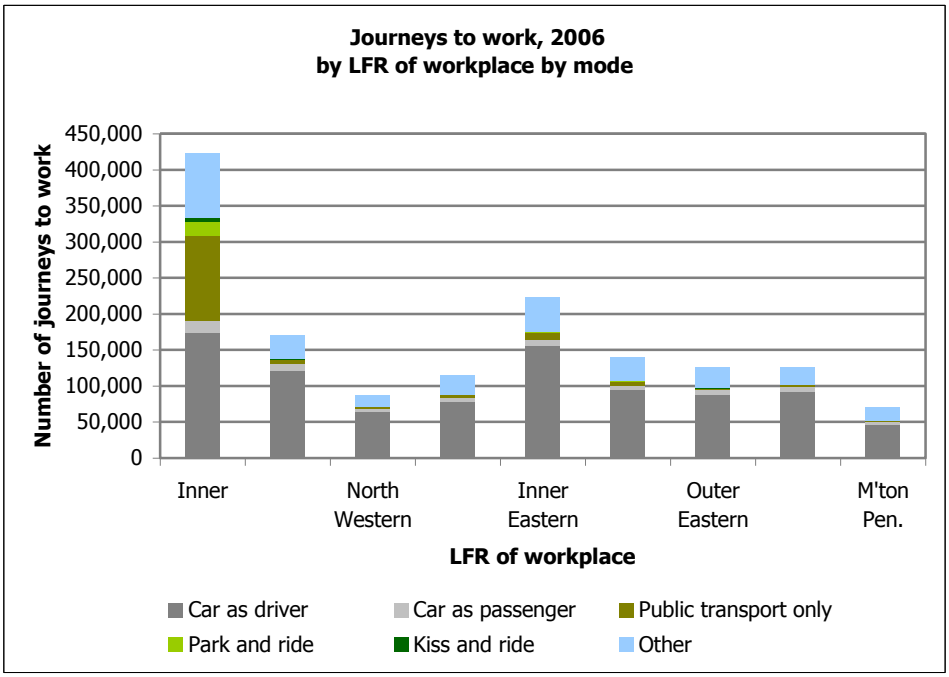

Figure 1 Number of journeys to work, by destination and mode, 2006.

2.3 Incomes and Journey to Work Modes, 2006

There is substantial variation between incomes, modes and regions of origin and destination, as shown in Figures 2 (residential origin) and Figure 3 (workplace destination) below.

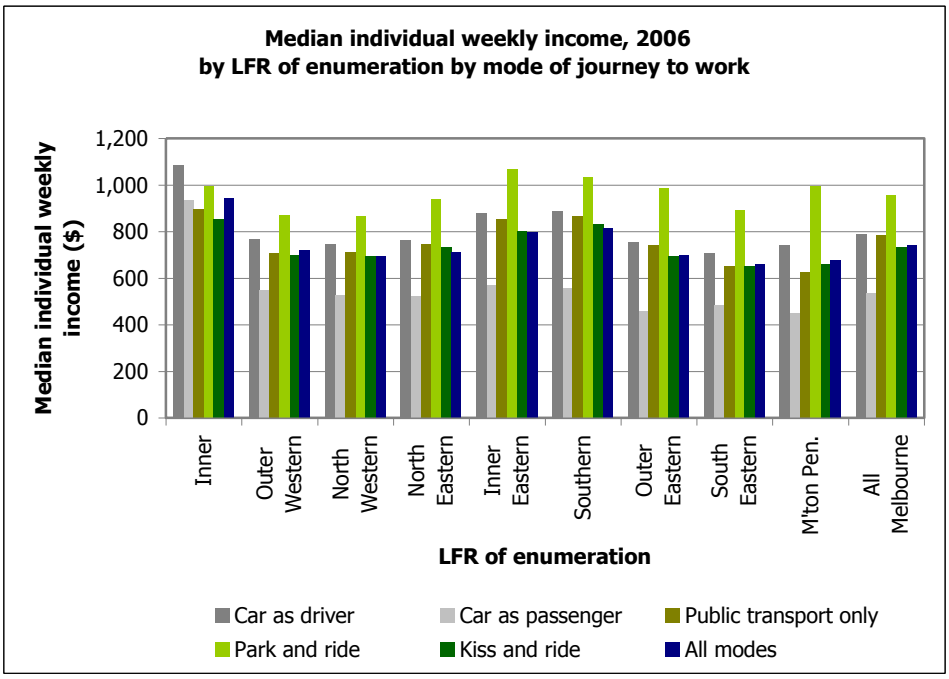

Figure 2 Median income by origin and mode of journey to work, 2006.

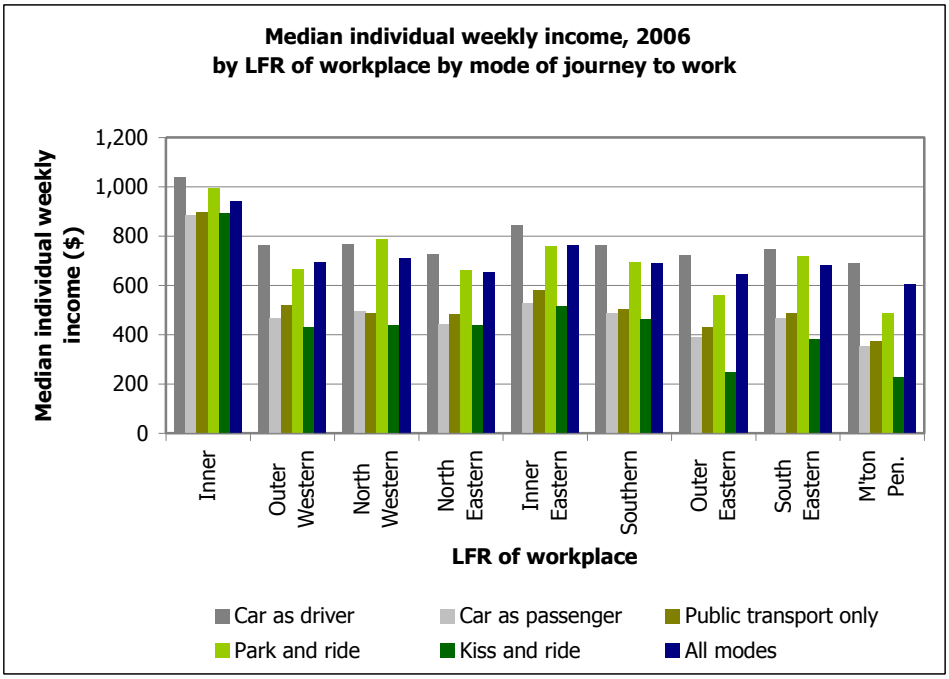

Figure 3 Median income by destination and mode of journey to work, 2006.

Figure 2 shows that, in each region of origin, the median income of residents who park and ride are generally higher than for those persons who commute by any other

mode. The exception is the Inner Melbourne region where 'car as driver' is marginally higher. The All-Melbourne median income for park and riders, at $954, is substantially higher than that of drivers or public-transport-only commuters, which are essentially the same ($789 and $785, respectively).

As illustrated in Figure 3, when considering the median income by mode by workplace region (or destination region), drivers generally have the highest median income, followed by park and ride. The median income of public transport only commuters, car passengers, and kiss and riders are generally very low. The exception again is for the Inner Melbourne LFR where median incomes by each of the modes, including public transport only, car passengers and kiss and riders, are higher, often substantially higher, than that recorded in any other region.

This income gap between workers in Inner Melbourne and workers in other regions is also the reason that the all-Melbourne median incomes of car drivers and of commuters who use only public transport are approximately the same, even though car drivers have significantly higher median incomes in every destination region.

3. Significant changes over 1996–2006

3.1 Changes in origin and destination

The number of employed Melburnians increased by 286,000 (21%), between 1996 and 2006 (from 1.39m to 1.68m), and the number of them who worked in Melbourne increased by 245,000, (20%, from 1.24m to 1.48m).

Melbourne's spatially uneven population growth is closely reflected in a spatially uneven change in *employed* residents. Journeys to work from the Inner Eastern region, for example increased by only 16,000 (6%), less than one-third of the city-wide 21%. The largest absolute increase in employed resident population was in the Outer Western region. In relative terms, however, the greatest increase in employed resident population was in Inner Melbourne: this increased 37% in the ten years to 2006.

Employment growth was also spatially uneven, though not as much as population growth. In particular, employment in Inner Melbourne grew *in line with the Melbourne average*, increasing by 21%, or 73,000, over the ten years. 50,000 of these jobs were created between 1996 and 2001; the number of jobs increased by only 6% from 2001 to 2006.

Despite uneven population and employment growth, the changes in origin-destination mixes are small. That is, employed residents of a given region have a similar mix of workplaces in 2006 as in 1996, and workers in a given region have a similar mix of origin regions in 2006 as in 1996.

3.2 Changes in transport mode share

Of the extra 286,000 journeys to work made by Melburnians in 2006, compared to 1996, 150,000 were car-only journeys and 53,500 used public transport. The great majority (90%) of the net additional public-transport trips, and *none* of the net car journeys, were to Inner Melbourne. Three trends stand out.

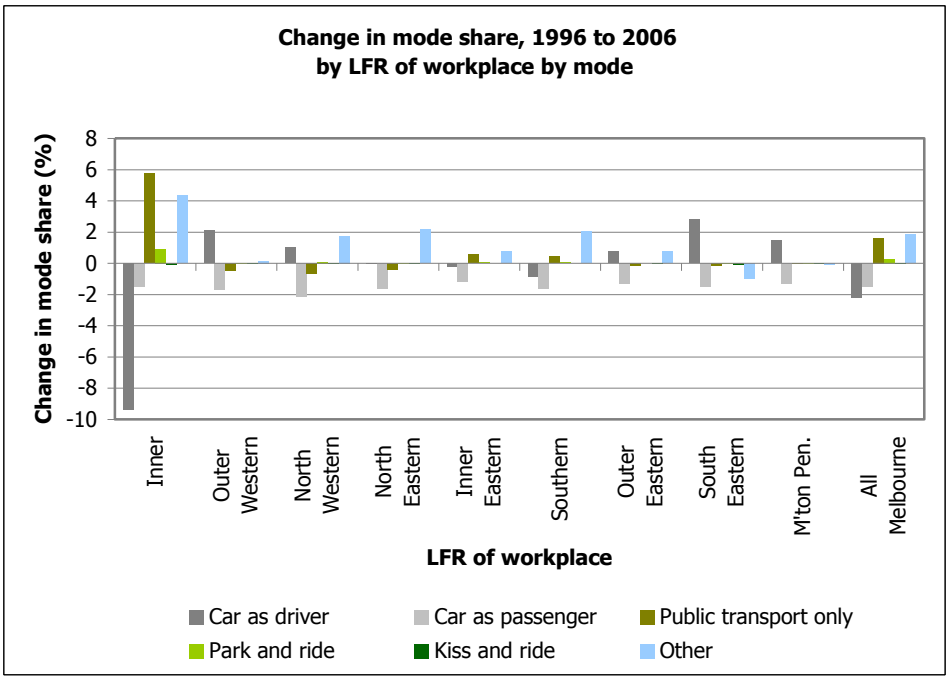

Figure 4 Change in journey-to-work mode share, 1996–2006, by destination.

Firstly, the shift from cars to public transport for the journey to work is generally only reflected in journeys to Inner Melbourne. Public transport mode share of the journey to work increased from 10.2% in 1996, to 11.7% as at 2006.

Secondly, the proportion of car-passenger journeys to work fell in every region (see Figure 4). In 1996, 6% of employed Melburnians went to work as a car passenger; only 4.7% did in 2006. Indeed, the total number of car-passenger journeys decreased. It is not possible to determine, from this analysis, what modes car passengers have been choosing instead.

Finally, the number of park-and ride journeys has increased dramatically, albeit from a very small base. In 1996, 17,000 Melburnians parked-and-rode to work, while by 2006 there were 23,900 park and ride trips, an increase of 41%. Park-and-ride journeys made up only 1.5% of all journeys destined for a Melbourne region, although they did make up 4.7% of journeys to Inner Melbourne (compared to 41% of journeys made as car drivers and 28% by public-transport only).

3.3 Changes in income

The median income of employed Melburnians increased by about 47% (or 15% in real terms[2]) between 1996 and 2006. The two most marked differences were, firstly, between Inner Melbourne and all other regions, and, secondly between income quintiles.

(i) The median income of Inner-Melbourne workers increased by 22% in real terms, while in other regions the real increase was between 9 and 13% (except Inner Eastern, where it was 16%). The median income of those who *lived* in Inner Melbourne increased even more (25%).
(ii) Relative increase in income was higher for higher income quintiles (see Table 1, below).

[2] that is, adjusting for inflation using the all-groups CPI for Melbourne

Table 1. Increase in percentiles of income between 1996 and 2006, across all Melbourne origins, destinations, and modes

Income percentile	1996 weekly income (2006 $)[3]	2006 weekly income ($)	Absolute increase in real weekly income (2006 $)	Relative increase in real income (%)
20%	366	387	21	5.7
40%	560	621	61	10.9
50%	645	739	94	14.6
60%	737	870	133	17.8
80%	1013	1247	234	23.1

4 Inner Melbourne – A Closer look

In this section, we examine commuting journeys to Inner Melbourne more closely. We first look at the origins of these journeys (§ 4.1) before examining the changes in mode shares (§ 4.2) and touching on incomes (§ 4.3).

4.1 Origins of commuting journeys to Inner Melbourne

Just under a quarter (23.6%) of journeys to Inner Melbourne started from within Inner Melbourne. The next most common origins were Inner Eastern and Outer Western Melbourne. The total number of journeys to Inner Melbourne increased from 350,000 in 1996 to 401,000 in 2001 and to 423,000 in 2006, but the number of journeys from some origins decreased over the second Census period. The number of journeys from Inner Eastern decreased by 2.1% between 2001 and 2006, and the number from Outer Eastern decreased by 6.4%.

The fastest growing origin, in both absolute and relative terms, is Inner Melbourne itself. This is an expected result of strong population growth in Inner Melbourne. The increase in the number of *car* journeys *starting* from within Inner Melbourne is perhaps less expected. The number of car journeys from the Outer Western region (which includes the growth areas of Melton and Wyndham) also increased, but the number of car journeys from the established Inner Eastern and Southern regions decreased.

4.2 Mode shares of commuting journeys to Inner Melbourne

Driving has about a 40% mode share of commuting journeys to Inner Melbourne, with car passenger, public transport only, park and ride, and kiss-and-ride collectively accounting for another 40%. The approximately 50% increase in the number of public transport journeys to work to the Inner Melbourne region between 1996 and 2006 is the result not only of possible mode shift but, almost as significantly, a 21% increase in employment.[4] It should also be borne in mind that journeys to work are only one sort of public transport trip, albeit a major sort during the morning peak. Journeys to

[3] Adjusted using the all-groups CPI for Melbourne, which was 119.6 in the September quarter 1996, and 153.7 in the September quarter 2006.
[4] Public-transport patronage has increased without a corresponding increase in passenger capacity. Indeed, since about four-fifths of public-transport commuters bound for Inner Melbourne use trains, and changes to the train network and to services have been relatively minor over 1996–2006, there has been little change in the capacity of public transport to carry passengers to Inner Melbourne.

work make up about 70% train and tram trips during the AM peak, with journeys to education constituting another 20%.[5]

Origins of journeys to Inner Melbourne fall into three groups with similar mode shares.

4.2.1 From the Inner Melbourne Region Itself

The 'other' category, namely walking, cycling, did not go to work, and worked at home, has the largest mode share, at approximately 42%, for Journey to Work trips with both the origin and destination in the Inner Melbourne region. A substantial proportion of this mode share might be assumed to be walking or cycling. For example, the Inner Melbourne SLA has 33.2% of total destination journey to work mode share being made by either walking or by cycling, although this is for a much smaller geographic area than the Inner Melbourne LFR.[6].

Of the remaining 58% of journeys, driving and public transport have equal shares (27–28% each). The car's share decreased markedly between 1996 and 2006 (10% in absolute terms), but its share did not mainly go to public transport but to other, unclassified, modes. As mentioned previously, many of these additional journeys by 'other' modes are probably by walking or cycling,[7] as the number of *usual residents* of Inner Melbourne who did not leave home to go to work (counts based on place of enumeration were not readily available) only increased from 19,500 to 20,750 persons.

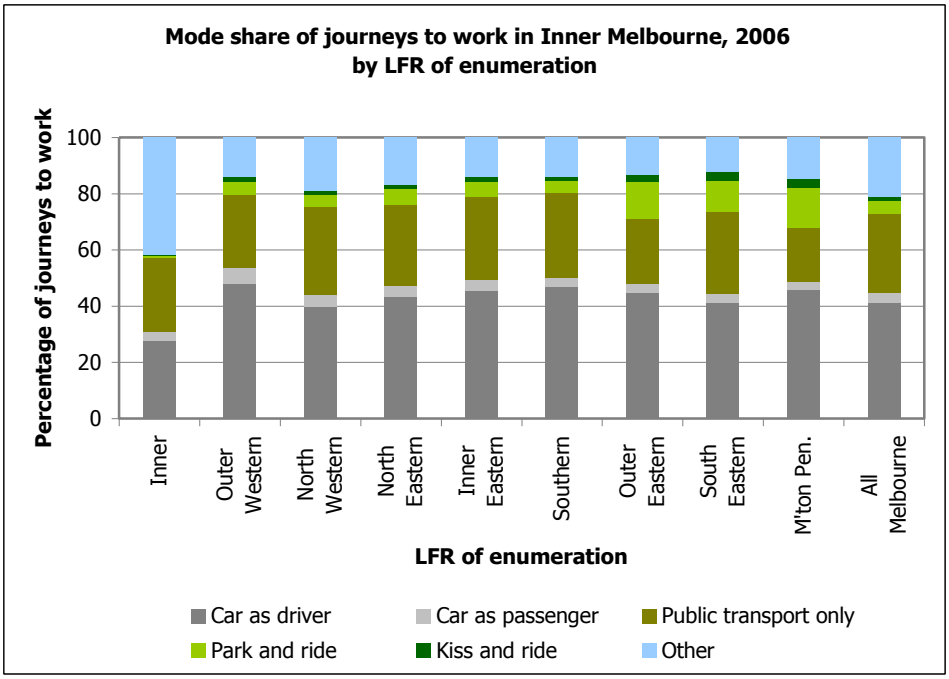

Figure 5 Mode share of journeys to work in Inner Melbourne, by origin, 2006.

[5] DOT, preliminary results from VISTA 07. On buses the ratio is roughly reversed — 75% of trips are to education and only 15% for work — but this includes school buses and the sample size is small.
[6] Source: Walking and Cycling; Census Analysis, Department of Transport, September 2008
[7] Of people *usually resident* in the Inner Melbourne statistical region, 20,700 (5,700) walked (cycled) to work in 2006, compared to 14,000 (3,700) in 2001. Source: ABS Census Basic Community Profiles. (Data for 1996 was not readily available, nor was the place of enumeration profile for 2001.) There were 10,200 more journeys within Inner Melbourne by 'other' modes in 2006 than in 2001, according to the Experimental Journey to Work Tables.

4.2.2 From Regions Bordering Inner Melbourne

Between 30 and 35% of journeys originating in each of the five regions that border Inner Melbourne are by public transport, of which 4–6% are park-and-ride journeys. Public transport's mode share increased over 1996–2006 in all five regions, by between 7.5% and 8.5% in absolute terms (which means 30% or more in relative terms). For Outer Western and North Western, the increase in public-transport mode share was slightly greater in the first than the second lustrum, while it was slightly greater in the second lustrum for the Inner Eastern and Southern regions.

4.2.3 From the Eastern Periphery

Both 2006 mode shares and the 1996–2006 changes are similar to regions bordering Inner Melbourne, except that a greater proportion of journeys that use public transport include car travel.

4.3 Incomes

Median incomes are higher for the origin regions Inner Eastern and Southern, and lower for Outer Western, North Western and North Eastern. However, incomes of workers who live in the Inner Eastern and Southern regions are higher than the incomes of those who live in Inner Melbourne. Firstly, this reflects the greater demographic mixture of Inner Melbourne residents compared to other regions. For example, young workers (on starters' salaries and perhaps sharing houses to cope with the high housing costs in the inner city) may be more likely to live in Inner Melbourne than Inner Eastern Melbourne.[8] Secondly, it reflects that Melbourne's well-known spatial segregation, along socio-economic lines, is highly anisotropic about a centre that is offset ~6km to the east of the CBD.

The differences in median incomes between modes and origins are significant but not enormous. These relatively small differences are partly because of spatial 'smoothing' , the labour force regions are large areas. More pronounced differences can be seen if we consider 80th-percentile income instead, shown in Figure 6, below. It should be noted the Census only collects income information in ranges, and the highest range was '≥$2000 per week' in the 2006 Census and approximately $1730 per week, in 2006-dollar terms, for the 1996 and 2001 Censuses. The 80th-percentile incomes of some of the groups, therefore, are likely to be underestimated in Figure 6.

The 80th-percentile income of Inner Melbourne workers was $1,600 in 2006. It was highest for car drivers from the Inner, Inner Eastern, and Southern regions, ≥$2,000, and lowest, at $1,200, for car as passenger, kiss and ride and public transport only from the Outer Western, North Western, and South Eastern regions. Kiss-and-riders from North-Western Melbourne had the lowest 80th-percentile income, but at 414 persons, this represented only a very small fraction of journey-to-work trips.

The income gap between drivers and others is more pronounced at the 80th percentile than the median, particularly for park-and-riders. This gap is seen in all nine origin regions. In 2006, the 80th percentile for those who reached work in Inner Melbourne by public transport only was $1,490, while it was $1,857, or 25% more, for those who drove to work. The gap does not seem to have narrowed over 1996–2006.

[8] ABS (2009), pp 224–232, and Census 2006 Basic and Expanded Community Profile tables

The differences apparent in the Journey to Work Tables — especially the more pronounced gap between 80th-percentiles than medians — confirm anecdotal wisdom that high-income earners are more likely to drive to work (instead of taking public transport) than middle-income earners, and there is no evidence in this data to suggest that this is changing.

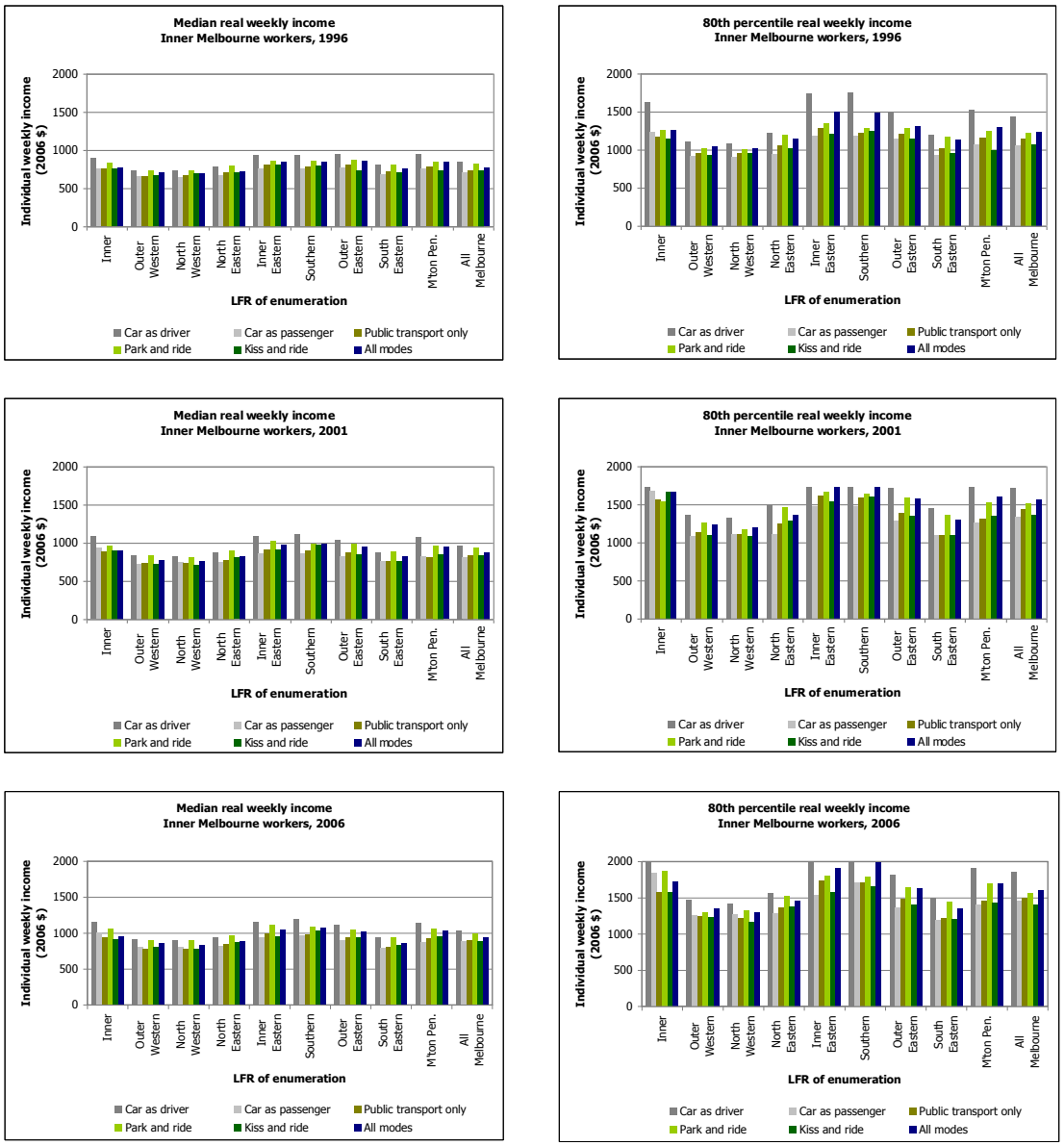

Figure 6 Median and 80th-percentile incomes of Inner-Melbourne workers, 1996, 2001, and 2006. (Bars are coloured by transport mode as in Figures 2 and 3.)

6 Discussion and Conclusion

The results from the *ABS Experimental Journey to Work* Income tables show pronounced regional variation in incomes and the corresponding journey to work mode share.

A quarter of employed Melburnians work in the Inner Melbourne region, and their income and mode-share characteristics differ substantially from workers elsewhere. The noticeably higher incomes of the large workforce employed in Inner Melbourne, and the high public transport mode share, has a significant impact on the overall Melbourne results. It also might be assumed from this that those Melburnians who commute to work using public transport would also have higher incomes, as compared to the other regions. The results show that this is only partly the case.

It should be noted from the outset that car as driver has both the highest journey to work mode share and the highest income by workplace location, in all workplace regions including Inner Melbourne.

This is not the case when considering LFR of origin where park and riders have the highest incomes for all regions, with the exception of trips beginning in the Inner Melbourne LFR, because park and ride journeys are predominantly to Inner Melbourne.

In any given workplace region, except Inner Melbourne, people who either kiss and ride, journey as car passengers, or use only public transport, have much lower incomes overall.

In short, we conclude that if the employed person can drive a vehicle for the journey to work trip, whether that vehicle is driven directly to the place of work or left at a public-transport stop, they are likely to have a higher income than those who do not have such access.

Next steps in this research include analysing the journey to work expenditure by origin, destination, and mode. The relative incomes, journey to work expenditures, and mode shares of part-time workers will also be investigated: it would be interesting to know to what extent the lower incomes of car passengers and kiss and riders is attributable to a greater proportion of part-time employment.

7 References

ABS, (2009) *A Picture of the Nation: the Statistician's Report on the 2006 Census*, ABS Cat. No. 2070.0

Department of Transport, (2008), *Transport Demand Information Atlas for Victoria – Volume 1: Melbourne*

Paul Mees, Eden Sorupia & John Stone, (2007), *Travel to work in Australian capital cities, 1976-2006: an analysis of census data*, GAMUT, University of Melbourne

VicRoads, (2009), *Analysis of Journey to Work data*, Victorian Government, Melbourne