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Travel behaviour differences between private and public-school students in South East Queensland

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Abstract

Australia has seen a steady rise in the number of car-passenger trips made by children to school, and a decline in walking-to-school. Australia differs from most nations in that it has one of the highest rates of private schooling in the world at around 34%, supported by high levels of funding support from the Commonwealth Government. Little is known about the effects this has on travel behaviour and whether it is a factor in our high rates of chauffeuring. This paper looks at journeys-to-school in South-East Queensland. Two research questions were posed: i) how do students in private and public schools travel to school? and, ii) is there any relationship between school type and mode choice? The methods involved advanced geo-spatial matching to allocate all trips made to schools in the *2017-2018 South East Queensland Travel Survey* to either public or private schools. The resulting dataset included 617 trips from home to private schools and 2,539 to public schools. Private school students are less likely to walk to school and more likely to be chauffeured, than public school students. For those chauffeured, trip distances are much greater for private secondary school students (median = 7.7km) compared to public secondary school students (4.4km). We estimate that private secondary schooling alone was responsible for around 56 million km of additional private motor vehicle travel on the SEQ road network in 2016. Australia's policy settings supporting high rates of private schooling appear to be a modest but important contributor to traffic congestion and declines in child physical activity and independent mobility. These impacts should be considered in any holistic evaluation of the costs and benefits of Australia's school funding model.

1 Introduction

Australia has one of the highest rates of private school education. Commonwealth Government policy and programs have lifted the share of private-schooling significantly over the years. Unusually, compared to elsewhere in the world, these schools, are supported by state subsidies. By 1999, private school enrolments were 60% higher than in 1974 (Burke and Spaull, 2002) and by 2018 some 34.3% of all

Australian school children attended a private school (ABS, 2018)). This rate far outweighs the OECD average of 16%.

Trip distances play an important role in mode choices for school travel, especially for active modes (Mandic et al., 2017; Wilson et al., 2010). Public primary schools in pre-war Australia tended to have smaller enrolments (less than 500 students), were found in almost every suburb, and were located on grid street networks that allowed for good pedestrian access. Children enrolled locally had a reasonable walking distance (800m or less) or at least an easy cycling distance (for children aged 10 or more) from home to school, though road conditions were not always conducive to active travel[1].

The smaller number of private schools across a city, their diversity (i.e. religious affilition), and their often larger size, means they tend to have larger school catchments than public schools, often, with enrolments across a sub-region, rather than from a single suburb. Though students attending the new public super-schools in the outer suburbs also face large catchment distances, students attending private schools are, in theory, more likely to travel further than students attending public schools. Given households have limited travel budgets, this is likely to encourage use of faster modes for the journey-to-school, especially private motor vehicle travel. Love's (2015, p. 208) PhD thesis explored travel behavior change initiatives in Catholic school in Victoria, Australia, suggesting that the larger school catchment sizes of these schools, compared to local public schools, did stymie efforts to shift journey-to-school mode choice away from the car. If the high rates of private schooling in Australia add significant demand on our road networks, contributing especially to AM peak traffic congestion, the implications are significant, given the sizeable cost of congestion to the Australian economy. The direct congestion costs could be in the hundreds of millions of dollars per annum, given the known costs of congestion to the Australian economy ($16.5 billion for the 2015 financial year – BITRE (2015)).

Two research questions were therefore posed: *i)* how do students in private and public schools travel to school? and, *ii)* is there any relationship between school type and mode choice? These questions were explored using advanced geospatial matching techniques applied to household travel survey data for the South East Queensland region.

2 Methods

The methods involved: i) advanced geo-spatial matching techniques using *Python* to allocate all trips made to schools in Brisbane from the *2017-2019 South East Queensland Travel Survey* (SEQTS) to either public or private schools as coded in Education Queensland geo-spatial data, using the destination locations of home-to-school trips; ii) Z-tests of two proportions (one-way tests) using *R* was then applied to analyse the mode choices and trip distances across the two groups (public/private school trips)

There were 3,156 children who travelled to school in the dataset including private, public and special school students. Special school students' were excluded due to their particular travel needs. Though weightings were included in the dataset, we did not apply any weightings in the analysis of school trips due to the small subset sample

[1] Australia's posted street speeds in local streets and in school zones are 20km/h and 10km/h higher, respectively, than in much of continental Europe.

size. Significant error and a skewed view of how far people might have actually travelled is likely if weightings were applied to these subset datasets.

Using *Python,* every trip made by a child to primary or secondary education was identified. These trips were allocated to the nearest known school, whether public or private (catholic and independent), using the longitude and latitude of the destination reported in the trip record. School locations were matched using Education Queensland's *School Locations 2018* dataset. All trips to schools that were exclusively to primary or secondary schools were coded as such. Using *MS Excel*, a series of mode share and trip distance calculations were then undertaken on the final set of primary and secondary school trips, using the Trip file, and using the 'main mode' allocated to each trip. Z-tests of two proportions and binomial logistic regression were performed using *R* to explore the likely probability that the travel behavior differences observed were meaningful.

3 Results

3.1 Mode shares and trip distances

Comparisons between the travel mode choices of children in public and private primary schools are shown in Figure 1.

For primary schools, 12.5% of public school students walk to school, 80.2% are chauffeured; whereas only 2.75% of private school students walk, and 88.3% are chauffeured. More than twice the number of private school students travel by school bus, compared to public school students. Cycling to school is low across both groups, with 2.58% cycling to public schools and 2.41% cycling to private schools.

To test the hypothesis that the ratio of private primary school students who are driven to school is greater than the ratio of public primary school students who are driven to school, (i.e., $P_1 > P_2$) one can use either z-tests of two proportions or binomial regression. For the z-tests:

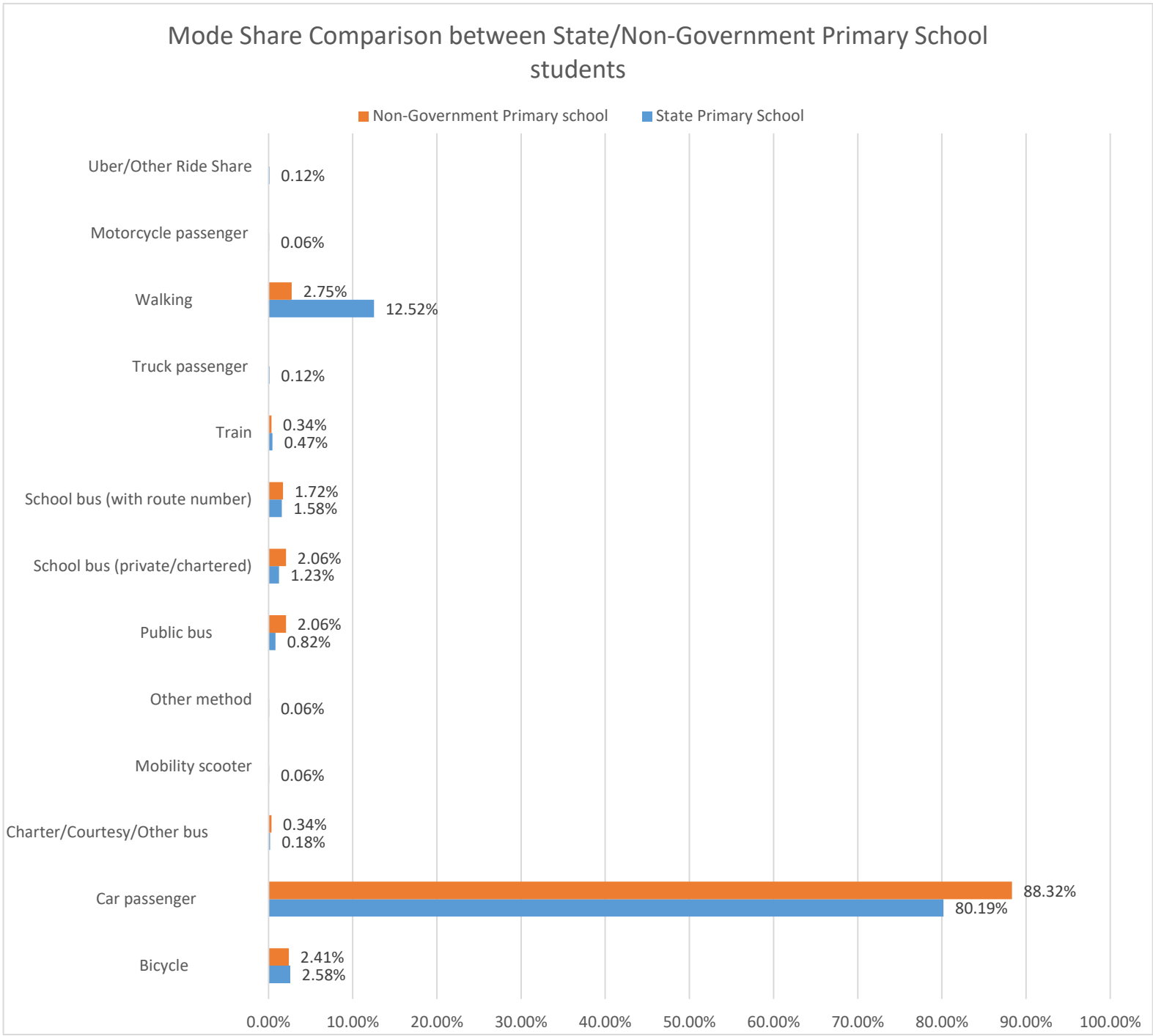
$$H_0: P_1 = P_2 \text{ against } H_1: P_1 > P_2$$

and the test for this problem is:

$$Z = \frac{\left(\hat{P}_1 - \hat{P}_2\right) - (P_1 - P_2)}{\sqrt{\frac{\hat{p}\,q}{n1} + \frac{\hat{p}\,q}{n2}}}$$

The results are: Z = 3.21; p = 0.00066, which suggest the differences in the proportion of car-passenger trips across the two groups is significant.

Figure 1: Mode shares for public (state) and private (non-government) primary schools

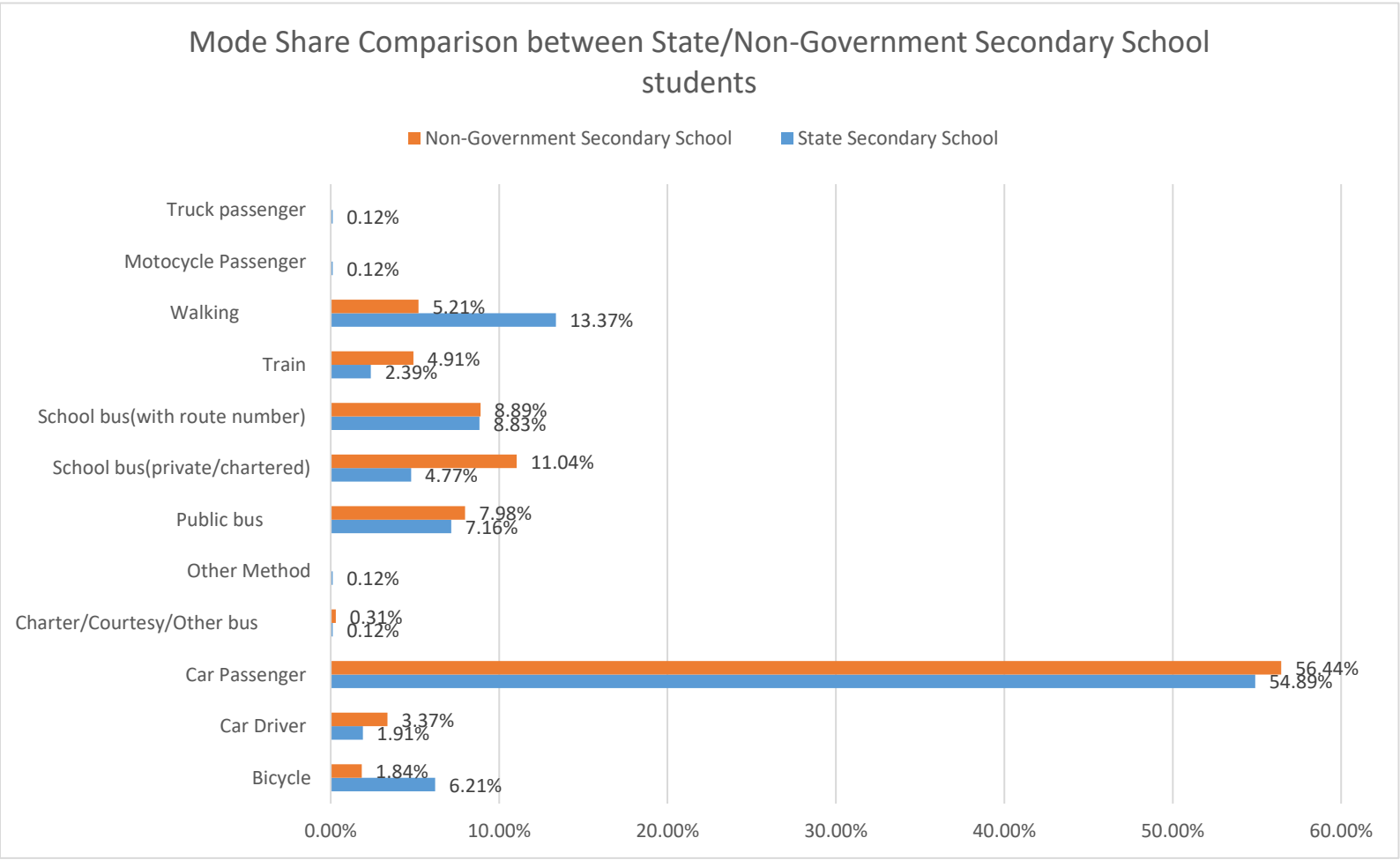


For secondary schools (Figure 2) some 13.4% of the public school students walked to school, compared to only 5.2% of the private school students. Public transport use is much more important for secondary school students compared to primary school students. More private school students travel by public transport than their public school counterparts, especially for private/chartered school buses (11.0% vs. 4.8%, respectively). 54.9% of public school students were chauffeured, compared to 56.4% of private school students. Private secondary students has larger proportion of driving

to school compared to public secondary students (3.4% vs. 1.9%). 6.2% of public school students cycled, compared to only 1.8% of private school students.

We again used z-tests of two proportions to determine if these differences were significant. For the difference in the mode share of car passenger trips across the two groups the results were that Z = 0.868; p = 0.193; suggesting that the differences, though sizeable, only approach (but do not fully reach) statistical significance and indicating that there is insufficient evidence in my sample to conclude that a non-zero correlation exists between car-passenger trips and school type at the secondary school level.

Figure 2: Mode shares for public (state) and private (non-government) secondary schools



Median trip distances by school type are provided in Table 3. Median values are used, as mean averages are often skewed by extremely large values in household travel surveys (i.e. occasional inter-city trips, possibly from a distant co-parent's house). Significant caution must be used when considering the trip distances for modes with very small sample sizes.

Table 1: Median trip distances by school type (km)

	State Primary	Non-Government Primary	State Secondary	Non-Government Secondary
Bicycle	**1.58**	**N/A**	**2.09**	**N/A**

Car Driver	**N/A**	**N/A**	**3.06**	**9.17**
Car Passenger	**3.08**	**4.21**	**4.39**	**7.74**
Public bus	**3.32**	**N/A**	**6.29**	**8.02**
School bus (private/chartered)	**5.99**	**N/A**	**9.89**	**15.47**
School bus (with route number)	**5.44**	**N/A**	**6.47**	**9.72**
Train	**N/A**	**N/A**	**11.74**	**16.66**
Walking	**0.69**	**1.61**	**1.38**	**0.74**

* Caution – many modes have small sample sizes, especially for private schools; observations with a sample size of 10 or less are not applicable

For primary schools, the public (state) school students travelled much shorter trip distances for different modes compared to the private (non-government) school students. But the only mode for which meaningful comparison can be made is car-passenger trips. Public school students had a mean travel distance for car-passenger trips of 3.1 km, for private school students it was 4.2 km.

For secondary schools, a similar pattern emerges. There is slightly higher sampling f or the different bus modes, giving more confidence that the differences showing long er median trip distances for private school students are meaningful. But again, the m ode for which we can have the most confidence is car-passenger. Public school stud ents had a mean travel distance for car-passenger trips of 4.4 km, compared to 7.7 k m for private school students.

4 Discussion

This study makes a modest but important methodological contribution in determining how to spatially match household travel survey trip records to a geo-coded education department database of school locations, by type, for the first time, allowing one to categorise travel as being to public or private schools. The main findings are that private school travel is much less sustainable than public school travel.

Though care is needed in interpreting the figures, and we need to be sure the results hold once other variables are considered. But at this stage of the analysis there is a prima facie case that private schooling may add significant load, and contributes greatly to congestion, in morning peak hours. For the 2016 ABS census population of 94090 private primary school students across all of SEQ, this preliminary analysis suggests private schooling adds approximately 71,000km of additional car travel to the network each day (presuming a rate of joint drop-offs of more than one child in the household of 0.33 and using median trip distance difference). For secondary school students, private schooling adds 266,136km per day. As there were 192 school days in 2016 (four 10-week terms minus public holidays) we estimate private schooling added a total of ~66,300,000km to the network across all of 2016, just for journeys to school (not journeys home).

The Prime Minister recently blamed migrants for traffic congestion, which is highly disputed (Crowe, 2019). But it may be that current Commonwealth school funding

policies are an as yet unrecognized contributor to congestion effects in Australia. The direct congestion costs of private schooling have not been modelled in this paper. But any benefits obtained from subsidizing high rates of private schooling may not counterweigh the disadvantages of the travel patterns they produce. Education departments should be considering transport costs in their decision-making. This may lead to changes such as reintroducing stronger school catchment policies, and policy changes to Commonwealth school funding for private schools.

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