Transport Policy 64 (2018) 29–37

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Transit user reactions to major service withdrawal – A behavioural study

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ARTICLE INFO

Keywords:
Public transport
Traffic congestion
Travel behaviour
Mode shift
Disruption

ABSTRACT

Public Transport (PT) plays an important role in mobility in urban areas. A major PT disruption removing all service can have a considerable impact on travel and increase traffic congestion. This paper investigates the behavioural reactions of PT users in Melbourne to removal of PT service using self-reported responses and an online questionnaire. Of the 640 respondents, 52% would switch from PT to become a car driver, 11% would switch to car as a passenger and 5% would shift to taxi/Uber. Mode shift to cars would directly contribute to an increase in congestion. By contrast, only 31% in total would switch to either non-motorised modes (cycle and walk) or trip cancellation. In order to explore factors affecting changes in travel behaviour among PT users, a multinomial logit regression model was adopted. The analysis indicates that users with a driver's license or a car were found to prefer using a car should PT be unavailable. Work trips were more likely to be undertaken by car as a driver. Users who had trips to the CBD were more likely to cancel their trips and those who accessed PT stations by car were more willing to shift to being a car driver. This paper provides new insights into how PT users change their travel behaviour in the event of major PT disruptions. Based on the findings, potential measures can be proposed to mitigate the increase in traffic congestion.

1. Introduction

Public transport (PT) provides various benefits for the modern transport system such as reducing traffic congestion, increasing traffic safety, reducing air and noise pollution, and improving accessibility, particularly for non-drivers (Litman, 2015). However, disruption to PT can occur due to various factors such as malfunctions and breakdowns of vehicles, power outages and personnel strikes (Pnevmatikou et al., 2015). This paper explores this issue and poses the question: *"How would PT users travel in the event of a major PT withdrawal?"*.

PT strikes have taken place in several large cities around the world (Exel and Rietveld, 2009). For instance in 2015, Melbourne's public transport system experienced tram and train strikes as unions negotiated working conditions. More recent examples of all mode PT strikes are those in Rome, Italy (Keep Talking Greece, 2016) and Athens, Greece (Wanted in Rome, 2016) in 2016. These strikes naturally affected PT users to some extent, in particularly their daily travel plans.

Previous published research has shown that in the event of PT withdrawal, PT users switch to alternative modes or cancel their trips. Mode shift to a car, either as a driver or a passenger, contributes to an increase in the number of car trips on the road network (Exel and Rietveld, 2001; Aftabuzzaman et al., 2010b; Nguyen et al., 2015). As a result, the level of traffic congestion increases and this results in an increase in travel delays, travel costs, accidents and air pollution (Exel and Rietveld, 2009). Furthermore, the mode shift to car when PT is removed is considered to be a key parameter used for estimating traffic congestion relief associated with PT (Nguyen et al., 2015; Aftabuzzaman et al., 2010a). From this information, the routes or corridors facing congestion can be targeted for attention in order to seek a desired level of congestion relief and appropriate PT policies can encourage desired development in designated locations to achieve congestion relief. However, studies on mode shift from PT when PT is no longer available are very limited – this study aims to address this deficiency.

A better understanding of changes in users' travel behaviour and factors affecting mode shift, particularly mode shift to car, in the event of major PT disruptions is needed. Results can assist authorities not only to propose appropriate policies which aim to reduce mode shift from PT to car, but also to design mitigations in response to major PT withdrawal.

This paper explores the stated intentions of how PT users would change their travel behaviour in the event of a whole-day removal of an

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https://doi.org/10.1016/j.tranpol.2018.01.004
Received 28 August 2017; Received in revised form 29 November 2017; Accepted 12 January 2018
Available online 3 February 2018
0967-070X/

Table 1
Mode shift when PT was unavailable.

Source	Year	Location	PT mode removed	Mode shift to car		Cancel trip
				As a driver	As a passenger	
Exel and Rietveld (2001)	1966	New York, USA	All	50%	17%	10%
	1974	Los Angeles, USA	Bus	50%	25%	–
	1978	Leeds, UK	All	5%	60%	15%
	1981	The Hague, Netherlands	All	10%	25%	5%
	1995	Ile-de-France, France	All	28%	21%	11%
	1995	The Netherlands	Bus	30%		10%
	1998	Norway	Bus	20 %[a], 40–60%[b]		–
WDOT (2003)	2001	Wisconsin, USA	All	8%[c] (3.7%–14.6%)	12%[c] (9%–14.8%)	56%[c] (52%–67.3%)
Exel and Rietveld (2009)	2004	The Netherlands	Train	24%	14%	44%

[a] Urban traffic.
[b] Interurban traffic.
[c] Average value.

Table 2
Factors affecting mode shift when PT was unavailable.

Source	Location	PT mode removed	Method	Survey data	Factors affecting mode shift
Exel and Rietveld (2009)	The Netherlands	Train	Quantitative	Secondary	Age, gender, trip distance, frequency of train use and trip purpose
Pnevmatikou et al. (2015)	Athens, Greece	Train	Quantitative	Primary	Gender, income, trip purpose, travel cost, transfer inconvenience
Nguyen-Phuoc et al. (2016)	Melbourne, Australia	All PT	Qualitative (Interview)		Individual-specific factors, context-specific factors and journey-specific factors.

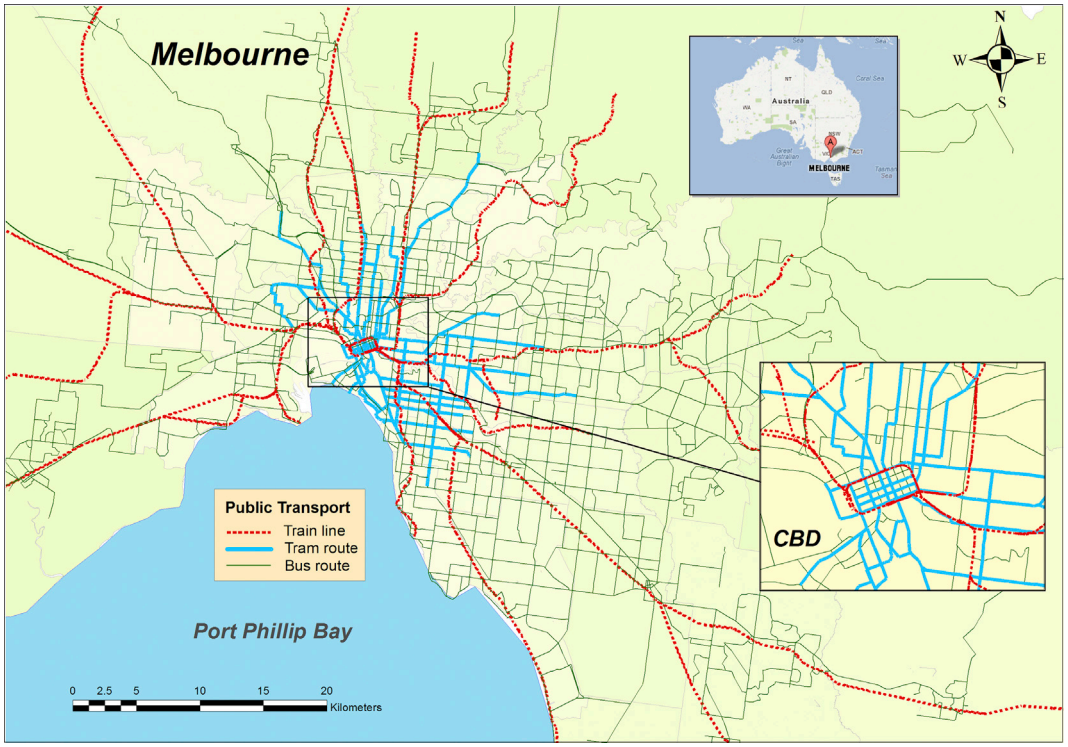

Fig. 1. Public transport network in Melbourne.

entire PT system with advanced notification. Stated intentions are explored given that PT strikes are relatively rare (e.g. in Melbourne, only one rail strike has occurred in the past decade while no bus strikes have occurred). The characteristics of users and trips associated with the chosen reactions are also investigated. This study would be of interest to city transport authorities, particularly where major PT disruptions occur.

This paper is structured as follows: the next section outlines previous studies on PT users' behavioural reactions in the event of major PT withdrawal and provides background to the research. This is followed by a description of the research context. The study methodology and results are then described. The paper concludes with a discussion, summary and areas for further study.

2. Background

Even though removal of PT can have a considerable impact on users'