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Promoting active transportation modes in school trips

Alireza Ermagun [a,*], Amir Samimi [b]

[a] Humphrey School of Public Affairs, University of Minnesota, 301 19th Avenue, Minneapolis, MN 55455, USA
[b] Department of Civil Engineering, Sharif University of Technology, Azadi Avenue, Tehran, Iran

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ABSTRACT

Urban and transportation planners have put a special focus on students' health and fitness in the past decade, however they struggle to find effective policies to promote walking and biking for school trips. Commuting to school is an opportunity to embed a regular physical activity in students' daily routines and prevent many health issues that are stimulated by physical inactivity during childhood. A three level nested logit model is introduced to explain the motives behind school trip modal selection. Four choice situations, namely walking, driving, school busing, and taking public transit are considered. This study, particularly, underscored the significance of model misspecification in terms of policy outcomes, since multinomial logit models are typically adopted in the literature and have strong and, in many cases, unrealistic assumptions. Elasticity analysis of the MNL model showed an indirect elasticity of vehicle ownership of −0.13 for non-automobile modes, while NL model provides different elasticities of −0.12, −0.20 and −0.08, respectively for public, school bus, and walk modes. This misspecification results in over estimating the reduction in the share of students who walk to school when vehicle ownership increases. Moreover, a wide range of policy-sensitive variables along with their effect magnitude was discussed and compared with the previous studies. The results showed that one percent increase in the probability of walking to school is expected for every 0.04 percent increase in auto travel time, 0.07 percent increase in the normalized-to-income cost of driving, 0.08 percent decrease in vehicle ownership, 0.03 percent increase in distance to public transit, or 2.37 percent decrease in commute distance. Safety was also found to be very influential on active commuting, such that addressing the safety concern of parents is expected to increase propensity of active commuting to school by around 60 percent.

1. Introduction

A global increase in the children obesity rate has triggered policy-makers to promote a more active lifestyle among students. Many studies have shown that cardiovascular diseases along with several other health issues in adulthood are rooted in a lack of physical activity during childhood and adolescence (Andersen et al., 2003, 2006). Since walking is the most common form of physical activity for all ages (Saelens et al., 2003), transportation and urban planners struggle to find policies that promote active modes of transportation (AMT). This is, particularly, deemed as an opportunity for children to perform regular physical activity and diminish several diseases throughout their life (Cavill et al., 2008; Tudor-Locke et al., 2002). AMT is also a prospect for city officials to decrease congestion levels in the morning peak hours and thereby mitigate externalities of the transportation system (Rabl and Nazelle, 2012; Pedestrian and Bicycle Information Center, 2008). Parents, on the other hand, have understandable reservations that have led to a significant decline in the share of active modes.

It is essential to study the motives behind the mode choice decisions in school trips, and implement effective policies to promote AMT. Students' mode choice have received a growing attention since 1994, when Towner conducted a descriptive analysis on students' modal selection behaviors in England and measured exposure to injury risk in school trips (Towner et al., 1994). Since then a wide range of factors are found to influence students' active travel to school that includes 1) household demographic and socio-economic factors, 2) students' characteristics, 3) built-environment variables, and 4) socio-economics of the residential neighborhood. Table 1 provides a summary of explanatory variables, alternative modes of school travel, and data analysis methods that are applied in some previous studies. According to this table, very few studies (Larsen et al., 2009; McDonald and Aalborg, 2009; Yarlagadda and Srinivasan, 2008) had a complete coverage on the alternative modes, while the rest focused on a subset of alternatives. Moreover, an overview of the explanatory variables reveals that commute distance to school,

* Corresponding author.
E-mail addresses: ermag001@umn.edu (A. Ermagun), asamimi@sharif.edu (A. Samimi).

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Table 1
Summary of school trips studies.

Author/Year	Country	Age	Mode				AMT (%)	Indicated Parameters									Analysis Method
			Active (walk / bike)	*Automobile*	*Public Transit*	*School Bus*		*Gender*	*Age*	*Income*	*Vehicle ownership*	*Safety*	*Comfort*	*Distance*	*Travel time/cost*	*Transit Specs.*	
Ermagun et al., 2014	Iran	12-17	×	×	×	×	49	×	×	×	×	×	×	×	×	×	Copula-based Joint Approach
D'Haese et al., 2011	Belgium	11-12	×	×			59	×			×	×		×			Two level Bivariate Regression
Johansson et al., 2011	Sweden	11-15	×	×	×		63	×	×		×						Descriptive
Alemu and Tsutsumi, 2011	Japan	15-18	×	×	×		29		×		×			×	×	×	Multinomial Logit
Leslie et al., 2010	Australia	10-14	×	×	×		56	×									Binary Logistic Regression
Wilson et al., 2010	U.S.	7-12	×	×	×		24		×	×				×			Multinomial Logit
Dyck et al., 2010	Belgian	17-18	×	×	×		58	×				×					Logistic Multi Level
Mitra et al., 2010	Canada	11-13	×	×			70	×	×	×	×			×			Binomial Logit
Larsen et al., 2009	Canada	11-13	×	×	×	×	62	×		×				×			Logistic Regression
McDonald and Aalborg, 2009	U.S.	10-14	×	×	×	×	30	×	×	×		×	×	×			Descriptive
Rodriguez and Vogt, 2009	U.S.	9-11	×	×		×	12		×		×	×		×			Logistic Regression
Nelson et al., 2008	Ireland	15-17	×	×	×		37	×						×			Logistic Regression
Yarlagadda and Srinivasan, 2008	U.S.	< 18	×	×	×	×	15	×	×		×			×			Multinomial Logit
Wen et al., 2008	Australia	9-11	×	×	×		32	×	×		×	×	×	×			Logistic Regression
McDonald, 2008a	U.S.	7-14	×	×	×		12	×	×	×	×			×	×		Multinomial Logit
McMillan, 2007	U.S.	9-11	×	×			22			×	×	×	×	×			Binomial Logit
Martin et al., 2007	U.S.	9-15	×				48	×	×	×				×			Logistic Regression
Mota et al., 2007	Portugal	12-16	×	×	×		52							×		×	Logistic Regression
Kerr et al., 2007	U.S.	5-18	×				14	×		×	×						Logistic Regression
Kerr et al., 2006	U.S.	5-18	×				25				×	×					Logistic Regression
Merom et al., 2006	Australia	5-12	×	×	×		30	×	×		×	×		×			Logistic Regression
Timperio et al., 2006	Australia	5-6 / 10-12	×				33		×			×		×		×	Logistic regression
Schlossberg et al., 2006	U.S.	12-15	×	×	×		25					×		×			Logistic regression
deBruijn et al., 2005	The Netherlands	12-18	×				79	×	×								Three Step Linear Regression
Schlossberg et al., 2005	U.S.	12-14	×	×	×		26					×	×	×			Descriptive
Ewing et al., 2004	U.S.	7-18	×	×		×	8				×			×	×		Multinomial Logit
Evenson et al.,2003	U.S.	12-15	×				10	×	×								Logistic Regression