



# From better understandings to proactive actions: Housing location and commuting mode choices among university students



Jiangping Zhou\*

Department of Community and Regional Planning, Iowa State University, Ames, IA, 50011, USA

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## ABSTRACT

Reducing car dependence has become an important public policy issue. This manuscript examines the issue by focusing on university students, who have not been well studied in existing literature. It proposes a confirmatory framework for studies on university students' commuting mode and housing choice and their determinants. It also conducts a case study based on this framework to get more insights. This case study shows or re-confirms that when compared to the employees from the same university, university students are more likely to share a residence in exchange for rent affordability, bus proximity and short commute. They are also more likely to jointly determine their housing and mode choices. Transit pass subsidies significantly influence university students' alternative transportation use. Female students or graduate students are less likely to use alternative transportation. Undergraduate students have a shorter commute and use alternative transportation more. The above provide new implications for integrated housing–transportation planning and group-sensitive policies to increase alternative transportation usage among university students.

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## 1. Introduction

Driving has become the dominant mode of travel in the United States (US). In 2009, nearly 90% of personal miles traveled in the US are finished by private cars (Santos et al., 2011). Heavy reliance on driving has resulted in problems such as long commutes, traffic congestion, energy consumption and air pollution in the metropolitan area (Levine, 2006; Downs, 1992). It could also have contributed to the obesity and health issues (Lorenz et al., 2008). All the above problems or issues do not just involve general employees. University students cannot escape from them. For university students who live off campus, driving also dominates. In four major universities in Virginia, for instance, 42% of students drive alone to school, claiming the lion's share of all modes (Khattak et al., 2011). In the US alone, there are nearly six million part-time and over 13 million full-time university students (U.S. Census Bureau, 2008). Today's students would be tomorrow's elites and leaders of all walks of life in the society, shaping and making various policies and decisions that would profoundly influence and change our world. In addition, "due to their proactive educational milieu, college campuses are privileged places to communicate sustainability and to help reshape society's transportation patterns" (Balsas, 2003, p. 35). Thus, promoting

sustainable lifestyle in general and alternative modes of transportation ("alternative transportation" for shorthand hereafter) other than driving alone in particular among university students is not a trivial issue. Few existing literature, as argued by Balsas (2003) and Zhou (2012), however, has studied alternative transportation among university students. Most authors have dealt with car dependence or dominance among the general population or employee, its causes, consequences and/or cures (e.g., Newman and Kenworthy, 1999; Mark, 2009; Scheiner, 2010; Barr and Prillwitz, 2012; Susilo et al., 2012). But given the significant differences between the two groups, findings about the general population or employee and related policy recommendations may not apply to university students. There is urgent need for separate studies of alternative transportation usage among university students.

The above situations provide the impetus for this manuscript, which addresses these issues: *First*, we know the general population or employee and university students are different, but what are the exact differences between them in the context of housing and mode choice, especially when we focus on employees and students from the same university, where two groups could enjoy the same transit subsidy, use the same public transport system and share many destinations? *Second*, what specific theoretical framework one can propose for university students' housing and mode choices and their determinants, in light of the above differences and existing literature? *Third*, whether university students' housing and mode choices influence each other, and if

\* Tel.: +1 515 294 5470.

E-mail address: [zjp@iastate.edu](mailto:zjp@iastate.edu)

so, which factors influence such choices and to what degree and how different those are compared to employees?

For all the above questions, many of us have some perceptions or anecdotal evidences, for instance, the commuting distance of university students can be shorter as compared to general employees, university students may drive less than general employees and university students are more likely to share a residence with others. But there have been few in-depth studies of these perceptions or evidences. This manuscript would synthesize relevant existing studies (though there are not many) and conduct a case study to fill the gap. In the case study, the manuscript would use a confirmatory model, which has not been used in the existing studies of university students' mode of travel and housing choices, according to the author's knowledge.

The rest of the manuscript is organized as follows. The next section (Section 2) reviews existing literature and proposes a theoretical framework regarding university students' housing and commuting mode choices and their determinants. Section 3 is a case study, which helps test the framework and expand relevant existing literature, gaining more insights into university students' housing and mode choices and their determinants. The last section discusses overall implications of the study, its limitations and outlines future research directions.

## 2. Relevant literature

Existing literature examining housing and mode choices and their determinants among general population or employees have been extensive. Five streams of literature emerge if we assume that each individual literature is operationalized within one distinct framework and only identifies one category of determinants. These streams are: jobs–housing balance, amenity, social-economics, land use and built environment and institutions.

### 2.1. Jobs–housing balance

In a nutshell, jobs–housing balance means most employees of a given small geography such as Traffic Analysis Zone or census tract could potentially find a job and a residence within that geography or nearby, or in other words, there is a match between the quantity/availability and quality/characteristics of jobs and residences that are within a reasonable commuting distance (cf. Peng, 1997; Giuliano, 1991). Places suffering from jobs–housing imbalance could mean higher car dependence and more vehicle miles traveled (e.g., Cervero, 1996). Quite a few authors and entities thus have advocated or even incentivized jobs–housing balance as a way to reduce peak-period automobile travels and optimize commutes, in particular, commutes by driving alone (e.g., California Department of Housing and Community Development, 2007; California Planning Roundtable, 2008; Cervero, 1989; Downs, 1992).

### 2.2. Amenity

Despite the fact that jobs–housing balance has become an important policy issue (Giuliano, 1991), not all the authors agree that land use promoting jobs–housing balance would result in shorter commutes and/or higher usage of alternative transportation, i.e., jobs–housing balance is a sufficient condition for high share of alternative mode of transportation. Based on a longitudinal analysis, for instance, Wachs et al. (1993) argued that employees' residential location is jointly determined by many factors such as quality of neighborhood and schools and perceived safety. Home–work separation is only one of them. In other words, even if a place has jobs–housing balance some employees still

voluntarily choose to live in another place so as to gain other amenities other than jobs–housing proximity. For such amenities, these employees would have to, or are willing to drive to work. There are other authors who uphold similar positions like Wachs et al. (1993). Giuliano (1991), Linneman (1981), Follain and Jimenez (1985) and Quigley (1985), for instance, argued that amenities such as neighborhood quality, availability of parks, quality of school, racial and ethnic mix and microclimate could have bigger impacts on employees' residential location choice. In line with these works, Giuliano (1991) and Giuliano and Small (1993) have suggested that land use policies aimed at promoting jobs–housing balance would only have limited impacts on commuting, including mode choice of commuters.

### 2.3. Social-economics

Social-economic factors have been commonly used by metropolitan planning organizations (MPOs) to forecast people's mode choice. The Southern California Association of Governments (2012), the largest and one of the well-recognized MPOs in the US, for instance, used car access and income as two of the independent variables in addition to generalized travel costs to forecast mode choice of trips by different purposes. In academia, there have also been extensive studies on the impacts of socio-economic factors such as automobile ownership, race, income, gender, work classification and even the lifestyle/residential preference on commuting and/or mode choice. Automobile ownership, for instance, has been factored into an integrated and the state-of-the-art model of land use and transportation choices (Pinjari et al., 2011). It has also been regarded as a contributor to, and a cure for spatial mismatch, which involves the separation of low-skilled and/or minority workers in central cities and employments in suburbs (for a recent review, see Fan, 2012). In the US context, Emond et al. (2009) found that in addition to safety perception and household responsibility, gender affects bike usage and females are less likely to bike. This is distinct from what happens in the Netherlands, Germany, and Denmark, where the percentage of female and male cyclists are not significantly different. Regarding income and work classification, Gordon et al. (1991) suggested that low-income and low-skilled workers should have shorter commuting distance, as low-income and/or low-skilled employment is spatially ubiquitous while high-income and/or high-skilled jobs tend to cluster geographically. In terms of preference, Cao et al. (2009) have demonstrated that residents have different lifestyle and community/residential preferences, which are associated with different mode choice, in particular, mode choice of non-work trips. As per the above, residents prefer certain mode of travel and lifestyle could have self-selected into certain community/residential location. Cao et al. (2009) also found that preferences/attitudes and the built environment play a more prominent role in explaining the variation in non-motorized travel than for auto and transit travel. Thus they believed that if cities could have land use patterns or an urban form that offer options to drive less and use transit and non-motorized modes more, many residents favoring the latter would do so. In other words, there could be unrealized usage of alternative modes of transportation among many residents simply because of the lack of supportive land uses or urban forms.

### 2.4. Land use and built environment

Ewing and Cervero (2001, 2010) have provided a meta-analysis of voluminous existing literature concerning land use and built environment's impacts on travel. The overall findings of Ewing and Cervero (2010) are that: (a) as a whole, land use and built environment is not a significant predictor of mode choice.

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