Transportation Research Part F 43 (2016) 48–55

Contents lists available at ScienceDirect

Transportation Research Part F

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

Cargo bikes as a growth area for bicycle vs. auto trips: Exploring the potential for mode substitution behavior

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ARTICLE INFO

Article history:
Received 26 February 2015
Received in revised form 15 August 2016
Accepted 18 September 2016
Available online 6 October 2016

Keywords:
Cargo bikes
Bicycles
Linked trips
Mode choice

ABSTRACT

Cargo bikes are increasing in availability in the United States. While a large body of research continues to investigate traditional bike transportation, cargo bikes offer the potential to capture trips for those that might otherwise be made by car. Data from a survey of cargo bike users queried use and travel dynamics with the hypothesis that cargo and e-cargo bike ownership has the potential to contribute to mode substitution behavior. From a descriptive standpoint, 68.9% of those surveyed changed their travel behavior after purchasing a cargo bike and the number of auto trips appeared to decline by 1–2 trips per day, half of the auto travel prior to ownership. Two key reasons cited for this change include the ability to get around with children and more gear. Regression models that underscore this trend toward increased active transport confirm this. Based on these results, further research could include focus on overcoming weather-related/elemental barriers, which continue to be an obstacle to every day cycling, and further investigation into families modeling healthy behaviors to children with cargo bikes.

1. Introduction

For many years, academics and practitioners have recognized the limitations of bicycling in urban areas (Gallagher, 2010; Pucher & Buehler, 2012). These include built environment factors (Chatman, 2009; Nuworsoo, Cooper, Cushing, & Jud, 2012; Pucher, Dill, & Handy, 2010a; Saelens, Sallis, & Frank, 2003), weather and topographical conditions (Cervero & Duncan, 2003), as well as personal factors (Lawson & Morris, 1999; Lovejoy, Handy, Pucher, & Buehler, 2012; Rosenbloom & Burns, 1993). Increasingly, there has been an emphasis in current research on decisions not to bicycle, which depend less on destination than on personal factors such as stops or links along a trip, transporting children, or the necessity of carrying gear (for oneself or for children).

This paper posits that the cargo bike platform offers a potential mitigating factor for some of these conditions, and can be a tool for mode substitution behavior that draws individuals away from automobiles as their primary mode of travel and increases active transportation. To test this, the researcher surveys before and after travel behavior of cargo bike owner, exploring trends and significance by using descriptive statistics and linear regression. This is done to investigate the utility of a unique platform—not to advocate or advertise for the cargo bike as a platform, but to test if it has a utility that might serve travelers in a different way than traditional bicycles, meeting a different set of needs and users. The data from surveys that is analyzed and provides for discussion of how cargo bikes might expand urban cycling—especially for those with children.

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http://dx.doi.org/10.1016/j.trf.2016.09.017
1369-8478/

2. Background

A cargo bike is a bicycle designed and constructed specifically for transporting loads. They are frequently named by other terms including freight bicycles, carrier cycles, freight tricycles, box bikes, cycle-trucks or long johns. As depicted in Fig. 1, cargo bicycles come in various shapes and sizes, and from a variety of manufacturers, sometimes with electric assist capacity. For example, some can carry a substantive amount of cargo and multiple children in a front-loading carrier and Dutch-style, gender-neutral step-over, while others focus on rear-cargo capacity. Research has shown that these bike types may have advantages for the transport of gear and children in that they may be more visible, and therefore more safe from collisions, than a pull-behind bicycle trailer (Harris et al., 2011; Lovejoy et al., 2012; Powell & Tanz, 2000).

Despite this opportunity, only a small amount of literature exists on cargo bikes. Specifically, most of the literature has focused more generally on bicycle transportation. For example, an ample body of work deals with bicycles, mode choice and programs to promote cycling (Pinjari, Pendyala, Bhat, & Waddell, 2008; Pucher, Buehler, & Seinen, 2011; Pucher, Dill, & Handy, 2010b) and the built environment correlates of active transportation (Bors et al., 2009; Dobson & Gilroy, 2009; Frank et al., 2006; Handy, Boarnet, Ewing, & Killingsworth, 2002; Handy, Cao, & Mokhtarian, 2005). Literature shows that young adults and men are more likely to cycle for utilitarian purposes (e.g. trips for errands, to school, or work vs. for leisure) than their older or female counterparts (Winters, Friesen, Koehoorn, & Teschke, 2007).

Some studies analyze the deficiencies and limitations related to these utilitarian trips, especially with regard to carrying gear or children (Akar & Clifton, 2009; Cervero & Duncan, 2003; Gallagher, 2010; Heinen, Maat, & van Wee, 2011; Lovejoy et al., 2012). These limitations are especially acute for women, who make up a minority of cyclists in the United States, yet are more likely to be responsible for transporting children (Garrard, 2003; Garrard, Handy, & Dill, 2012). This is as opposed to the Netherlands, where use of bikes by women is higher in general (Pucher & Buehler, 2008b). It also may be significant in older populations who may be more inclined to engage in use of e-bikes who may have reduced muscular capacity for riding (Dill & Rose, 2012).

The reference to these limitations, along with other work that has identified the need for the evaluation of different kinds of bike platforms (Blanco et al., 2009) as a research priority, indicate the possibility that cargo or utility bikes offer (Riggs, 2015a). Such bikes have the potential to provide an opportunity to attract cyclists with utilitarian trip needs. Some sources suggest that cargo bike use is on the rise (La Ferla, 2010; O'Connor, 2011), and other publications indicate that different formats or types of bikes have the potential to support mode substitution away from autos (Piatkowski, Krizek, & Handy, 2015).

This idea of the mode substitution behavior potential of cargo bikes is propped up by a small number of publications that offer cargo bikes as a possible type of human-powered transport that can attract a certain demographic user (Shaheen, Guzman, & Zhang, 2010), or that can be used for freight, goods movement and logistical purposes (Gruber, Kihm, & Lenz, n.d.; Lenz & Riehle, 2013). One study cites the example of Berlin, which did a ban on car-courier services within the city center in favor of cargo bikes (Gössling, 2013; Pucher & Buehler, 2008a). These cargo bike focused studies are also paralleled by recent work which suggests that mode choice and travel behavior is not based solely on origin-destination or financial market factors, but also on social, behavioral and cultural norms (Carrel, Ekambaram, Gaker, Sengupta, & Walker, 2012; Riggs, 2015b; Riggs & Kuo, 2014; Riggs & Kuo, 2015).

3. Methodology

Given this literature background, the purpose of the study is to learn more about if cargo bikes influence travel differently than standard bicycles, and if they might contribute to mode substitution behavior. This section describes the study data and research framework used.

3.1. Study data

A stated preference survey was used to explore the traits of travel before and after the purchase of a cargo bike. The goal of the survey was to explore those who had self-selected this modal platform and how it influenced their travel choices after

Fig. 1. Examples of varying cargo bike designs.