Transportation Research Part D 63 (2018) 677–688

Contents lists available at ScienceDirect

Transportation Research Part D

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

Investigating people's preferences for car-free city centers: A discrete choice experiment

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ARTICLE INFO

Keywords:
Berlin
Germany
Random parameters logit model
Mobility
Stated preferences

ABSTRACT

In the face of climate change and growing health hazards due to air pollution in urban centers, private car use is being increasingly criticized. At the same time, research suggests that there is an unsatisfied demand for modes of transportation other than private cars. In fact, many cities all over Europe have already established car-restricted or car-free areas. This paper uses a discrete choice experiment to learn more about people's preferences regarding a car-free city center in Berlin, Germany. We find that, given the current infrastructure, around 60% of our respondents are willing to accept a car-free city center. By improving infrastructure for cyclists, willingness to accept a car-free city center strongly increases. Similarly, improving the network of bus stops and train stations as well as rededicating released streets to recreational uses would contribute to a higher acceptance of a car-free city center. Using a random parameters logit model, we have also identified observed and unobserved sources of heterogeneity.

1. Introduction

In September 2015 the American Environmental Protection Agency discovered that many Volkswagen cars with diesel engines had a software which was able to manipulate tests to measure carbon dioxide emissions levels. In the following months, it turned out that not only Volkswagen but several European carmakers used similar software to bypass emission rules (EPA, 2017). The "diesel dupe", as the scandal was nicknamed in the media (BBC, 2015), brought the problem of air pollution in city centers back on the political agenda. Whereas there is a likelihood that the car industry will be able to find technical solutions to reduce air pollution from diesel engines, environmental organizations call for the ban of cars with diesel engines in cities (Deutsche Umwelthilfe, 2017). However, neither better filters for diesel engines nor the replacement of diesel cars by petrol-driven or electric cars can solve all of the urgent problems of urban centers caused in large parts by individual motorized traffic. Apart from high concentrations of particulate matter and poor air quality, motorized traffic leads to high noise levels, causing, among other problems, sleep disturbances. Additionally, some authors claim a rapid increase in lifestyle-related health problems such as heart disease, caused by the sedentary aspect of driving (Dora and Philips, 2000). On a global level, motorized traffic substantially contributes to CO_2 emissions and thus to

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https://doi.org/10.1016/j.trd.2018.07.004

climate change (Kent, 2014).

Balancing the need for mobility with environmental and health concerns is one of the most pressing issues for the sustainability of urban centers (European Commission, 2004). Still, motorized traffic is rapidly growing. In 2011, the number of cars in the world was estimated at around one billion (OECD/ITF, 2012). Taking into account increasing incomes and population growth, researchers project that the number of vehicles could pass two billion by 2050 (OECD/ITF, 2012). In recent years, decision makers have drawn more attention to these problems, most prominently to health problems caused by insufficient physical activity and poor air quality. In addition, the fact that emissions from private cars significantly contribute towards climate change has led to a more critical view on car usage. Scholars, government agencies and health organizations have shown growing interest in identifying strategies to convince people to abstain from using their cars (Stradling, 2003) and have started to become actively engaged in developing transportation systems that promote new modes of transportation.

One possible solution to the problems caused by private car use is the establishment of car-free city centers. Since the 1990s, several European cities have introduced measures to restricting car use, ranging from car-free city centers, as in Vienna, to restricting car access in new residential areas, where parking is no longer adjacent to housing but rather organized in concentrated parking facilities (Borgers et al., 2008). Crawford (2002) was among the first to approach the topic of car-free cities theoretically. Without ignoring the health and environmental problems mentioned above, he proposes that the most convincing reasons to establish car-free cities are actually social and aesthetic in nature. In line with others such as Urry (2004), Crawford (2002) argues that the omni-presence of cars in urban areas has caused public spaces to decay and will ultimately lead to a disturbance of urban social systems. He suggests entirely car-free urban designs for new cities but also provides solutions regarding how existing cities can substantially reduce car use. As a result, cycling and walking will become faster, safer and ultimately much more desired modes of transportation. Melia (2014, p. 213) defines car-free areas rather broadly as “residential or mixed use developments which provide a traffic free or nearly traffic free immediate environment (1), are designed to facilitate movement by non-car means (2), and offer no parking for residents or limited parking separated from the dwellings (3)”. Related to this differentiation, Melia et al. (2012) distinguish three types of car-free development. The first type is the Vauban model, which is not per se car-free but does not allow parking adjacent to housing. The second type is limited access, which is similar to the Vauban model but features “less peripheral parking than Vauban” and “varying arrangements to physically control the access of motor vehicles to the residential areas” (Melia et al., 2012, p. 136). The third type of car-free development covers pedestrianized centers which, unlike the first two types, are not set in new residential areas but rather in existing urban spaces that have been retrospectively transformed into car-free city centers.

Citizens’ attitudes and preferences towards car-free city centers are largely unknown, yet crucial for the design of policies. Some studies have focused on preferences for switching from cars to alternative modes of transport. Handy et al. (2005) find that a substantial number of people drive out of necessity rather than actually preferring it to other modes of transportation. Therefore, they suggest, “policies that provide alternatives to driving or that reduce the length of driving trips would help. Such policies might include improved transit services and improved bicycle and pedestrian infrastructure” (Handy et al., 2005, p. 18). This finding is echoed by Ruiz and Barnabe (2014), who identified an unsatisfied demand for non-motorized modes of transportation. Their results suggest that, among those travelling 30 minutes or less, a significant number of people are “willing to change to cycling” (Ruiz and Barnabe, 2014, p. 209). In addition, they find that willingness to cycle to and from work/school depends on the educational level of respondents, distance and bike availability. Similarly Hayden et al. (2017) find that even highly car dependent individuals are willing to reduce car use if alternative transportation strategies are put in place. In contrast, Skov-Petersen et al. (2017), using observed data on bicycle rides before and after an infrastructural improvement in Copenhagen, find that improved bicycle infrastructure does not lead to people shifting transportation mode. Carse et al. (2013) investigate why people prefer using cars for various trip purposes, finding that for work trips “commuting distance and workplace car parking availability were strongly associated with using the car to travel to work” (Carse et al., 2013, p. 69). While they acknowledge that it might be difficult to influence commuting distances in established cities, they point out that these factors and their influence on travel behavior ought to be taken into consideration when planning the location and type of new residential areas. Qin et al. (2013) analyze car-owners’ choice behavior using a discrete choice experiment. They concluded that people are most sensitive to changes in fuel cost and parking fees. Borgers et al. (2008) conducted a discrete choice experiment in four Dutch cities to investigate how residents can be compensated for having to park at some distance from their homes. Their findings suggest that even though residents prefer to park their cars adjacent to their home, safe parking facilities and improved public transport facilities significantly affect their perceptions of concentrated parking areas. They conclude that these factors must be taken into account when designing new car-restricted residential areas. Da Silva Borges and Goldner (2015) investigated which socio-economic variables influence people's willingness to reside in a car-free neighborhood. Drawing on a standardized questionnaire they found that age, children and mode of transport influence the willingness to reside in a car-free zone. Younger people and parents are more likely to accept car-free zones than the elderly and people without children. Respondents who predominantly travel by bike or walk are more likely to live in car-free zones than people who use public transport or cars and motorbikes.

The present paper adds to this literature by investigating preferences and willingness to pay values for a completely car-free city center in one of the largest cities in Europe. To our knowledge, this is the first study to measure the potential of car-free city centers quantitatively. Our study explicitly formulates strategies for car-free city centers and asks people to choose their preferred strategy using a discrete choice experiment. The method allows us to identify drivers – urban green space, and improvements in the public transportation and bicycle infrastructure – that facilitate the acceptance of a car-free city. We analyze how these drivers affect the probability to opt for a car-free city center and to what extent people are willing to pay for different scenarios of car-free city centers.

We have chosen Berlin as a case study as there are ongoing debates on topics related to car-free city centers: Berlin is among those cities in Germany most affected by high concentrations of particulate matter (UBA, 2014). Following a change of government and a