ARTICLE IN PRESS

Transportation Research Part D xxx (2015) xxx–xxx

Contents lists available at ScienceDirect

Transportation Research Part D

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

Happy or liberal? Making sense of behavior in transport policy design

Linus Mattauch [a,b,*], Monica Ridgway [c,1], Felix Creutzig [a,b]

[a] Department Economics of Climate Change, Technical University of Berlin, Strasse des 17. Juni 145, D-10623 Berlin, Germany
[b] Mercator Research Institute of Global Commons and Climate Change, Torgauer Str. 12-15, D-10829 Berlin, Germany
[c] Ecologic Institute Berlin, Pfalzburger Strasse 43, 10717 Berlin, Germany

ARTICLE INFO

Article history:
Received 8 October 2014
Revised 19 July 2015
Accepted 13 August 2015
Available online xxxx

Keywords:
Mobility behavior
Behavioral economics
Low-carbon transport
Subjective well-being
Co-benefits

ABSTRACT

Appropriate microeconomic foundations of mobility are decisive for successful policy design in transportation and, in particular, for the challenge of climate change mitigation. Recent research suggests that behavior in transportation cannot be adequately represented by the standard approach of revealed preferences. Moreover, mobility choices are influenced by factors widely regarded as normatively irrelevant. Here we draw on insights from behavioral economics, psychology and welfare theory to examine how transport users make mobility decisions and when it is desirable to modify them through policy interventions. First, we explore systematically which preferences, heuristics and decision processes are relevant for mobility-specific behavior, such as mode choice. We highlight the influence of infrastructure on the formation of travel preferences. Second, we argue that the behavioral account of decision-making requires policy-makers to take a position on whether transport policies should be justified by appealing to preference satisfaction or to raising subjective well-being. This distinction matters because of the (i) influence of infrastructure on preference formation, (ii) health benefits from non-motorized mobility, (iii) negative impact of commuting on happiness and (iv) status-seeking behavior of individuals. The orthodox approach of only internalizing externalities is insufficient because it does not allow for the evaluation of these effects. Instead, our analysis suggests that transport demand modeling should consider behavioral effects explicitly.

Introduction

Effective climate change mitigation necessitates, *inter alia*, the decarbonization of the transport sector (IPCC, 2014; Rothengatter et al., 2011). This challenge is arguably more difficult than the analogous transformation of the energy or the buildings sector: Mobility requires high-density fuels as opposed to electricity generation or heating (Sims et al., 2014; Pietzcker et al., 2014). Also, the emissions stemming from passenger transport result directly from the consumption decisions of the individual end-users. As such, behavioral aspects play a much more important role than, for example, in the utility sector, and, as we will argue, pose a challenge for standard welfare theory as applied to mobility.

Options for decarbonizing transportation fall into two groups, which can be delineated with a decomposition of total greenhouse gas (GHG) emissions (Schipper and Marie-Lilliu, 1999; Creutzig et al., 2011; Sims et al., 2014). Carbon and energy

* Corresponding author at: Mercator Research Institute of Global Commons and Climate Change, Torgauer Str. 12-15, D-10829 Berlin, Germany. Tel.: +49 (0)30 3385537x221.
E-mail addresses: mattauch@mcc-berlin.net (L. Mattauch), mridgway@c40.org (M. Ridgway), creutzig@mcc-berlin.net (F. Creutzig).
[1] Present address: C40 Cities Climate Leadership Group. 120 Park Avenue, 14th Floor, New York, NY 10017, United States.

http://dx.doi.org/10.1016/j.trd.2015.08.006
1361-9209/

intensity can be reduced by technological options. This group was emphasized in former assessments on the decarbonization of transportation, for instance Kahn Ribeiro et al. (2007). However, transport demand and modal share also influence to global GHG emissions from transportation. A number of studies indicate that these factors can equally support the decarbonization of transportation (Banister, 2008; Creutzig and He, 2009; Kahn Ribeiro et al., 2012; Sims et al., 2014). While it has been argued that the second set of options can have substantial benefits in addition to reducing emissions (Woodcock et al., 2009; Creutzig and He, 2009; Creutzig et al., 2012; Shaw et al., 2014), the corresponding analyses are often not founded in economic models of decision-making and thus the welfare effects cannot be properly derived.

Here, we provide such a foundation for transport policy-making by addressing two questions: First, can policies based on behavioral findings regarding mobility choices substantiate behavioral change as an appealing option for decarbonizing the transport sector? Second, how do two different normative viewpoints, the satisfaction of preferences and the maximization of subjective well-being, produce diverging policy conclusions? Under the paradigm of rational choice, transport economics was freed of addressing the normative distinction between maximizing subjective well-being and satisfying the preferences of transport users. The idea of preference satisfaction was seen as unproblematic as, for instance, time-inconsistent or ill-defined preferences were deemed irrelevant, or preference satisfaction and maximizing well-being were understood to be identical. This article shows that many particular aspects of mobility behavior deviate from rational choice. Thus, our main claim is that the decision maker must take an explicit position regarding preference satisfaction or the maximization of subjective well-being: The two positions imply different transport policies.[2] We find that taking subjective well-being as a welfare criterion means that climate change mitigation policies become more closely entwined with policies addressing behavioral effects.

We proceed in three steps: (i) we comprehensively classify the choice mechanisms shaping mobility behavior, (ii) we characterize the option space of behavioral mitigation policies in the transport sector and (iii) we propose a refined and normatively explicit welfare analysis of transport policies.

First, we establish which choice mechanisms are the major explanations for mobility-specific behavior.[3] We systematically identify the main drivers of behavior in various modal choice situations, drawing from the large class of choice mechanisms that are well established in behavioral economics, such as time-inconsistency, social preferences, overconfidence, framing, focusing illusion, loss aversion and limited attention.

Second, our classification of choice mechanisms involved in mobility decisions allows us to exhaustively derive the option space for decarbonization policies addressing transport users' behavior. We pinpoint some of the choice mechanisms as the most promising for the design of such policy instruments. Key options include enhancing environmental awareness, addressing behavioral factors that may lead to a higher modal share of non-motorized transport, encouraging the purchase of more fuel efficient cars as well as exploiting the influence infrastructure has on preferences. We highlight the importance of understanding the built environment and choice architectures as crucial leverages for achieving low-carbon transport.

Third, we argue that our descriptive results indicate that understanding transport policy as internalizing the externalities of otherwise optimal behavior is insufficient. Instead, a distinction between two normative viewpoints – the maximization of subjective well-being ('happiness') and the maximization of preference satisfaction – is necessary in order to assess the merits of the potentially beneficial side effects of decarbonization policies. The reason is that the benefits, such as improved health or greater social cohesion, carry greater weight when happiness is maximized instead of preferences fulfilled, since transport users may not have preferences for the outcomes that make them happy. Finally, we delineate the differences between transport policies that follow from the two different welfare conceptions.

This article is connected to the pertinent literature in two ways: First, traditional transport demand modeling relies on the rational choice approach to explaining economic behavior. Underlying the standard disaggregate transport demand models, such as (multinomial) logit or probit models of mode choice and trip scheduling, is utility-maximization based on *revealed* preferences, often expressed as minimizing generalized costs, including time (Quinet and Vickerman, 2004; Small and Verhoef, 2007; van Wee et al., 2013). This does not allow, for instance, for an influence of the physical and social environment on preference *formation*. In contrast, while no canonical transport demand models based on behavioral economics exist; previous empirical work on mobility choices has produced a great number of findings that highlight the importance of empirical mechanisms for explaining mobility choices successfully. Examples include mass effects and conformity behavior (Abou-Zeid et al., 2013), symbolic and affective motives for car use (Steg, 2005), inertia (van Exel, 2011) or self-value of travel (Mokhtarian and Salomon, 2001). However, such research has not given an overview of which psychological effects generally identified as important for economic decisions matter specifically for explaining mobility (Markovits-Somogyi and Aczél, 2013). Moreover, empirical findings on mobility behavior have not been well integrated into the catalog of 'non-standard' choice mechanisms produced by behavioral economics (DellaVigna, 2009) that are amenable to rigorous welfare analysis (van Wee et al., 2013). An exception is Avineri (2012), who also discusses the relevance of behavioral effects in mobility choices for low-carbon transport policies. Nevertheless a systematic classification of the relevant effects on choices and the distinction between subjective well-being and preference satisfaction for drawing policy implications methodically are missing.

[2] In this article, we discuss which transport policies follow from different welfare criteria without addressing the question of how institutions should be guided by such criteria. The reason is that the policy domain of transport does not seem particularly different from other policy domains in this regard (see also section 'Two viewpoints of welfare').

[3] In this article, we only discuss behavioral effects in understanding *households'* mobility choices. Arguably, firms' transportation choices may also be subject to behavioral effects and are very important for a complete picture of mobility behavior, yet they are beyond the scope of this article.

Please cite this article in press as: Mattauch, L., et al. Happy or liberal? Making sense of behavior in transport policy design. Transport. Res. Part D (2015), http://dx.doi.org/10.1016/j.trd.2015.08.006