



## Personal carbon allowances: Can a budget label do the trick?

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### ARTICLE INFO

#### Keywords:

Labeling effect  
Public transport  
Mental accounting  
Fungibility  
Policy  
Complementary currency  
Emissions  
Commuting  
Personal Carbon Allowances

### ABSTRACT

In this study, participants in a computerized experiment were asked to manage Personal Carbon Allowances (PCAs) and tokens (here an experimental currency) simultaneously and to spend their budget on either private or public transportation. They participated in four treatments, which differed with respect to the available budget. Treatments 1 and 2 served as a baseline and concerned the administration of tokens only. In treatment 3, PCAs encompassed an environmental label on the budget in favour of public transportation. This increased choices for public transportation by 12 percentage points, when comparing to treatment 2. In treatment 4, by labelling a part of the budget for public transportation, subjects increased their spending on that transport mode by 15 percentage points when comparing to treatment 2. These findings contribute to the academic and policy discussions on whether PCAs could provide an effective instrument to tackle increasing levels of pollution from transportation.

### 1. Introduction

Personal transportation is, to a large extent, characterised by habitual patterns (Aarts et al., 1998). For example, commuting to work or school is a repetitive action, which usually takes place very often at the same time every day and is mainly made in the same transport mode, via the same itinerary. Therefore, it is challenging to reshape the habits in the short-term and adapt them over a more extended period (Vanier and Trippi, 1976; Thøgersen and Møller, 2008; Wadud, 2007; Eriksson et al., 2008; Winkelman et al., 1999; Schade and Schlag, 2003; Stern, 2006). People face considerable internal and external obstacles to change their habits. On the one hand, they may not be willing to make an effort due to personal beliefs or aspirations (such as a preference for private transportation due to social recognition or the considerable comfort of driving). On the other hand, they may be constrained by obstacles, on which they do not have much impact (such as the existing infrastructure or place of residence). This study contributes to the search for solutions to overcome these obstacles by providing an experiment on the use of personal carbon allowances.

Meaningful incentives or policy instruments may have an impact on people's commuting choices. In the context of environmental protection, the personal carbon allowances (PCAs) are a possible instrument. This policy instrument could address, at least to some extent, both internal as well as external challenges simultaneously. The general principle of their functioning is similar to the EU's Emission Trading Scheme

for businesses. According to a PCA system, individuals, similarly to businesses, would be endowed with a limited number of allowances for polluting. They would have to surrender these allowances when purchasing energy for travelling or domestic use (e.g. heating).

PCAs seem to be a straightforward solution to tackle the increasing amounts of pollution. However, they will require additional time and skills to manage, even if they were to be administered electronically. Namely, subjects would have to manage both monetary and carbon budgets simultaneously as they would have to make payments in both currencies. They would also have to double their attention to ensuring they have enough of both budgets to purchase energy or to travel.

In this context, Capstick and Lewis (2010) examined the mental accounting theory for a carbon-as-currency approach. The authors found that people could indeed perceive PCAs as another currency. However, the authors used only one currency in their experimental task. The present study builds on the previous findings of Capstick and Lewis (2010) and seeks to explore the way people manage two currencies simultaneously, i.e., PCAs along with tokens, where tokens represent money. The subjects were asked to manage these two budget types simultaneously in an experiment on commuting choices. This study is one of the few examples, in which people made choices under PCAs regime and the first one (to the best of authors' knowledge), in which they administered two budgets simultaneously, i.e., PCAs along with another currency. We find that an introduction of PCAs leads to self-restriction with respect to the number of all undertaken trips and

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thus budget spending.

In addition, the present study was designed in a way that would enable testing the labelling effect, which was observed in the management of money. Due to the labelling effect, people may seek to “match” the source of income with the way it should be spent (Christiansen and Pan (2012), McGraw et al. (2003), Thaler and Shefrin (1981), Thaler (1990, 1999), Shefrin and Thaler (1988)). As a result, individuals may overspend their resources for the labelled good (Heath and Soll, 1996). The findings of the present study confirm this hypothesis. The study revealed that by labelling a part of the budget for a particular mode of commuting, subjects increased their spending on that transport mode.

This study proceeds as follows. Section 2 provides an overview of the relevant literature. Section 3 contains a description of the experimental design. Section 4 presents the experimental results and section 5 is devoted to a discussion and conclusions.

## 2. Related literature

Endowing people with PCAs should mean increasing their responsibility for the environment as a private asset (Montgomery, 1972; Ahlheim and Schneider, 2000; Stern, 2006) and should incentivise them to change their habitual choices. However, some researchers suggest that individuals may treat PCAs as another currency in their budget and, therefore, not pay attention to their pro-environmental attributes (see for example Seyfang, 2006; Seyfang, 2008; Seyfang et al., 2007; Parag et al., 2011).

Lessons drawn from the existing PCAs' schemes for businesses suggest that they could be perceived and handled similarly to money, granting them a status of a complementary currency (see for example Button, 2008; Victor and House, 2004). In a broader sense, PCAs would be fulfilling analogous functions to money in that they could “act” as a store of value, a medium of exchange and a unit of account (Button, 2008; Victor and House, 2004; Van der Horst and Vermeylen, 2011; Descheneau, 2012). However, PCAs embed also psychological aspects because they make carbon emission equivalents tangible (Fawcett, 2005). They may boost individual responsibility for and engagement with the environment and its protection (Fawcett et al., 2007). Having them in their hands, individuals should decide according to their personal preferences, thereby attaining the environmental goals. Raux et al. (2015) show evidence that PCAs could effectively change travel behaviour and hence reduce transport emissions from personal travel. Nevertheless, the authors recognise that there are also psychological aspects that should be taken into account and call for further research in this regard.

Given the fact that PCAs may be administered similarly to money, people may also take their decisions in line with the mental accounting theory (as was shown by Capstick and Lewis, 2010). In this study, particular attention was paid to a part of this theory, namely to the labelling effect. A core idea behind the labelling effect is that people treat assets as less fungible than they are. They often track their financial activities by labelling their money according to the context, in which it was obtained or for which it was spent. As noted by Thaler (1999), expenditures are grouped into categories (housing, food, etc.), and spending is budget-constrained. The money to spend is also labelled. Dividing spending into budget categories facilitates making rational trade-offs between competing uses for the available budget (Thaler, 1999). In addition, it serves as a self-control device in keeping spending within the budget (Thaler and Shefrin, 1981).

Vouchers or subsidies for a particular purpose, service or good are typically an example of labelling a part of the budget for a specific use (see for example Abeler and Marklein, 2017; Beatty et al., 2011; Kooreman, 2000). Distribution of vouchers for beverages to clients of a restaurant resulted in higher additional spending on beverages than on food (Abeler and Marklein, 2017). Beatty et al. (2011) found that a cash transfer for fuel granted to households of seniors led to a greater

increase in the average spending on fuel under the UK Winter Fuel Payment (WFP) than a non-labelled transfer. The study of Kooreman (2000) also presented empirical evidence that the label “child benefits” on income influenced the way the overall income was spent. Further studies of Carriker et al. (1993) as well as Christiansen and Pan (2012) also found the labelling effect in the management of different sources of income.

Furthermore, the labelling effect may have either a negative or positive influence on people's choices. On the one hand, it can nudge to take decisions that decrease instead of improving one's wellbeing. The study of Abeler and Marklein (2017) revealed that due to the beverages' voucher, spending on more expensive alcohol drinks increased. It is well known that drinking too much alcohol may be dangerous to one's health. On the other hand, the labelling effect may nudge people to make better choices. The examples above of Kooreman (2000) and Beatty et al. (2011) are a case in point. The present study investigates whether the labeling effect of PCAs would have a positive or negative effect on pro-environmental choices.

## 3. Experimental design

### 3.1. Procedure

All subjects participated in all treatments following a within-subject design. The order of the treatments was randomised. The independent variables (also called the within-subject factors) were the changing budgets, while the quantitative dependent variables, on which each participant was measured, were the commuting choices throughout the treatments.

The subjects were divided into small groups of four people in each session, which encompassed four treatments. They were orally informed about the experimental procedures and received written instructions. They received 8 euros for participating in the experiment. The instructions were handed out to subjects, so that they could consult them at any time during the experiment.

The participants did not interact directly and could not talk to each other. They also did not have any influence on outcomes of others in the experiment. They could ask the experimenter for clarification at any time. They also responded to four questions, which verified their understanding of the experimental tasks and procedures, prior to the experiment. Once they provided correct responses to all questions, they were allowed to commence the experiment.

It should also be noted that there was no time constraint. Subjects could have spent as much time as they wanted on each of the treatments. However, they had to provide responses to all four treatments and the surveys in order to be eligible to receive the remuneration.

### 3.2. Task

#### 3.2.1. Commuting choices

The commuting choices were taken in a laboratory with PCs, aiming to mirror real decisions. Subjects decided on the number of trips using either public or private transportation. These two commuting alternatives were interchangeable (an individual chose to commute by one or another transport mode) to arrive at a destination. These choices were purely hypothetical and had no material consequences on either the participants themselves or others.

The choice between these two commuting options could be seen as a social dilemma decision (see Van Vugt and Van Lange, 1996). Theoretically, an individual that has to decide between these two transport modes is faced with a trade-off. On the one hand, by choosing public transportation, s/he pollutes the environment less but may have to suffer all the inconveniences that this transport is associated with (i.e., waiting for the metro, changing from the metro to a bus). On the other hand, by choosing private transportation s/he pollutes more but usually travels comfortably (i.e., on-demand and door-to-door). This trade-off

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