

Financial Incentives to Reduce Vehicle Miles Traveled

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BACKGROUND AND OBJECTIVES

This research explored the viability and effectiveness of positive financial incentives with the objective of promoting the use of transit and micromobility alternatives to private automobiles to ameliorate traffic congestion. A way of mitigating traffic congestion is the reduction of vehicle-miles traveled (VMT). The reduction of VMT is linked to public and social goals like better air quality, sustainable and healthy environments, and the reduction of fuel consumption, among others impacts. Decision-makers look to stimulate changes in population behavior through the design and implementation of incentives and deterrents. The main goal of this study was to analyze the acceptability, implantability, and the impact on automobile users of positive financial incentives that can be used for the design of policies aiming towards the reduction of VMT. The specific objectives to achieve the main goal were to prepare a literature review, develop and carry out a survey instrument oriented to travelers to determine their willingness-to-accept (WTA) financial incentives to change their travel mode selection toward VMT reduction alternatives, perform a field experiment with subjects to evaluate their opinions about the potential effectiveness of positive financial incentives to reduce VMTs by promoting a micromobility alternative in the Municipality of Mayagüez in Puerto Rico, and to develop and conduct an Expert Opinion Survey (EOS). The EOS helped to obtain the experts' opinions and assessment about the primary traveler's survey and field experiment results, as well as providing their interpretations about the effectiveness and feasibility of implementing incentives to reduce VMT in small cities and college towns.

METHODOLOGY

The methodology consisted of the following: a literature review, a survey to estimate the WTA of monetary incentives for the use of alternative transportation modes, a field experiment to evaluate the effectiveness of financial incentives for the use of e-scooters on a student community, interviews to the participants to analyze their involvement and decisions during the experiment, and the feedback from experts about the potential use of financial incentives. The literature review was on the selection and application of financial positive incentives to modify behavior. It focused on understanding the different types of incentives and their impact on VMTs. The review explored previous studies and experiments on the relationship between receiving positive financial incentives and the public policies associated with implementing these programs. For the traveler's WTA Survey, Stated Preference questions were included along with open questions to identify travel mode preferences. Socio-economic and demographic questions were included to analyze the acceptability of incentives based on the sample characteristics. Residents of Puerto Rico were selected as the target population for the survey. The participants recruited for the field experiment were from the University of Puerto Rico at Mayagüez (UPRM). The field experiment was designed as a factorial experiment. Post-experiment interviews were conducted with the participants to explore their reasons for the decisions taken during the experiment and to understand their perception and opinions about the long-term use of the e-scooters. Qualitative interviews were performed to gather a deeper understanding of the participants' mindset and impact in their decision to use an alternative travel mode. The interviews were carried out six months after the experiment and were conducted through individual online meetings. For the Expert Opinion Survey (EOS), a questionnaire was developed to obtain the experts' opinions. The questionnaire provided the experts with summarized results from the Travelers' WTA Survey, the field experiment, and the participants' follow-up interviews. Each question included a summary of findings for each of the research tasks completed to give the experts the relevant information for each of the questions. The questionnaire was divided into five sections, that included four questions related to the Travelers' WTA Survey, five questions related to the WTA, four questions related to the Stated Preferences scenarios, two questions related to the Field Experiment, and four questions related to the Follow-up Interviews.

RESEARCH FINDINGS

The convenience sample for the travelers' WTA survey obtained 336 responses from the local population for a 5.2% error at a 95% confidence level. A high percentage (76.5%) of the participants stated to use their private automobile as their primary mode of transportation. Only 16% of the sample stated to be transit users and 20.6% stated to use e-scooters. Several critical factors impact the choice of transit and micromobility over private vehicles. The three most important factors in the decision to use transit are the parking conditions, transit travel time, and travel security. In the case of e-scooters, the three most important factors are the weather conditions, riding safety, and service fare. The Tren Urbano heavy rail service had the lowest mean incentive value (\$17.10 per trip) as an alternative to the automobile, whereas e-scooters obtained the highest mean incentive of \$18.90 per trip. The difference in WTA values between the three alternative modes: municipal buses, Tren Urbano, and e-scooters, was found to be statistically significant. An important tendency was that the incentive value requested for each of the three alternative modes decreases as the age and the income of the person increase. The stated preference scenarios suggest that as the monetary incentive offered for using the Tren Urbano heavy rail increases it increased the probability of choosing it over the automobile option. On the other hand, the models suggest that as the travel time for a trip in any of the three alternative modes increases (reducing or removing savings in travel time) the probability of the person choosing any of them over their automobile significantly decreases.

The field experiment tested the use of financial incentives on the shared e-scooter service offered in the Municipality of Mayagüez. The procedure evaluated the potential long-term impact to reduce VMTs on college students by offering incentives of \$15 and \$30 per trip. Fourteen subjects participated in the experiment. The participants were called during the morning or the afternoon period on weekdays to inform them of their time to make a trip using the e-scooter service and the amount of the incentive offered. Five students (36%) did both incentivized trips, six students (43%) completed one of the trips, and three students (21%) did not make any of the incentivized trips. Interviews were conducted six months after the end of the experiment to obtain feedback about the decisions and experiences of using the e-scooters. The results suggest that e-scooters have the potential to replace automobile use for the student population, especially if proper riding safety measures and long-term cost considerations are taken. The incentive program seems to have been successful in motivating the willingness of using or acquiring an e-scooter on some of the participating students.

Eight experts participated in the Expert Opinion Survey. The experts considered the potential use of financial incentives to promote the selection of alternative modes to reduce VMT. About the results from the field experiment conducted in Mayagüez the experts tend to agree that while financial incentives could change the transportation mode selection for a short period, their actual implementation will require sustained improvements in the transit services offered locally and improvements in the road infrastructure.

The study results indicate that financial incentives can help motivate, within some limits, a shift from private vehicles to alternative modes of transportation, such as transit and micromobility. However, the effectiveness of these incentives varies significantly across demographic groups, influenced by factors such as age, income, and perceptions about the transit service quality and the safety of the e-scooters when sharing the road with other vehicles. The study points out that while younger and lower-income populations are more responsive to higher financial incentives, older adults are willing to accept lower incentives, which suggests a lower valuation of time of these social groups.

POLICY AND PRACTICE RECOMMENDATIONS

Regarding policy implementation, the study highlights the benefits of promoting transit and micro-mobility, but these must be perceived by the community as safe, efficient, and reliable services. The study recommends the potential implementation of a program of financial incentives as a public policy strategy that must be accompanied by street infrastructure improvements, like exclusive lanes or right-of-way to accommodate e-scooters, wider shared lanes that allow separation from vehicular traffic, and increase restrictions on the use of private cars in urban areas by limiting free on-street parking. Furthermore, additional research could focus on increasing and stratifying the sample (by age, gender, students, faculty and employees) of the experimental study of financial incentives as well as including new variables and alternative modes. The survey results suggest the population has a low opinion of the capacity of transit to efficiently compete with a similar trip in an automobile. Once the efficiency of transit services and the on-road safety of micromobility are improved and the alternatives are available for the population, a citizen education campaign should be implemented.

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