SUPPLEMENTARY MATERIALS

This document contains additional information to supplement the paper presented at the SBP-BRiMS conference. The first section provides details about the variables considered in the satisfaction function, the following section indicates an external link that contains results from the survey applied to transport users in our case study city and serves as a source to parametrize some of the variables in the model. The final section redirects to a working paper that presents the analysis of the survey results.

1.1. Needs considered in the trip satisfaction calculation

We are considering in our model seven needs or transport attributes that represent factors that people consider to make a decision about the transport mode that they will use to commute in the city.
The first need is the acquisition cost, which includes the purchase price of the vehicle, including sale taxes and complementary expenses such as the car plate registration. The operating costs for cars and motorcycles include fixed components such as insurance and annual taxes, and the variable portion refers to fuel consumption costs. For the public transit this cost is calculated with the average fare. The third need is road safety which is calculated based on the accident rate of the agents; it is differentiated by transport mode. The next attribute is the personal security, understood as the risk perception of being robbed or assaulted in the mean of transportation. This is calculated as a probability of being affected by an insecurity event. The need called travel comfort considers aspects like autonomy, protection from bad weather and travel autonomy. We also include travel time as a need that commuters consider in their selection. This is affected by the congestion in the system, which depends on the number of people using each transport mode. If the proportion of agents using cars increases, the average speed of vehicles decreases and then, the whole system will slow down. Finally, pollution is an attribute calculated according to the average emissions produced by each type of vehicle in circulation, which in turns, depends on the traveled distance.

Values for these variables are calculated after each trip for every agent and are used to calculate the weighted overall satisfaction at each time step in the simulation.

1.2. Summary of survey results

A survey was conducted in Cali, Valle del Cauca, Colombia with the support of Universidad Javeriana Cali. We obtained 799 responses from transport users that provided information about their socio-demographic situation, travel behavior and transport mode preferences. An interactive dashboard using Tableu can be found in this link:
https://public.tableau.com/app/profile/jes.s.d.az.blanco/viz/Encuestas_16844425109290/Surveysummary

The survey was applied to a simple random sample calculated based on a population of 1,822,869 in year 2022 (DANE, 2023). Using a 95% confidence level and a 5% accuracy, the sample size is 384.
The data collected gave us information about travel patterns of the transport users and the level of importance that they give to the different factors influencing the decision making to choose a transport mode to commute. This information was used to complement the historical data and socioeconomic conditions from the city to parameterize the model according to the case study. We grouped people according to socioeconomic levels and rank the satisfaction needs according to their preferences to calculate the needs' weights. The weights' analysis report is described in the next section. Also, we used the average travel distance and origin and destination dynamics to identify concentration of commuters around the city.

1.3. Survey analysis and Needs' weights calculation

The survey results were compiled and analyzed in this working paper: https://github.com/Kathleenss/SBP-Brims23-SupplementaryMaterials/blob/main/Descriptive_analysis-Survey.pdf

A descriptive analysis of the socio-economic variables was carried out to characterize the transport users in Cali city. Then, a Kruskal-Wallis non-parametric test was applied to the categorical variables to compare the level of importance that users give to the travel needs among the socioeconomic groups. In order to stablish a ranked level of importance within the socioeconomic groups, a Mann-Whitney non-parametric test for paired categorical variables was implemented. These levels of importance were standardized and used as weights for the satisfaction function in the simulation model.