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Abstract

Micromobility vehicles, and especially free-floating electric scooters (FFES), have been thriving over the past couple of years, Paris being the most important market worldwide. In this paper, we first define micromobility. Then, we present the design and results of an extensive face-to-face road survey among e-scooter (ES) users in Paris (N = 459, F(men) = 68%). Results indicate that ES users rarely own their proper microvehicle, are mostly men, aged 18–29, and have a high educational level. They are not less motorized than the general population and use ES occasionally. Their main motivation is travel time savings followed by playfulness and money savings. However, users seeking money savings are not frequent riders. They shifted mainly from walking and public transportation (72%) and few have increased their total mobility by making new trips (6%). Findings can be useful to researchers, policy makers, and FFES operators especially in the context of COVID pandemics.

Introduction

The rapid expansion of free-floating (i.e. dockless transportation vehicles) e-scooters (FFES) was first triggered in the United States in March 2017 (Dowling, 2018), with 33 cities having shared-ES services in August 2018, becoming 90 cities only 5 months later (Fong et al., 2019). The phenomenon then expanded across Europe. In April 2019, Europe counted almost 20 different FFES operators, while North America counted a dozen, South America half a dozen, and Asia, the Middle East, and Oceania 4 operators each (6-t, 2019). Between March 2017 and July 2018, US FFES companies funding increased exponentially (Dowling, 2018). One of them was evaluated at 2 billion USD by its investors (Ajao, 2019), while the two leading FFES companies reached 1 million rides each within 6 months after their launch, then 10 million rides within one year, and about 25 million within 18 months (Dediu, 2019a, Dediu, 2019b).

The microvehicle market had boomed in France even before the rapid expansion of FFES. Already in 2018, e-scooters (ES) became the first sale of the microvehicle market accounting for 110 million euros and representing a surge of +76% in terms of value and +129% in terms of volume compared to 2017. At the same time, non-electric scooter sales dropped by 20% within one year (Smart Mobility lab and FP2M, 2018). Between June 2018 and May 2019, thirteen ES operators penetrated the Parisian market totalizing a fleet of over 20,000 FFES and making Paris the biggest world market and a micromobility showcase (6-t, 2019). Paris municipal authorities expected the fleet to double by 2020 (Ville de Paris, 2019). Nevertheless, we ignore in this paper 2020 data due to COVID pandemics that put on hold FFES activities. However, an uptake is projected for 2021 as ES provide a good alternative to public transport (PT) where passenger congestion may facilitate virus propagation. Of course, ES growing popularity came at a price in terms of safety. In 2018, we observed a 23% increase in crashes involving microvehicles (Mongaillard and Alexandre, 2020).

On the one hand, microvehicles seem to be a promising solution to many urban mobility issues: they can potentially contribute to reduce private car use and mititgate its related externalities (congestion, emissions, noise, car accidents). Indeed, like other microvehicles and shared mobility services, ES may answer the first-last mile problem or even be used for door-to-door trips (Hardt and Bogenberger, 2019). They could thus have a positive effect on human footprint as they are potentially less harmful to the environment, especially if they

substitute private cars (Chang et al., 2016). In the case of Paris, they could also have a positive effect on congestion aboard transit vehicles that could be used instead for longer trips only. Congestion in PT vehicles is a serious problem of the Parisian network, especially during rush hours. In addition, ES are fun to ride and easy to use and store. Finally, they could play an enhanced role in the post-COVID mobility era as virus transmission is limited to the surface of handlebar grips and can be easily addressed by the use of appropriate materials, regular disinfecting, or glove use.

On the other hand, ES could potentially substitute active modes like walking and cycling and, thus, generate negative effects to public health and to the environment (Berge, 2019, Civity, 2019). The lifespan of FFES and the end-of-life of these vehicles, especially their electric batteries, are two main environmental issues currently questioned (Bishop et al., 2011). Another raising issue is public space sharing. The latter concerns road pavement and sidewalks used for ES circulation and, also, for ES parking. The curbside is nowadays recognized as a strategic place for mobility optimization, that needs to be "managed", i.e. "dynamically allocate[d] and price[d]" (Schweiger, 2019, Gössling, 2020). So far, cities have been dealing with this emerging mode of transport with the trial and error method (Gössling, 2020). Finally, important safety concerns arise as evidence on e-scooter related accidents become available (Kobayashi et al., 2019, Nellamattathil and Amber, 2020, Sikka et al., 2019, Siman-Tov et al., 2017), while rules and legislation still remain unclear in many cases (vehicle certification, right-of-way, speed limits, obligatory safety equipment, insurances, and so on).

In spite of the apparent interest of these questions, few data and relevant studies have been published mainly due to commercial confidentiality and FFES competition issues (Schweiger, 2019). As a result, public authorities and the scientific community have little knowledge on ES users and usages. This knowledge is however critical to (i) the understanding of this phenomenon, and (ii) the elaboration of evidence-based policies capable of mitigating possible negative effects while encouraging all positive ones. In view of the above, we designed and undertook an extended survey among ES users in Paris in order to shed light to a simple question: who is using ES and how? The survey was conducted by face-to-face road interviews in May-June 2019. The focus of the questions was on user profile (age, gender, occupation, etc.) and travel habits (frequency of use, distance covered, travel purpose, modal shift, etc.). The final sample includes 459 valid answers and covers almost all FFES operators as well as privately owned ES. We further explored survey results and specified 3 logit models to better understand the factors influencing ES ownership, trip frequencies, and durations.

The remainder of this paper is organized as follows. First, we offer a literature overview on shared-mobility and ES user profiling research efforts (Section 2). Secondly, we present our methodology and interview sites (Section 3). Section 4 provides an overview of results through descriptive statistics. Section 5 presents model results and relevant discussion. Finally, Section 6 provides general conclusions and discussion on future steps.

Section snippets

Defining micromobility

The term “micromobility” is widely used and mostly refers to Personal Mobility Vehicles. Existing definitions of the term are few in number and rather (i) vehicle- or (ii) business-oriented. Shaheen and Cohen (2019) mention that “micromobility includes various service models and transportation modes that meet the diverse needs of travelers, such as station-based bike-sharing (a bicycle picked-up from and returned to any station or dock) and dockless bike-sharing and scooter sharing (a bicycle

Site and survey design

The Paris region covers an area of 12,011 km^2 comprising Paris inner-city (105 km^2 for 2.1 million inhabitants), the “inner suburbs” (657 km^2 for 4 million inhabitants), and the “outer suburbs” (11,249 km^2 for 5 million inhabitants) (IAURIF, 2019.). Inner-city density is of 21,500 inhabitants/km^2 making Paris the 9th denser city in the world (WorldAtlas, 2018). Paris is 20% less dense than Manhattan, but respectively twice and three times as dense as New York City and San Francisco (U.S. Census

Sample characteristics: Who is using ES?

In total, 459 answers were analyzed. Sample statistics are presented in Table 2. Respondents were 2/3 men and 1/3 women, while the average Parisian population is gender-balanced (INSEE, 2019). 97% of the respondents live in France: 56% in Paris inner-city, 13% in the close suburbs, 11% in the rest of the Parisian region, and 20% elsewhere in France. The 3% visiting users came in majority from Italy (43%), US (21%), and Switzerland (14%). We note here that the percentage of foreign tourists is

Modeling mobility choices

In this section, we will try to further explore observed mobility choices and identify the underlying factors behind the differences between owners of ES and FFES riders, frequent (class ‘2′ and ‘3′ of the relevant variable in Table 3) and non-frequent ES users (class ‘1′), longer and shorter ES trip choices. For this reason, we develop three binary logit models. In line with the previous analyses, three models were specified for the following choices:

1.

    Ownership: own an ES versus use an FFES;

2.

Discussion and conclusions

Knowledge on ES usage and user profiles remains scarce. In this paper, we presented the first results from a face-to-face road survey among ES users. The survey was conducted in Paris, France (May – June 2019), where micromobility is thriving over the past couple of years. According to our sample, ES users rarely own their proper microvehicle, are mostly men aged 18 to 29, and have a high educational level. These findings are consistent with studies about bike-sharing systems. Male

CRediT authorship contribution statement

Zoi Christoforou: Conceptualization, Data curation, Formal analysis, Methodology, Writing - original draft, Writing - review & editing, Funding acquisition. **Anne de Bortoli:** Conceptualization, Data curation, Formal analysis, Methodology, Software, Visualization, Writing - original draft. **Christos Gioldasis:** Conceptualization, Methodology, Formal analysis, Data curation, Writing - original draft, Writing - review & editing. **Regine Seidowsky:** Conceptualization, Funding acquisition.

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