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Toward a new paradigm for urban mobility in Brazil: An empirical investigation in the city of Florianópolis

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ABSTRACT

Traffic congestion and unsustainable mobility patterns represent a severe issue for most Brazilian cities, with traditional approaches often proving to be scarcely effective in tackling the problem. We argue that a crucial hindrance is represented by the limited attention devoted to "the commuter perspective": only a deeper understanding of the motives behind mobility-related behaviors of citizens would enable policy makers to implement sound mobility plans. We performed an empirical investigation on residents of the city of Florianópolis (n = 436), analyzing the determinants of modal choice. Results confirm the pivotal role exerted by habits, and the willingness of respondents to opt for sustainable transport modes; a peculiar finding is represented by the marginality of social and environmental aspects in shaping commuters' behaviors, and the perceived lack of convenient alternatives that is yet hindering a broad shift which is seen as necessary. Based on the evidence emerging from the study, we provide a contribution to the debate by discussing possible lines of action and policy options that could be implemented.

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Sustainable mobility; habits; policy options; commuters; modal choice

1. Introduction

Over the past few years, the issue of sustainable mobility trespassed the boundaries of academia and niche practitioners to reach the spotlight both in the public debate and at institutional level. There is today widespread awareness of the need to change current mobility patterns, which are clearly not sustainable given their detrimental impacts ranging from environmental pollution to social exclusion, from economic burdens to traffic congestion, and so on: "the transport sector consumes approximately one-third of our final energy and probably causes more environmental and social problems than any other sector" (Holden et al., 2019, p. 2). The problem is particularly severe in urban areas, which are particularly vulnerable as they concentrate a large population and their mobility-related activities over a small area (Zawieska & Pieriegud, 2018).

Growing concerns, however, seldom led to an effective change of pace, as policy makers and municipalities are striving to implement strategies capable of leading the way to a shift in the mobility paradigm. The attitude toward the problem still suffers from a deeply rooted top-down approach, with a predominant focus on changing infrastructures and little attention paid to a holistic view of mobility systems: urban planners and transport experts design new mobility plans, build new infrastructures and propose new services without an adequate focus on the *voice of commuters*. These are scarcely involved in the process; however, they represent the actor that by means of their daily behaviors can determine the success or failure of any given policy or initiative (Lanzini, 2018a). Further, the existing empirical evidence on the determinants of modal choice is mostly based either in the EU, the USA or in Far East countries (Hoffmann et al., 2017; Lanzini & Khan, 2017), while little has been done in different cultural and administrative contexts, such as South America and, specifically, Brazil. The lack of studies adopting a cultural lens to investigate the determinants of sustainable behaviors has been indeed indicated as a problem by a growing number of voices in academia (Chatzidakis et al., 2018; Sen et al., 2016).

The paper aims at providing a contribution to the debate by i) investigating the key determinants of modal choice by means of an online survey circulated among commuters in a large Brazilian city and, based on the emerging evidence, ii) suggesting how policies could be implemented as to change effectively individual mobility behaviors.

To this end, the paper is organized as follows. First, the policy background is set by introducing the issue of sustainable mobility policies for contemporary cities (section 2). Then, stemming from the need to adopt a commuter-based perspective, the main theoretical frameworks on the determinants of modal choice are illustrated (section 3). In the methodological section, the setting of the empirical investigation (that is, the city of Florianópolis) is introduced and both the questionnaire and the statistical techniques adopted to analyze data are described in detail (section 4). The results and policy implications section i) describes the evidence emerging from the data-analysis (specifically, the

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predictive capability of different popular models in consumer behavior research is tested, analyzing how the inclusion of habits could increase their effectiveness) (section 5), and ii) provides a discussion of how the results of the empirical investigation could be used by policy makers in order to implement effective strategies aimed at pursuing a long-term vision that leads to a thorough shift in the mobility paradigm. Lastly, some concluding remarks are illustrated at the end of the manuscript (section 6).

2. Sustainable mobility policies for contemporary cities: the role of stakeholder involvement

2.1. A new vision for mobility policies

The design and implementation of mobility policies involves a vision of city management including, besides the traditional concepts of city and built space, also the social and relational aspects of urban management.

As for the built space, the process of conceiving urban mobility always involves key political decisions, ranging from the concept of city organization to landscape preservation, or even to social and economic dynamics affecting public well-being and quality of life. According to Hansen (2011, p. 97) "planning and planners are increasingly expected to more proactively embrace spatial complexity and facilitate interaction of actors and people in multiple networks in order to improve the identity and quality of places, and ultimately the quality of life."

Accessibility and quality of life in peripheral neighborhoods represent indeed an inveterate issue which proves hard to be dealt with (Venter et al., 2021). Based on performance and economic offer, urban space management historically tends to create secluded peripheries with low accessibility to work and leisure opportunities (Lessa et al., 2019), and a high impact both on the cost of commuting and on workers' quality of life (receiving lower wages and less work options or access to basic infrastructure). Basing the centrality on the higher land value, cities started considering mobility policies allowing the movement from the center to the periphery, bringing in the workforce when necessary (usually at specific times with detrimental impacts on traffic, congestion and accident rates).

Considered as public infrastructure policies, mobility policies end up having high design and implementation costs, not only impacting public budget by involving significant structural works, but also requiring political capital, as they often impact on local culture or require difficult decisions (e.g., road closures). Consequently, decision-makers tend to draw up plans and implement them according to a traditional "top-down" model, with an (over) reliance on technological innovation and new infrastructures (Schiller & Kenworthy, 2017). However, in modern public management models public policies need to be considered based on the citizens' proposition, and to be consequently designed with and built for them. Such policies would empower the community and not only an elite of managers, promoting a fruitful dialogue from the beginning of the urban planning process and prioritizing the harmonization between what citizens envision as a city and policy makers' capacity to meet such demand. Participatory policies not only widen the scope of action of public managers (Wu et al., 2014) but also, by involving multiple actors, bring the planner's vision closer to local realities.

Indeed, mobility planning represents a complex and dynamic process, where top-down and bottom-up approaches at different levels should synergically coexist. Le Pira et al. (2016) refer to the concept of *citizen control*, insofar planning "becomes the management of a bi-directional communication process and it requires specific programs and skills, able to coordinate many players, conflicting interests and variables and anticipate problems. Public participation should be planned well in advance and it requires specific competences and skills. There are several tools that can be used to foster participation [including] citizen involvement through citizen workshops and questionnaires" (p. 231).

There is a growing awareness on the need to focus on stakeholder involvement and to hear the voice of citizens along the process. Zhao et al. (2020) stress that "[i]t is necessary to undertake key stakeholder consultation or involve stakeholders in the policy making process" (p. 8), and the involvement of different actors (commuters and citizens *in primis*) can support both the decision-making activities (Gil et al., 2011) and the promotion of sustainable mobility (Buehler et al., 2015; Sagaris, 2010). Some authors propose *smart cities* models which, as pointed out by Zawieska and Pieriegud (2018), bring at once new challenges such as decarbonizing transport, new business models, cybersecurity, government policies, mobility management, collaboration of stakeholders and governance maturity. In this sense, it is also necessary to prioritize a design of sustainable mobility that doesn't focus solely on commuting, but rather on issues of city distribution in a space that democratizes access to work, better articulates the social and economic system, preserves the characteristic cultural aspects of the urban space and, above all, promotes the sustainability of environmental resources with less impact on the quality of life of people and the environment. These factors lead to the need for policy makers to adopt a holistic and systemic approach (Lima et al., 2019), involving in the process all relevant stakeholders. Specially in the context of the change in the transport matrix, promoting policies that reduce motorized transport implies the search for alternatives to increase transport efficiency, expanding at once accessibility options (D'Agosto, 2015). It is especially a matter of dealing with the impact of individual transport, prioritizing collective matrices or less environmental impacts. In this way, public managers need to consider that mobility policies must cover society in all its dimensions. In a proposition to reduce the use of cars and enable more alternatives to public transport, planning should consider factors of stimulus and attraction or, as suggested by Santos et al. (2010), the integration of transport policies with other (economic, public health and environmental) policies, and integration with broad social objectives of government action.

Meira et al. (2020) also remark how lack of popular participation represents one of the main barriers to sustainable

mobility policies in developing countries, while Lanzini and Stocchetti (2020) suggest that participatory planning represents a building block of the new principles of sustainable mobility: citizens and commuters are indeed to play a pivotal role and will be object of the present paper. This is consistent with the new approach adopted, for instance, by the European Union, which builds on the increasing green attitude of citizens (Holden, 2016) and is framed around the SUMPs (Sustainable Urban Mobility Plans) concept. Notwithstanding the key-role that infrastructure-based strategies still play (Maltese et al., 2021), community involvement is considered as a prerequisite for any policy to succeed, since "[t]he Local Planning Authority should involve the relevant actors - citizens, as well as representatives of civil society and economic actors […] from the outset and throughout the process to ensure a high level of acceptance and support" (EU, 2013).

2.2. Sustainable mobility in Brazil: evolution and challenges

As far as Brazil is concerned, the greatest mark toward sustainable urban mobility is represented by the 2012 National Law of Urban Mobility (Law 12.587/2012 – Brazil 2012), which "makes it mandatory for cities with over 20,000 inhabitants to elaborate a Urban Mobility Plan [UMP] and it defines the directives to guide the regulation and planning of urban mobility in Brazilian cities" (Bezerra et al., 2020, p. 809). The concept itself of sustainable mobility in urban areas, where lives and works the majority of Brazilians, should be developed around four axes which are equally structured in the development of policies and initiatives at the level of Federal Government: environmental sustainability, democratization of public space, social inclusion and participative management (Brazil 2012). Despite the new legal framework and growing concerns about the unsustainability and ineffectiveness of traditional mobility plans and policies, UMPs in Brazil are seldom carried through, or fall short of envisaged requisites (Mello & Portugal, 2017): this could be ascribed to many intertwining factors, ranging from the lack of autonomy of the municipalities (Fernandes & de Araùjo, 2015) to the lack of planning culture (Rubim & Leitão, 2013).Such shortcomings are somehow typical of most Latin America Countries: due to the features of urban development, the widespread social inequalities and city planning according to the center-periphery model, large urban centers in Latin America share many similarities in urban transport and development policies (Moller, 2006; Pardo, 2009, Yañez-Pagans et al., 2019). To stimulate the economy and promote the displacement of labor from the periphery to the productive centers, there is a need of Public Transport (hereafter PT) development policies allowing increased accessibility for the workforce, while at once avoiding the shift to private vehicles.

Socioeconomic conditions and challenges like poverty or unemployment call for a thorough (re)discussion on transport fares and stimulate policy makers to build PT systems in Latin America around similar and shared ideas: for instance, the integration and modernization of buses and the use of the BRT (Bus Rapid Transit) system in cities like Curitiba (Brazil), Quito (Equador) and Bogotá (Colombia) (Pardo, 2009), or the use of the cable car under specific orographic conditions to connect poor neighborhoods to economic centers, such as in Medellin, Rio de Janeiro and La Paz (Yañez-Pagans et al., 2019). In other words, PT policies in Latin America should have their roots in economic development ensuring at once equity and accessibility. Further, it is necessary to consider that Brazil, as well as Latin America in general, witnessed the planning and building of its cities based on individual transport, especially automobiles (Álvarez, 2016). Brazil and Mexico are emerging as major producers and exporters of automobiles in the Latin American region: likewise, neighboring countries became major buyers of such production. In addition, the oil-based economy in Brazil and Venezuela boosts the local market and available alternatives such as rail or maritime transport play a marginal role compared to cars and trucks. Therefore, thorough changes in the transport matrix encounter economic, structural and behavioral barriers. As regards the latter, the difficulty to involve the population and to give voice to its needs and desires also emerges as a factor hindering an effective implementation of sustainable mobility plans in the region (Bezerra et al., 2020). A propaedeutic step for the involvement of citizens in the shaping of future urban mobility plans is indeed represented by an adequate investigation of the drivers behind their commuting-related behaviors: to this end, the following section will provide an overview on the theoretical frameworks on modal choice.

3. Determinants of modal choice: the role of habits

Research in consumer behavior in the field of sustainability is vast, integrating perspectives from heterogeneous literatures and disciplines. Acknowledging the complexity of the topic being investigated (that is, the antecedents of responsible behaviors), an effective starting point can be represented by the dichotomy between rationality and automaticity as the engine triggering individual activities. That is, behaviors can be performed i) as the result of a rational cognitive process of evaluation of the alternative courses of action at hand, ii) as automatic responses to a familiar situation, or typically iii) as the result of a combination of both (Lanzini, 2018a). This is evident also focusing the analysis on the specific setting of sustainable mobility, where the behavior of commuters has been object of a vast (and steadily increasing) number of empirical investigations and integrative reviews (Chng et al., 2018).

Theories in the rational cognitive stream assume that habits have little relevance as predictors of behavior, as individuals are considered as rational beings processing available information to develop an aware and elaborated intention to act. Two main branches within the rationalistic perspective can be identified (de Groot et al., 2016). The first refers to attitude-behavior research stemming from expectancy-value models: individuals choose the course of action based on its expected positive consequences. A typical example of such

models is represented by the Theory of Planned Behavior (TPB, Ajzen, 1991), which is a popular framework in consumer behavior research suggesting that intentions are the closest predictor of behaviors and are in turn spurred by attitudes (representing the predisposition toward the activity), subjective norms (mirroring the experienced social pressure) and perceived behavioral control or PBC (as behaviors can be out of volitional control). TPB has been extensively adopted in empirical investigations, and its predictive validity has been confirmed across different cultural contexts (Mancha & Yoder, 2015) in a broad range of behavioral domains, including sustainable mobility (Abrahamse et al., 2009; Gardner & Abraham, 2010; Klöckner & Matthies, 2009).

The second rationalistic branch, on the other hand, refers to moral norms as the key driver of responsible behaviors, thus adopting a more "altruistic" interpretative key of individual behavior. Norm-Activation Model (NAM, Schwartz, 1977; Schwartz & Howard, 1981), suggests that personal norms (that is, feelings of moral obligation to perform an activity) represent the main antecedent of sustainable behaviors. Personal norms are activated by awareness of consequences (of not adopting the virtuous behavior) and ascription of responsibility: that is, how much an individual feels personally responsible for such consequences.

The assumption that behaviors are always the result of a rational and aware process exposed these theories (along with other rational cognitive theories, see Lanzini, 2018a for a review) to criticism, as there is indeed evidence that when a behavior becomes habitudinal, a sub-conscious and automatic response is triggered so that past behaviors interact with intentions in predicting behavior (Conner & Armitage, 1998; Ouellette & Wood, 1998). Theoretical frameworks integrating habits in the set of predictors of (sustainable) behaviors have been hence proposed. The Attitude-Behavior-Context theory (Guagnano et al., 1995), for instance, encompasses attitudinal factors, contextual forces, personal capabilities and habits as variables predicting sustainable behaviors while the Comprehensive Action Determination Model (Klöckner & Blöbaum, 2010) focuses on the role played by intentional, habitual and situational sources. Ajzen himself considers habit as a factor potentially mediating intentions and behavior, relegating it nonetheless to a minor role (Ajzen, 1991). Furthermore, Ronis and colleagues propose a Theory of Repeated Behavior, stating that habits exert on behavior an influence which is independent of intentions, and "repeated behaviors may be largely determined by habits rather than by attitudinal variables, although attitudes are central to the formation and modification of habits" (Ronis et al., 1989, p. 213).

The role played by habits is particularly relevant in the domain of mobility, since activities such as commuting are well-practiced and habitual: indeed, when we commute from home to work (and vice-versa) we basically travel on the same route, likely at the same time of the day, in similar contextual situations (e.g., traffic conditions). Notwithstanding such relevance, with the term being often used even in everyday conversation, it is actually difficult to provide a definition of habits that can be universally agreed upon. Clearly, the frequent repetition of a behavior represents a crucial condition that is propaedeutic for a habit to emerge. Some authors even propose specific frequency thresholds that signal the presence of a habit, ranging from twice a month (Ronis et al., 1989), to once a week, or more (Ouellette & Wood, 1998). At the same time, however, frequent past behavior and habits represent two different (though interrelated) constructs, which should not be used as synonyms. A second element that characterizes habits is represented by the stability of the context (Aarts & Dijksterhuis, 2000; Verplanken & Aarts, 1999; Wood et al., 2005). While dynamic and ever-changing contexts have individuals consider new alternatives and courses of action, stable contexts become strongly linked to the mental representation of repeated behavior in that context, so that contextually cued behavior can be performed with limited conscious intent (Ouellette & Wood, 1998). Moreover, positive reinforcements (i.e., rewarding consequences) are required for a repetitive behavior to develop into a habit gaining strength over time: only when the outcome of an activity is satisfactory, an individual is likely to repeat the former (Ouellette & Wood, 1998). Frequency, context stability and rewarding consequences can be hence considered as relevant elements that facilitate the emergence of habitual behaviors. However, the discriminating factor is to be found in *how* behavioral choices are made (Steg & Vlek, 2009). Aarts et al. (1998) argue that habits comprise a goal-directed type of automaticity so that the habitual behavior response is triggered sub-consciously in the presence of a specific goal, activated many times before in the same context. Most authors in the field agree that automaticity is a defining feature of habitual behavior (Klöckner & Verplanken, 2018). Triandis (1980) for instance defines habits as situation-behavior sequences that are or have become automatic, so that they occur without self-instruction, while Aarts and Dijksterhuis (2000) define an established habit as automatic activation of a goal directed behavior, which is able to restrict the behavioral alternatives to be considered when planning an activity.

Habits represent hence a complex and multidimensional construct. To the end of this article, in line with relevant literature on the topic (Orbell & Verplanken, 2018; Ouellette & Wood, 1998; Verplanken & Aarts, 1999) we consider habits as goal-oriented scripts based on repeated behaviors, which are carried out in stable contexts deactivating conscious planning and suppressing at once the search of information for alternative courses of action. Or, to use the words of Verplanken, habits are repeated behaviors that have become automatic responses in recurrent and stable contexts (Verplanken, 2012, p. 22).

The relevance of habits for behavioral investigations asked for the adoption of tools capable of providing an effective measure of such an elusive construct. Stemming from the awareness that frequency of past behavior alone does not represent an adequate measure of habits in the context of the intention-behavior relationship, Aarts and colleagues (Aarts et al., 1998; Verplanken et al., 1998) developed a Response Frequency measure, tested in the domain of travel-mode choice which can be by nature quite repetitive: the Response Frequency index is represented by the number of times a given transportation mode is mentioned

by the respondent as the choice across a number of travel destinations. Verplanken and Orbell (2003), on the other hand, developed the Self-Reported Habit Index scale, which is composed of a battery of 12 statements regarding the behavior object of analysis on which respondents have to express their agreement as to elicit automaticity, repetition and identity (that is, habit strength). Scales have also been developed aimed at investigating the general predisposition of individuals to change behaviors vs develop habits. The Resistance to Change scale (Oreg, 2003) is composed of a battery of statements (44 in the original formulation, fewer in later revisions) on which respondents express their agreement as to elicit their resistance to change. Unlike previous measures, the Oreg scale does not focus on a specific behavior, but on a generic predisposition toward change.

The nature of habits clearly makes them inherently resistant to change, representing a barrier for all subjects (e.g., policy makers and companies) willing to influence behavioral patterns. Researchers focusing on how to modify habits suggest that a viable option could be represented by disrupting (when possible) stable contexts (Wood et al., 2005). The Habit Discontinuity Hypothesis (Verplanken et al., 2008) suggests that changing habits is easier during so-called *windows of opportunity*, that emerge when the change of context makes people more willing to look for further behavior relevant information, and more open to change: this could be a consequence for instance of life-changing events (relocating, getting married, and so on) or by changes in the context itself such as a temporary closure of a highway or a bridge for roadwork.

4. Methodology

4.1. Setting of the case-study: the city of Florianópolis

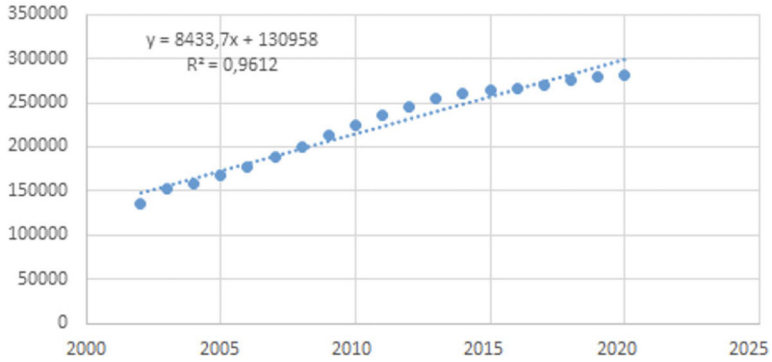
Brazil has been witnessing, in recent years, a decline in the use of PT by commuters and a slight increase in the use of cars (D'Agosto, 2015), as the former is considered inadequate, expensive and obsolete. According to data from the National Public Transport Association (ANTP., 2020), between 2014 and 2018 the use of PT (buses and trains) as a modal dropped in the country from 28.7% to 28%, while the use of individual transport (cars and motorcycles) experienced an increase from 27.7% to 30.3%: for the first time, the use of individual transport surpassed that of PT (ANTP, 2018). This phenomenon has affected several urban centers in Brazil and even cities like Curitiba, long considered a model for PT (and with an increase in use over the 2005-2008 time period) have recently experienced a reduction in the number of passengers (Vasconcelos, 2019). In addition to the decrease in the use of PT, it is possible to perceive a steady growth in the fleet of private cars and, also, new forms of urban commuting (e.g., Uber, car sharing, etc.): indeed, between 2014 and 2018 the fleet of individual vehicles (cars and motorcycles) grew from around 36 million to 40 million units (ANTP, 2018, 2020).

Our study is based in the city of Florianópolis, administrative capital of the State of Santa Catarina in Southern Brazil. Florianópolis has a population of around 500,000 (IBGE, 2020a) inhabitants, but if we consider the larger metropolitan area the city is part of a single conurbation of 1,200,000 inhabitants, which includes other cities such as Biguaçu, Palhoça or São José (IBGE, 2020b). Florianópolis currently has 323.507 licensed drivers; a number that rises to 545,000 when considering the number of licenses currently valid throughout the region (DETRAN, 2021).

The reasons behind the choice of Florianópolis as the empirical setting of the study are manyfold. On the one hand, the city shares many of the features of large Brazilian cities, and related problems: ineffective accessibility from peripheral and low-income neighborhoods, heavy traffic congestion affecting air quality and, subsequently, health issues, and the time needed to commute (with the related productivity and economic loss). On the other hand, it has peculiar traits that make the need to improve urban mobility more pressing (e.g., the orography of the territory, since the city center is built on an island while peripheral neighborhoods are on the mainland with two bridges, one of which has been closed for years due to reconstruction processes, until recently reopening, representing the only connection between the island and the continent). Based on data from the Department of Infrastructure of Santa Catarina (DEINFRA), Silva (2018) estimates that "traffic over bridges is around 175,000 vehicles per day, of which about 3,000 are buses (3,5%), 5,000 motorcycles (5.5%), and 80,000 private cars (91%)" (p. 108).

Florianópolis hence represents a good empirical setting to derive generalizable information on psychological determinants on modal choice in highly populated Brazilian cities, and to frame sound policy measures. The PT system is represented by a semi-integrated bus network (considering that the system is only partially integrated, since new connections and new tariff payments are needed to access the metropolitan region system), while there are no subway lines nor ferry services operating in the area. In recent years Florianópolis has registered an increase in the number of vehicles (cars and motorcycles). The historical series of the increase in vehicles can be seen in Graph 1, according to the records of the institution responsible for registering vehicles in the city (DETRAN, 2021).

The municipality's population is also on the rise, though at a lower pace compared to that of vehicles. Over the last decade (2010-2020), vehicles have been growing at a rate of 2.54% per year, while the population of Florianópolis has been growing at a rate of 1.73% per year. Consistently, over the same time-span the rate of people per vehicle dropped from 1.9 to 1.8, and it is estimated that it will reach 1.6 by 2030, further proof of the individualization in the use of vehicles for urban mobility. As pointed out by Silva (2018), daily commuting by private modes exceeds trips made by PT, especially at rush hours. In addition, the average travel time using PT is approximately 57 minutes, while for private modes it is around 30 minutes, which makes the former far less attractive also due to the poor connectivity between bus lines. PT in Florianópolis is offered as a public concession from the municipality to a private company, Consórcio Fênix, and users from Florianópolis currently pay a fare of



Graph 1 – Vehicles Evolution (2002-2020).

R$4.25 (local currency) per trip on the common bus within city limits, while for trips to neighboring municipalities they must pay a new ticket. An average of 235,000 passengers uses buses every day, and local authorities estimate an average of 5.5 million passengers and around 3.5 million kilometers traveled monthly (Consórcio Fênix, 2021). For Silva (2018), the four factors that require greater attention in relation to PT in Florianópolis, according to users, are: (1) Trip duration; (2) Fare price; (3) Conservation (quality) of bus stops; (4) Capacity (buses traveling over capacity).

4.2. Questionnaire and constructs

To investigate what are the drivers that make commuters in Florianópolis choose between cars and alternative (and more sustainable) means of transportation, we conducted an empirical investigation based on a cross-sectional survey circulated among commuters of the metropolitan area. The questionnaire, which was part of a broader research on mobility and transports, was structured using Qualtrics, while IBM SPSS23 was adopted for data analysis. International guidelines on ethical research have been adopted and participants (who have been recruited online) were informed that participation to the survey was voluntary, and that all collected data would have been used at an aggregate level as to safeguard the privacy and anonymity of respondents.

446 respondents filled in the survey, but 10 responses had to be dropped since only a small part of the questions had been completed. The final sample is hence composed of 436 commuters (n = 436), which is deemed appropriate by statistical tests such as the Slovin's formula at 95% confidence level (Guilford & Frucher, 1973). Furthermore, the sample size is consistent with mainstream social psychology literature on modal choice determinants: almost 70% of the studies included in the two recent meta-analyses on the topic (Hoffmann et al., 2017; Lanzini & Khan, 2017) have a sample of less than 500 respondents.

Males represent 43% of the sample, and the mean age is 27 years old whereas the median age in Brazil is 33 years old. Although all age groups are represented in the sample, there is a slight over-representation of younger cohorts (commuters in their 20 s and 30 s), which represent the citizens of tomorrow and should be seemingly a priority target for communicational campaigns and inducements about new mobility policies.

54% of the sample is composed of non-university commuters, while students (mainly, yet not exclusively, from the UDESC campus) account for the remaining 46% of the sample.

The questionnaire (which has been pre-tested on a group of 20 respondents to check the clarity of questions) is composed of 33 questions, some of which are not pertinent to the present article and will not be hence illustrated. The introductory section investigates some basic aspects of the daily commute of respondents, asking them *i) On a typical day, how many km do you travel for your commuting?* and *ii) On a typical day, how much time (hours and minutes) do you spend on your commuting?*

Then, the following sections analyze the commuting intentions and behaviors of respondents as well as the elements of the theoretical frameworks considered: TPB, NAM, and habits. We adopted validated scales and questions' formats widely adopted in the literature on consumer behavior, which have been adjusted to fit with the specific behavior object of analysis:

- Behaviors:
  How often, over the past 12 months, did you use the following means of transportation?
  (1 = never; 5 = very often) [a. private car; b. transport mode alternative to private car (any type)]

  As regards modes of transportation alternative to private car, how often over the past 12 months did you use each of the following?
  (1 = never; 5 = very often) [car sharing; bicycle; motorbike; train; bus; subway; taxis; car pool; walking (short distance, less than 2 km); walking (long distance, over 2 km)]

- Intentions:
  My intention to use [private car vs transport modes alternative to private car] for my daily commutes in the coming weeks is:
  (1 = very weak; 5= very strong)

- Habits (Self-Reported Habit Index scale):

  Using [private car vs transport modes alternative to private car] is something that:
  (1 = totally disagree; 5= entirely agree)
  I do frequently.
  I do automatically.
  I do without having to consciously remember.

that makes me feel weird if I do not do it.
I do without thinking.
would require effort not to do it.
that belongs to my (daily, weekly, monthly) routine.
I start doing before I realize I'm doing it.
I would find hard not to do.
I have no need to think about doing.
that's typically 'me'.
I have been doing for a long time.

TPB Constructs

- Attitudes:
  To me, using (each of the following travel modes) in the future would be:
  (1= very unpleasant; 5= very pleasant)
- Subjective Norms:
  My relevant ones would approve that I use (each of the following alternatives) as transport mode *(1= totally disagree; 5= entirely agree)*
- PBC:
  To me, using (each of the following modes) for my daily commute would be:
  (1= extremely difficult to 5= extremely easy)

NAMConstructs

- Awareness of Consequences:
  How much do you believe air pollution and energy consumption represent a menace for the biosphere and for humans?
  (1 = not at all; 5= very serious)
- Ascription of Responsibility:
  How much do you believe private car use contributes to such problem?
  (1 = not at all; 5= very much)
- Personal Norms:
  Do you perceive as a moral obligation the reduction of car use?
  (1 = not at all; 5= very much)

4.3. Statistical methodology

We performed correlational and regression analyses to investigate the determinants of modal choice and, specifically, the antecedents of behavioral intentions and actual behaviors pertaining the use of sustainable means of transportation, alternative to private car use. We focus on i) TPB (expression of expectancy-value models) and ii) NAM (expression of altruistic models), both alone and with the integration of habits.

To analyze the data we then used logistic regression, which is useful when dealing with dichotomous dependent variables (Hair et al., 2010): indeed, the underlying principle is to link the occurrence or nonoccurrence of an event to explanatory variables. In our study, the event is represented by the choice of a sustainable travel mode for future trips (hereinafter, "sustainable transport"). We focus both on behaviors and intentions (as treating them as synonyms would overlook possible intention-behavior gaps), and for each of the two the dependent variable (y) can assume the value of 0 (if the commuter does not use sustainable transport) or 1, (if the commuter uses sustainable transport). The explanatory variables are represented by the TPB constructs (attitudes, subjective norms and PBC), NAM constructs(personal norms, awareness of consequences and ascription of responsibility), and habits. We checked the conditions for the reliability of logistic regression, and the correlation analysis confirms that multicollinearity is not present. Figure 1 illustrates the logistic regression scheme for the two behavioral models. With the LOGIT model approach, it is not necessary to transform data and use normal methods. For binary data, the most common model to calculate the probability of a given result is the logistic regression model (Agresti & Finlay, 2009). Furthermore, a logistic regression has the advantage of being less affected than a discriminant analysis when the normality of the variables is not satisfied (Hair et. al., 2010).

We performed tests on the Self-Reported Habit Index scale, as habits represent a key-construct of our analysis. The Kaiser-Meyer-Olkin Measurement of Sampling Adequacy (MSA) test, which is a measure of how the data is suited for factor analysis, presented overall MSA value 0.94, which is positive as MSA is expected to be greater than 0.5 (Hair et al., 2005) or 0.6 (Field, 2009). Further, we performed the Bartlett Sphericity Test, and we found a p-value of less than 0.001, with chi-square 7805,854 in 276 degrees of freedom. The Cronbach's alpha for the Self-Reported Habit Index on Sustainable Transport was C = 0.917, with excellent internal consistency.

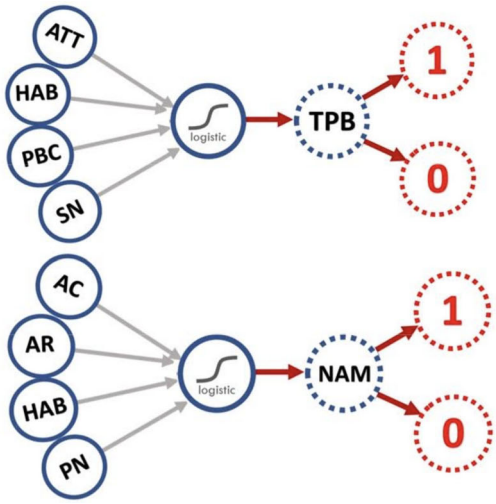
5. Results and policy implications

As a preliminary step, we investigated some key-aspects of daily commutes of respondents in the sample. It emerges (Figures 2a and b) that on average respondents travel 28 kilometers a day spending 73 minutes to commute (round-trip), with 50% stating their commute is at least 1 hour long:

Then we investigated the correlations between the constructs (see Table 1), using an ordinal measure of association, Spearman's rho (ρ): according to Barbettai (2006) correlations below 0.33 are low, between 0.33 and 0.66 are moderate and above 0.66 are strong.

Tables 2a and 2b summarize the results of the regression analysis, with respect to intentions and behaviors, respectively (see the Appendix for full details):

We tested the two main models on sustainable modal choice (TPB and NAM Model), and results suggest that the former has a higher explicative power. More in detail, the model has a R^2 of .157 and .062 (with reference to intentions and behaviors, respectively), while NAM has a R^2 of .007 and .008, respectively. R^2 measures the percentage of the variance explained by the model. As such, results show that altruistic stances and moral considerations (as envisaged by NAM) are largely irrelevant as antecedents of sustainable transport behavior as they explain less that 1% of the latter. On the other hand, TPB constructs explain over 15% of the variability in behavioral intentions to adopt sustainable transport mode (a medium effect size, according to Cohen,



Variables in the equation	
AC	Awareness of Consequences
AR	Ascription of Responsibility
ATT	Attitudes
HAB	Habits
NAM	Norm-Activation Model
PBC	Perceived Behavioral Control
PN	Personal Norms
SN	Subjective Norms
TPB	Theory of Planned Behavior

Figure 1. Logistic regression scheme. *Source:* own elaboration

[1992], while the numbers are lower in the case of actual behaviors probably because of the role exerted by habits, as to be later discussed).

If we look more in detail at the different TPB constructs, results suggest that for Florianópolis commuters the choice between private car and sustainable transport modes shows higher correlations with PBC and lower correlations with attitudes and subjective norms, compared to most evidence available in literature (see Lanzini & Khan, 2017). The correlation between PBC and intentions to adopt a sustainable transport mode is .446 ($p<.01$), outperforming both attitudes (.262, $p<.01$) and subjective norms (.161, $p<.01$). A possible speculation is that commuters might be willing to adopt sustainable mobility patterns, yet they are hindered by a perceived inadequacy of available options, so they recover to car use in the absence of valid alternatives (results show how indeed only 19% of the sample used public transportation over the last year). At the same time, the marginal role played by subjective norms suggests that campaigns angled toward the social aspect of sustainable mobility would be scarcely effective, since commuters do not consider social pressure as a relevant driver of their choices, thus not being affected by the behaviors of friends, colleagues and family members. While TPB proved to be an effective framework to analyze the behavioral antecedents of sustainable behaviors across countries and behaviors, the salience of the specific constructs might vary according to the socio-cultural context being investigated (Elhoushy & Lanzini, 2021; Mancha & Yoder, 2015; Morren & Grinstein, 2016): for instance, subjective norms play a relevant role in Confucian culture that are rooted in Far East countries, compared to western contexts (Chan & Lau, 2002). It is somewhat surprising, however, since Latin America citizens typically value relations with others and expectations of relevant ones more than citizens in individualistic communities (Corral-Verdugo & Pinheiro, 2009), and as a consequence higher relevance of subjective norms could have been expected.

As regards NAM constructs, the results are somehow surprising. Unlike TPB, indeed, the model has its own roots in sustainability-related research, as it pertains to an altruistic vision of the world where people act with the goal of preserving the environment and society at large, other than focusing on self-interest. Environmental concern and awareness are relevant dimensions of such vision, and individuals in the Florianópolis sample show high maturity with reference to these aspects. On the other hand, the correlation between NAM constructs and behavioral intentions and actual behaviors pertaining to sustainable transport modes is extremely low: for instance, the correlation between personal norms and green behavior is .022, and not significant. This has impacts also on the effectiveness that awareness campaigns could have, since Florianópolis commuters appear to be educated on the topic, and willing to give a contribution if only they were put in the conditions to do so. Compared to western-based literature (Lanzini & Khan, 2017; Hoffmann et al., 2017), the relevance of NAM constructs is lower and this could be ascribed to the lack of alternatives that are offered to the citizens of Florianópolis.

The most striking result emerging from the analysis is represented by the role exerted by habits in shaping behavioral patterns. Indeed, including habits as a further antecedent highly increases the predictive capability of existing models. For instance, if we focus on actual behaviors (Table 2b) adding habits to TPB leads to an increase of R^2 from .062 to .296, while in the case of NAM the increase is from .008 to .285.

The prevalence of TPB constructs over NAM constructs in predicting the adoption of sustainable means of transportation, as well as the crucial role exerted by habits once integrated in the model, is also confirmed by odds ratio analysis. If we focus, for instance, on behavioral intentions (Table 2a), we see that the probability of choosing sustainable means of transportation in case all TPB constructs have high scores is 57.28%, while the same probability is lower (43.24%) if all NAM constructs have high scores. In both cases, adding habits to the model sensibly increases such probability, to 99.54% and to 90.28%, respectively. This means that individuals scoring high on both TPB constructs *and* habits toward sustainable transport modes will almost

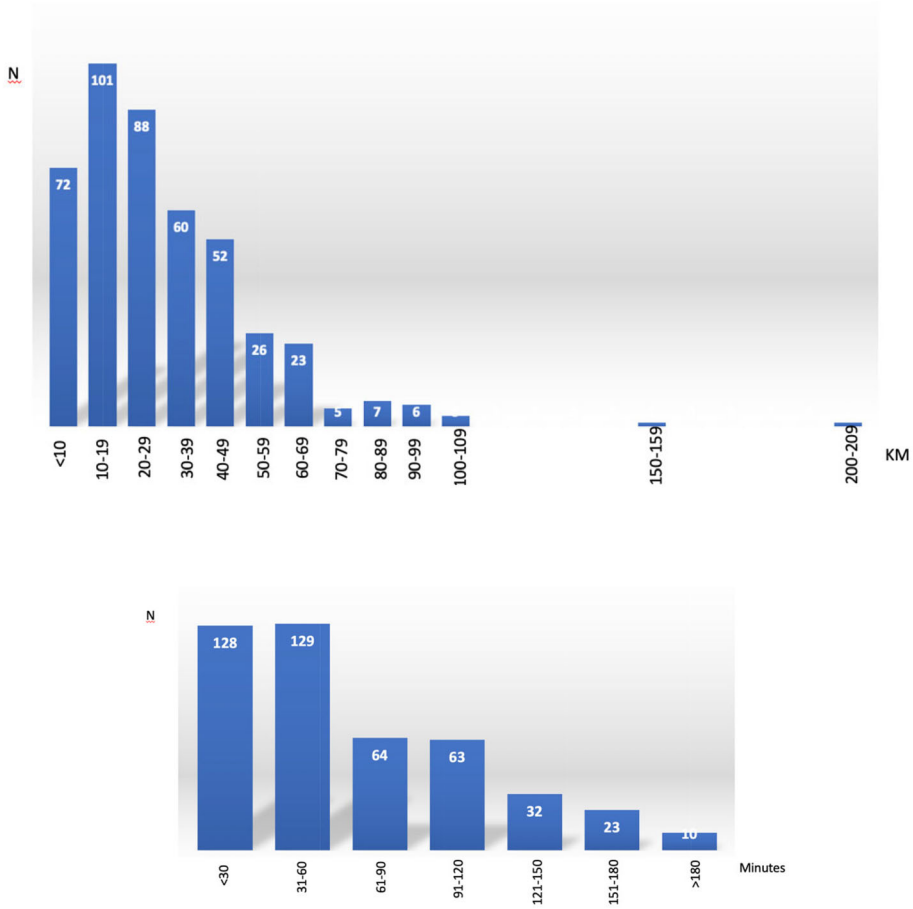


Figure 2 **a**. Daily commute (km). *Source:* own elaboration. **b**. Daily Commute (time). *Source:* own elaboration

certainly develop the intention to act consistently, while individuals scoring high on both NAM constructs *and* habits will likely do so, yet with less certainties.

Based on the analysis of the results, some policy implications and suggestions are set forth to support decision makers in the difficult choices that loom at the horizon. First, we perceived that "people cannot see options". Due to deeply rooted car habits, commuters do not perceive the availability of convenient alternatives, since the rational process of info seeking and processing gets deactivated; there is a sort of communicational barrier preventing individuals from reacting to communication campaigns, so that messages do not effectively reach the target. Yet, it is essential to envision a path of commuters' education, on the range of available alternatives, and the (often overlooked) benefits they would bear. Further information and guidance on how to exploit the existing PT network should be for example provided.

Secondly, it is necessary to observe that "new models need to be considered". The increased awareness about sustainable mobility options represents a necessary yet not sufficient condition for a promotion of a thorough shift in the paradigm in Santa Catarina's capital. New models such as those envisioned by PLAMUS represent examples of innovative alternatives that should be implemented and leave the early stages of the design phase that to date still hinder a broad uptake from the community. Maritime transportation, for one, could strengthen the offer of alternatives to private mobility, and the insular nature of the city of Florianópolis well explains the benefits of an integration into the existing network of a system of ferryboats for the transportation of both passengers/pedestrians and vehicles. A hindrance could hide in the aversion of commuters perceiving ferryboats as a modal choice for tourists on holiday rather than for employees on a tight schedule. Furthermore, an improved integration between heterogeneous modal alternatives should score high on the priority list, with a holistic vision of the system trespassing the narrow boundaries of the single pieces of the picture, as to exploit beneficial synergic effects of intermodality. An example is represented by buses and bikes: while Florianópolis cyclists could count on a developed network of bike lanes, some neighborhoods are poorly connected and it is difficult to park bicycles at bus terminals to shift transport mode and exploit above-mentioned intermodal opportunities.

The third implication in public mobility policies refers to policy makers: "hard choices on the horizon". A shift to more sustainable mobility paradigms calls for a long-term vision which is often at bitter odds with short-term political payback. Unpopular decisions might represent the most effective option, like for instance the partial closure to vehicular traffic of central areas, with only residents being allowed to circulate. Although wide pedestrian areas

Table 1. Correlation analysis – alternative mode choice [Spearman's ρ].

	Beh	Int	Att	SN	PBC	PN	AC	AR	H
Beh	1								
Int	.481**	1							
Att	.090	.240**	1						
SN	.066	.106*	.343**	1					
PBC	.216**	.307**	.335**	.319**	1				
PN	.022	-.001	.112*	.074	-.001	1			
AC	.013	-.065	.047	.051	-.043	.293**	1		
AR	-.007	-.042	-.016	-.003	-.032	.309**	.431**	1	
H	.462**	.436**	.124**	.031	.214**	.119*	.069	.049	1

represent a common occurrence in many Countries, this would represent a disruptive policy in Brazil, likely to encounter strong resistance from a large share of the community and dissatisfaction among commuters, given the need to reconsider and change their behavioral patterns. Yet, this might open what Verplanken et al. (2008) call "windows of opportunity" for behavioral changes, with citizens spurred to consider alternative routes and modes that might in turn prove to be more convenient, increasing overall trip satisfaction. While an initial period of adjustment would be a necessary toll to pay, the authors believe that commuters and the broader community would in the longer run appreciate the new scenario, which entails benefits deriving from decreased pollution and road congestion.

It is also necessary to consider that the Covid-19 pandemic is changing *the rules of the game*: during the pandemic, the use of PT dropped to minimum levels, being only used by health workers for a few months, and at the peak of the emergency there was a 58% decline in human mobility at PT terminals in Brazil (Betarelli Junior et al., 2021), while similar figures affected also other transport modes encompassing the sharing of spaces and/or vehicles, including taxis. Barbieri et al. (2021) in a study on the effects in different Countries including Brazil, confirm a change not only in modal shift but also in people's cognitive behavior, as cars and motorcycles are now considered as safer at the detriment of public transportation, where social distancing cannot be always guaranteed. There is indeed a growing body of empirical evidence which, consistently with Protection Motivation Theory (Rogers & Prentice-Dunn, 1997), suggests that the pandemic is triggering relevant attitude and behavioral changes (Aaditya & Rahul, 2021; Scorrano & Danielis, 2021; Thomas et al., 2021). Unfortunately, while the need to avoid crowded places and to guarantee social distancing is spurring a segment of commuters to shift (even once restrictions are lifted) to active transport such as walking or cycling to work, most commuters are likely to shift to private mobility and namely to cars and motorcycles, exacerbating problems such as road congestion and polluting emissions (Harrington & Hadjiconstantinou, 2020). A key aspect that needs to be investigated in months and years to come refers to the *persistence* of such changes, once the pandemic is under control: that is, whether new attitudes and habits will evaporate so that old habits are retrieved or whether they show strong persistence, becoming structural *changes* (de Haas et al., 2020; van Wee & Witlox, 2021). The challenge for policy makers is hence to turn a problem into an opportunity: consistently with the *windows of opportunity* concept, Barbieri et al. (2021) use the term "catalyst for change" as to stress the necessity for transit operators to strive to re-gain the trust of citizens, making public transportation mobility less risky.

Table 2a. Regression analysis (intentions).

Dimension	Variables	Sig.	Exp(B)	P(Y = 1) when all X = 0	P(Y = 1) when all X = 1
TPB	ATT	0,001	2,245	17,08%	57,28%
	SN	0,499	0,821		
	PBC	0,000	3,530		
TPB + Habits	ATT	0,001	2,568	77,14%	99,54%
	SN	0,553	1,219		
	PBC	0,000	3,375		
	Habits	0,000	6,013		
NAM	AC	0,698	1,612	18,32%	43,24%
	AR	0,186	2,488		
	PN	0,621	0,847		
NAM + Habits	AC	0,785	0,713	46,05%	90,28%
	AR	0,212	2,540		
	PN	0,672	0,854		
	Habits	0,000	7,036		

ATT = attitudes; SN = subjective norms; PBC = perceived behavioral control; AC = awareness of consequences; AR = ascription of responsibility; PN = personal norms.

Table 2b. Regression analysis (behaviors).

Dimension	Variables	Sig.	Exp(B)	P(Y = 1) when all X = 0	P(Y = 1) when all X = 1
TPB	ATT	0,669	1,103	40,18%	63,50%
	SN	0,853	0,952		
	PBC	0,000	2,468		
TPB + Habits	ATT	0,924	0,976	65,94%	97,27%
	SN	0,535	1,206		
	PBC	0,008	1,936		
	Habits	0,000	8,085		
NAM	AC	0,657	0,579	83,24%	54,25%
	AR	0,161	0,381		
	PN	0,831	1,075		
NAM + Habits	AC	0,271	0,256	54,04%	45,85%
	AR	0,071	0,262		
	PN	0,672	1,176		
	Habits	0,000	9,139		

ATT = attitudes; SN = subjective norms; PBC = perceived behavioral control; AC = awareness of consequences; AR = ascription of responsibility; PN = personal norms.

Finally, considering the findings of this research and the local history of urban mobility management, a "new approach to mobility" is needed. There is a widespread misconception (even among policy makers) about mobility, which is sometimes simplistically viewed as a synonym of traffic rather than a multi-faceted construct, encompassing a complex network of environmental, social and economic issues. Consequently, it is a myopic assumption to believe that focusing on infrastructures and traffic management alone could represent an effective approach. Furthermore, the traditional top-down approach where all decisions are taken upstream with no involvement of citizens and commuters should leave the ground to a new concept of shared planning, where the community is actively involved from the early stages of discussion till the practical steps of implementation. Active involvement entails structured procedures to hear their voice (surveys, public meetings, etc.) and to gain better understandings about concerns, needs and motives underpinning modal choices.

6. Conclusions

The steady rise in urbanization, coupled with rapidly increasing numbers of the circulating fleet in Brazilian metropolitan areas, made the issue of sustainable mobility a key-aspect that policy makers are bound to deal with in years to come. Acknowledging the complexity of the process needed to trigger a shift to a new mobility paradigm, we argue that a pre-requisite for the implementation of holistic and effective policies is represented by a deeper understanding of the motives underpinning travel mode choices of citizens.

We performed a cross-sectional survey on commuters and analyzed the drivers of cars/motorcycles vs sustainable transport modes via a LOGIT model. Although LOGIT models have a long track of empirical investigations in the domain of modal choice (Shamshiripour et al., 2019; Shanmugam & Ramasamy, 2021), the current paper provides a contribution to the literature insofar it focuses on the Brazilian context, which has been mostly overlooked by international social-psychology literature analyzing western or Far East Countries. Latin America societies share collectivistic traditions and holistic views of the world, probably stemming from diffused social and environmental problems such as poverty, inequity and environmental devastation. These common traits, notwithstanding some obvious differences between national contexts, make Latin America a homogeneous macro-region where shared socio-cultural contexts shape attitudes and behaviors of citizens, distinguishing them from individualistic western societies (Corral-Verdugo & Pinheiro, 2009). Furthermore, most contributions focusing on modal choice in Brazil do indeed delve on traditional variables such as socio-demographics, customer satisfaction, travel time, travel costs or comfort, while we focus on the psychological correlates of travel mode choice as derived from three theoretical families focusing on intentions (TPB), personal values (NAM) and habits.

The results of our Florianópolis based study suggest that there is a mature and aware *market*, with commuters showing an interest for sustainable travel options, alternative to private vehicles. Yet, reaping the fruits of such awareness is seemingly hindered by multiple factors. The first one is connected to the key role exerted by PBC, and is represented by the perceived inadequacy of PT system to face the challenges of modern mobility, with schedules not fully reliable and the integration between different bus lines not optimal (this negatively affecting travel time and the overall trip experience). A second factor reflects the diffusion among Florianópolis commuters of deeply rooted travel habits that are difficult to disrupt. Such habits deactivate the search for information about alternatives (and even the willingness to consider new options that might come along), representing a harsh obstacle for policy makers, being commuters a difficult target for communication campaigns focusing on the benefits of alternative transport modes or on the improvements of PT system.

The results of the study showed that, while on the one hand there is a generic predisposition toward clean and environment-friendly transport modes, from a practical standpoint there still is an obstacle separating the community from the vision of more sustainable and integrated options, which could bear the potential of reducing the dependence from traditional motor vehicles ensuring an improvement of road congestion and the achievement at once of heterogeneous goals from an environmental (less pollution), social (improved accessibility) and economic (increased productivity) standpoint. With the active involvement of citizens and commuters, urban mobility could be re-organized adopting a multi-modal perspective where maritime transport and multimodal nodes connecting PT with the safe use of bicycles interact with (and integrate) existing infrastructures. In this strategic effort aimed at a thorough shift of paradigm in urban mobility, citizens are to be a key-actor rather than simple targets of a traditional top-down approach.

Albeit much work has to be done, improvements are on the way, such as for instance the possibility to use apps that trace the position or the occupancy level of buses, thus providing a fairly accurate estimate of the waiting time at each bus station and a perspective for the comfort level of the trip. Moreover, there are plans to introduce innovative solutions such as the BRT (a rapid transit system for buses), though they are still in the design phase and it is not clear when the new system will come into force, and what could its effective impact be. PLAMUS (Plano de Mobilidade Urbana Sustentável, a local plan drawn up in 2014 by urban planning authorities and local organizations for the implementation of sustainable mobility systems in the metropolitan region, to date only partially implemented) represents an overarching attempt at analyzing urban mobility in the Great Florianópolis area, as to reshape the system focusing on the improvement of PT network and infrastructures as well as on a new institutional framework. Some proposals, like BRT or Maritime Transport, and an improvement on the local integration system with neighboring cities' transport systems, are currently in the early stages of planning, yet rely on heavy infrastructural public (or private) investments. Recently, some conclusions of this study were presented to the local Mobility Observatory, that is implementing specific parts of PLAMUS to local authorities, to help them planning new solutions.

However, such efforts might not stand up to the challenge as more radical changes are needed, especially in a scenario where future years are likely to be characterized by an increase of population on the one hand and circulating fleet of private vehicles on the other, with the consequent stress on key traffic nodes such as the bridge to mainland.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Aaditya, B., & Rahul, T. M. (2021). Psychological impacts of COVID-19 pandemic on the mode choice behaviour: A hybrid choice modelling approach. *Transport Policy*, *108*, 47–58. https://doi.org/10.1016/j.tranpol.2021.05.003

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: automaticity in goal-directed behavior. *Journal of Personality and Social Psychology*, *78*(1), 53–63. https://doi.org/10.1037/0022-3514.78.1.53

Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting behavior from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology*, *28*(15), 1355–1374. https://doi.org/10.1111/j.1559-1816.1998.tb01681.x

Abrahamse, W., Steg, L., Gifford, R., & Vlek, C. (2009). Factors influencing car use for commuting and the intention to reduce it: a question of self-interest or morality? *Transportation Research Part F: Traffic Psychology and Behaviour*, *12*(4), 317–324. https://doi.org/10.1016/j.trf.2009.04.004

Agresti, A., & Finlay, B. (2009). *Statistical methods for the social sciences* (4th ed.). Pearson Prentice Hall.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. 10.1016/0749-5978(91)90020-T

Álvarez, D. A. C. (2016). *A cultura do automóvel como parte da organização territorial urbana da América Latina: a mobilidade sustentável como alternativa*. UFU.

ANTP. (2018). *Sistema de Informações da Mobilidade Urbana da Associação Nacional de Transportes Públicos - SIMOB/ANTP. Relatório geral 2014*. http://files.antp.org.br/simob/simob-2014-v10.pdf.

ANTP. (2020). *Sistema de Informações da Mobilidade Urbana da Associação Nacional de Transportes Públicos - SIMOB/ANTP. Relatório geral 2018*. http://files.antp.org.br/simob/sistema-de-informacoes-da-mobilidade–simob–2018.pdf

Barbettai, P. A. (2006). *Estatística Aplicada às Ciências Sociais* (6th ed.). Editora da UFSC.

Barbieri, D. M., Lou, B., Passavanti, M., Hui, C., Hoff, I., Lessa, D. A., Sikka, G., Chang, K., Gupta, A., Fang, K., & Banerjee, A. (2021). Impact of COVID-19 pandemic on mobility in ten countries and associated perceived risk for all transport modes. *PloS One*, *16*(2), e0245886.

Bezerra, B. S., dos Santos, A. L. L., & Delmonico, D. V. (2020). Unfolding barriers for urban mobility plan in small and medium municipalities–A case study in Brazil. *Transportation Research Part A: Policy and Practice*, *132*, 808–822.

Brazil. (2007). *Ministério das Cidades. PlanMob – Construindo a cidade sustentável. Secretaria Nacional de Transporte e da Mobilidade Urbana.*

Brazil. (2012). *Lei Federal n° 12.587 de 3 de janeiro de 2012. Dispõem sobre as diretrizes da Política Nacional de Mobilidade Urbana. Diário Oficial da União, Brasília, DF, 13 abril, 2012.*

Buehler, R., Jung, W., & Hamre, A. (2015). Planning for sustainable transport in Germany and the USA: A comparison of the Washington, DC and Stuttgart Regions. *International Planning Studies*, *20*(3), 292–312. https://doi.org/10.1080/13563475.2014.989820

Chan, R. Y., & Lau, L. B. (2002). Explaining green purchasing behavior: A cross-cultural study on American and Chinese consumers. *Journal of International Consumer Marketing*, *14*(2–3), 9–40. https://doi.org/10.1300/J046v14n02_02

Chatzidakis, A., Shaw, D., & Allen, M. (2018). A psycho-social approach to consumer ethics. *Journal of Consumer Culture*, 21(2), 123–145.

Chng, S., Abraham, C., White, M. P., Hoffmann, C., & Skippon, S. (2018). Psychological theories of car use: An integrative review and conceptual framework. *Journal of Environmental Psychology*, *55*, 23–33. https://doi.org/10.1016/j.jenvp.2017.10.009

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science*, *1*(3), 98–101. https://doi.org/10.1111/1467-8721.ep10768783

Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, *28*(15), 1429–1464. https://doi.org/10.1111/j.1559-1816.1998.tb01685.x

Consórcio Fênix. (2021). *Indicadores do Consórcio Fênix*. https://www.consorciofenix.com.br.

Corral-Verdugo, V., & Pinheiro, J. Q. (2009). Environmental psychology with a Latin American taste. *Journal of Environmental Psychology*, *29*(3), 366–374. https://doi.org/10.1016/j.jenvp.2008.10.007

D'Agosto, M. (2015). Eficiência e tecnologia no transporte de massa e transporte individual. *PINHEIRO, Armando Castelar; FRISCHTAK, Cláudio. Mobilidade Urbana: Desafios e Perspectivas para as Cidades Brasileiras. Rio de Janeiro: Elsevier. Cap*, *6*, 167–194.

de Groot, J. I., Schubert, I., & Thøgersen, J. (2016). Morality and green consumer behaviour: A psychological perspective. In D. Shaw, A. Chatzidakis, & M. Carrington (Eds.), *Ethics and morality in consumption* (pp. 89–106). Routledge.

de Haas, M., Faber, R., & Hamersma, M. (2020). How COVID-19 and the Dutch 'intelligent lockdown'change activities, work and travel behaviour: Evidence from longitudinal data in the Netherlands. *Transportation Research Interdisciplinary Perspectives*, *6*, 100150.

DETRAN. (2021). *Departamento Estadual de Trânsito de Santa Catarina*. https://www.detran-sc.gov.br

Elhoushy, S., & Lanzini, P. (2021). Factors affecting sustainable consumer behavior in the MENA region: A systematic review. *Journal of International Consumer Marketing*, *33*(3), 256–279.

EU (European Commission). (2013). *COM(2013) 913 final. A concept for sustainable urban mobility plans. Annex to together towards competitive and resource-efficient urban mobility.*

Fernandes, A. S. A., & de Araújo, S. M. V. G. (2015). A criação de municípios e a formalização de regiões metropolitanas: os desafios da coordenação federativa1. *Urbe. Revista Brasileira de Gestão Urbana*, *7*(3), 295–309.

Field, A. (2009). *Discovering statistics using SPSS: Introducing statistical method* (3rd ed.). Sage Publications.

Gardner, B., & Abraham, C. (2010). Going green? Modeling the impact of environmental concerns and perceptions of transportation alternatives on decisions to drive. *Journal of Applied Social Psychology*, *40*(4), 831–849. https://doi.org/10.1111/j.1559-1816.2010.00600.x

Gil, A., Calado, H., & Bentz, J. (2011). Public participation in municipal transport planning processes–the case of the sustainable mobility plan of Ponta Delgada, Azores, Portugal. *Journal of Transport Geography*, *19*(6), 1309–1319. https://doi.org/10.1016/j.jtrangeo.2011.06.010

Guagnano, G. A., Stern, P. C., & Dietz, T. (1995). Influences on attitude-behavior relationships. A natural experiment with curbside recycling. *Environment and Behavior*, *27*(5), 699–718. https://doi.org/10.1177/0013916595275005

Guilford, J. P., & Frucher, B. (1973). *Fundamental statistics in psychology and education*. MC Graw-Hill.

Hair, J. F., Babin, B. J., Money, A. H., & Samouel, P. (2005). *Fundamentos de Métodos de Pesquisa em Administração*. Bookman Companhia Ed.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall.

Hansen, C. J. (2011). The role of policy-making and planning cultures for sustainable transport. *European Transport*, *47*, 89–108.

Harrington, D., & Hadjiconstantinou, M. (2020). Changes in commuting behaviours in response to the COVID-19 pandemic in the UK. *Journal of Transport & Health*, 24, 101313.

Hoffmann, C., Abraham, C., White, M. P., Ball, S., & Skippon, S. M. (2017). What cognitive mechanisms predict travel mode choice? A systematic review with meta-analysis. *Transport Reviews*, *37*(5), 631–652. https://doi.org/10.1080/01441647.2017.1285819

Holden, E. (2016). *Achieving sustainable mobility: Everyday and leisure-time travel in the EU*. Routledge.

Holden, E., Gilpin, G., & Banister, D. (2019). Sustainable mobility at thirty. *Sustainability*, *11*(7), 1965. https://doi.org/10.3390/su11071965

IBGE. (2020a). *Instituto Brasileiro de Geografia e Estatística*. https://www.ibge.gov.br/cidades-e-estados/sc/florianopolis.html?

IBGE. (2020b). *Instituto Brasileiro de Geografia e Estatística*. https://www.ibge.gov.br/cidades-e-estados/sc.html

Junior, A. A. B., Faria, W. R., Proque, A. L., Perobelli, F. S., & de Almeida Vale, V. (2021). COVID-19, public agglomerations and

economic effects: Assessing the recovery time of passenger transport services in Brazil. *Transport Policy*, *110*, 254–272.

Klöckner, C. A., & Blöbaum, A. (2010). A comprehensive action determination model: Toward a broader understanding of ecological behaviour using the example of travel mode choice. *Journal of Environmental Psychology*, *30*(4), 574–586. https://doi.org/10.1016/j.jenvp.2010.03.001

Klöckner, C. A., & Matthies, E. (2009). Structural modeling of car use on the way to the university in different settings: interplay of norms, habits, situational restraints, and perceived behavioral control 1. *Journal of Applied Social Psychology*, *39*(8), 1807–1834. https://doi.org/10.1111/j.1559-1816.2009.00505.x

Klöckner, C. A., & Verplanken, B. (2018). Yesterday's habits preventing change for tomorrow? About the influence of automaticity on environmental behaviour. In Linda Steg & Judith I. M. de Groot (Eds.), *Environmental psychology: An introduction* (pp. 238–250). Wiley.

Lanzini, P. (2018a). *Responsible citizens and sustainable consumer behavior: New interpretive frameworks*. Routledge.

Lanzini, P. (2018b). The automotive industry and the increasing relevance of a consumer perspective: a research agenda. *International Journal of Automotive Technology and Management*, *18*(1), 46–58. https://doi.org/10.1504/IJATM.2018.090173

Lanzini, P., & Khan, S. A. (2017). Shedding light on the psychological and behavioral determinants of travel mode choice: A meta-analysis. *Transportation Research Part F: traffic Psychology and Behaviour*, *48*, 13–27. https://doi.org/10.1016/j.trf.2017.04.020

Lanzini, P., & Stocchetti, A. (2021). From techno-centrism to socio-centrism: The evolution of principles for urban sustainable mobility. *International Journal of Sustainable Transportation*, *15*(11), 815–825.

Le Pira, M., Ignaccolo, M., Inturri, G., Pluchino, A., & Rapisarda, A. (2016). Modelling stakeholder participation in transport planning. *Case Studies on Transport Policy*, *4*(3), 230–238. https://doi.org/10.1016/j.cstp.2016.06.002

Lessa, D. A., Lobo, C., & Cardoso, L. (2019). Accessibility and urban mobility by bus in Belo Horizonte/Minas Gerais–Brazil. *Journal of Transport Geography*, *77*, 1–10. https://doi.org/10.1016/j.jtrangeo.2019.04.004

Lima, G. C. L. D. S., Brizon, L. C., Dutra, J. C., & Varejão Neto, E. D. S. (2019). Objetivos de *política para a promoção da mobilidade sustentável*. https://ceri.fgv.br/publicacoes/objetivos-de-politica-para-promocao-da-mobilidade-sustentavel

Maltese, I., Gatta, V., & Marcucci, E. (2021). Active travel in sustainable urban mobility plans. An Italian overview. *Research in Transportation Business & Management*, *40*, 100621. https://doi.org/10.1016/j.rtbm.2021.100621

Mancha, R. M., & Yoder, C. Y. (2015). Cultural antecedents of green behavioral intent: An environmental theory of planned behavior. *Journal of Environmental Psychology*, *43*, 145–154. https://doi.org/10.1016/j.jenvp.2015.06.005

Meira, L. H., de Mello, C. A., Castro, Y. M., Oliveira, L. K., & Nascimento, C. D. O. L. (2020). Measuring social effective speed to improve sustainable mobility policies in developing countries. *Transportation Research Part D: Transport and Environment*, *78*, 102200. https://doi.org/10.1016/j.trd.2019.12.002

Mello, A., & Portugal, L. (2017). A procedure based on accessibility for the design of Strategic Urban Mobility Plans: the case of Brazil. *EURE (Santiago)*, *43*(128), 99–125. https://doi.org/10.4067/S0250-71612017000100005

Moller, R. (2006). *Transporte urbano y desarrollo sostenible en América Latina: el ejemplo de Santiago de Cali, Colombia*. Universidad del Valle.

Morren, M., & Grinstein, A. (2016). Explaining environmental behavior across borders: A meta-analysis. *Journal of Environmental Psychology*, *47*, 91–106. https://doi.org/10.1016/j.jenvp.2016.05.003

Orbell, S., & Verplanken, B. (2018). *Progress and prospects in habit research*. In Bas Verplanken (Ed.), *The psychology of habit* (pp. 397–409). Springer.

Oreg, S. (2003). Resistance to change: developing an individual differences measure. *Journal of Applied Psychology*, *88*(4), 680. 10.1037/0021-9010.88.4.680

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, *124*(1), 54–74. https://doi.org/10.1037/0033-2909.124.1.54

Pardo, C. F. (2009). *Los cambios en los sistemas integrados de transporte masivo en las principales ciudades de América Latina*. CEPAL: Colección Documentos de Proyectos.

Rogers, R. W., & Prentice-Dunn, S. (1997). Protection motivation theory. In D. S. Gochman (Ed.), *Handbook of health behavior research 1: Personal and social determinants* (pp. 113–132). Plenum Press.

Ronis, D. L., Yates, J. F., & Kirscht, J. P. (1989). Attitudes, decisions, and habits as determinants of repeated behavior. In A. R. Pratkanis, S. J. Breckler, & A. G. Greenwald (Eds.), *Attitude structure and function* (pp. 213–239).

Rubim, B., & Leitão, S. (2013). The urban mobility plan and the future of cities. *Estudos Avançados*, *27*(79), 55–66. https://doi.org/10.1590/S0103-40142013000300005

Sagaris, L. (2010). From sustainable transport development to active citizenship and participatory democracy: The experience of Living City in Chile. *Natural Resources Forum*, *34*(4), 275–288. https://doi.org/10.1111/j.1477-8947.2010.01312.x

Santos, G., Behrendt, H., & Teytelboym, A. (2010). Part II: Policy instruments for sustainable road transport. *Research in Transportation Economics*, *28*(1), 46–91. https://doi.org/10.1016/j.retrec.2010.03.002

Schiller, P. L., & Kenworthy, J. R. (2017). *An introduction to sustainable transportation: Policy, planning and implementation*. Routledge.

Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221–279). Academic Press.

Schwartz, S. H., & Howard, J. A. (1981). A normative decision-making model of altruism. In P. J. Rushton & R. M. Sorrentino (Eds.), *Altruism and helping behavior* (pp. 189–211). Hillsdale: Lawrence Erlbaum.

Scorrano, M., & Danielis, R. (2021). Active mobility in an Italian city: Mode choice determinants and attitudes before and during the Covid-19 emergency. *Research in Transportation Economics*, *86*, 101031. https://doi.org/10.1016/j.retrec.2021.101031

Sen, S., Du, S., & Bhattacharya, C. B. (2016). Corporate social responsibility: A consumer psychology perspective. *Current Opinion in Psychology*, *10*, 70–75. https://doi.org/10.1016/j.copsyc.2015.12.014

Shamshiripour, A., Golshani, N., Shabanpour, R., & Mohammadian, A. (2019). Week-long mode choice behavior: dynamic random effects logit model. *Transportation Research Record: Journal of the Transportation Research Board*, *2673*(10), 736–744. https://doi.org/10.1177/0361198119851746

Shanmugam, L., & Ramasamy, M. (2021). Study on mode choice using nested logit models in travel towards Chennai metropolitan city. *Journal of Ambient Intelligence and Humanized Computing*, *13*(1), 1–9.

Silva, G. P. D. (2018). *Percepção dos usuários sobre a qualidade dos transportes públicos no município de Florianópolis*. IFSC.

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, *29*(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004

Thomas, F. M., Charlton, S. G., Lewis, I., & Nandavar, S. (2021). Commuting before and after COVID-19. *Transportation Research Interdisciplinary Perspectives*, *11*, 100423.

Triandis, H. C. (1980). Values, attitudes, and interpersonal behavior. In H. Howe & M. Page (Eds.), *Nebraska symposium on motivation 1979* (pp. 195–295). University of Nebraska Press.

van Wee, B., & Witlox, F. (2021). COVID-19 and its long-term effects on activity participation and travel behaviour: A multiperspective view. *Journal of Transport Geography*, *95*, 103144.

Vasconcelos, E. A. (2019). Mobilidade urbana em Curitiba – os limites do sonho. *Revista Dos Transportes Públicos – ANTP*, *41*(1), 7–24.

Venter, C., Mahendra, A., & Lionjanga, N. (2021). Urban expansion and mobility on the periphery in the global South. In C. Mulley & J. D. Nelson (Eds.), *Urban form and accessibility* (pp. 243–264). Elsevier.

Verplanken, B. (2012). Old habits and new routes to sustainable behaviour. In L. Whitmarsh, I. Lorenzoni, & S. O'Neill (Eds.), *Engaging the public with climate change: Behaviour change and communication* (pp. 17–30). Routledge.

Verplanken, B., & Aarts, H. (1999). Habit, attitude, and planned behaviour: is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology*, *10*(1), 101–134. https://doi.org/10.1080/14792779943000035

Verplanken, B., Aarts, H., Knippenberg, A., & Moonen, A. (1998). Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology*, *37*(1), 111–128. https://doi.org/10.1111/j.2044-8309.1998.tb01160.x

Verplanken, B., & Orbell, S. (2003). Reflections on past behavior: A self-report index of habit strength 1. *Journal of Applied Social Psychology*, *33*(6), 1313–1330. https://doi.org/10.1111/j.1559-1816.2003.tb01951.x

Verplanken, B., Walker, I., Davis, A., & Jurasek, M. (2008). Context change and travel mode choice: Combining the habit discontinuity and self-activation hypotheses. *Journal of Environmental Psychology*, *28*(2), 121–127. https://doi.org/10.1016/j.jenvp.2007.10.005

Wood, W., Tam, L., & Witt, M. G. (2005). Changing circumstances, disrupting habits. *Journal of Personality and Social Psychology*, *88*(6), 918.

Wu, X., Ramesh, M., Howlett, M., & Fritzen, S. (2014). *Guia de políticas públicas: gerenciando processos*. ENAP.

Yañez-Pagans, P., Martinez, D., Mitnik, O. A., Scholl, L., & Vazquez, A. (2019). *Sistemas de transporte urbano en América Latina y el Caribe. BID. Serie de Desarrollo a través del Sector Privado. September, 2018. Reviewd version, 2019.*

Zawieska, J., & Pieriegud, J. (2018). Smart city as a tool for sustainable mobility and transport decarbonisation. *Transport Policy*, *63*, 39–50. https://doi.org/10.1016/j.tranpol.2017.11.004

Zhao, X., Ke, Y., Zuo, J., Xiong, W., & Wu, P. (2020). Evaluation of sustainable transport research in 2000–2019. *Journal of Cleaner Production*, *256*, 120404. https://doi.org/10.1016/j.jclepro.2020.120404

Appendix

Regression analysis (intentions)

TPB		B	S.E.	Wald	df	Sig.	Exp(B)	Nagelkerke R Square	P(Y = 1) when all X = 0	P(Y = 1) when all X = 1
	ATT	,809	,246	10,840	1,000	,001	2,245			
	SN	-,197	,291	,458	1,000	,499	0,821			
	PBC	1,261	,246	26,379	1,000	,000	3,530			
								,157	17,08%	57,28%
TPB + Habits										
	ATT	,943	,279	11,.445	1,000	0,01	2,568			
	SN	,198	,333	,353	1,000	,553	1,219			
	PBC	1,216	,278	19,180	1,000	,000	3,375			
	Habits	1,794	,233	59,355	1,000	,000	6,013			
								,355	77,14%	99,54%
NAM										
	AC	,478	1,233	,150	1,000	,698	1,612			
	AR	,911	,690	1,745	1,000	,186	2,488			
	PN	-,166	,336	,244	1,000	,621	0,847			
								,007	18,32%	43,24%
NAM + Habits										
	AC	-,338	1,238	,075	1,000	,785	0,713			
	AR	,932	,748	1,555	1,000	,212	2,540			
	PN	-,158	,375	,179	1,000	,672	0,854			
	Habits	1,951	,228	73,384	1,000	,000	7,036			
								,251	46,05%	90,28%

Regression analysis (behaviors)

		B	S.E.	Wald	df	Sig.	Exp(B)	Nagelkerke R Square	P(Y = 1) when all X = 0	P(Y = 1) when all X = 1
TPB beh										
	ATT	,098	,228	,183	1,000	,669	1,103			
	SN	-,049	,265	,034	1,000	,853	0,952			
	PBC	,903	,223	16,452	1,000	,000	2,468			
								,062	40,18%	63,50%
TPB + Habits										
	ATT	-,024	,253	,009	1,000	,924	0,976			
	SN	,188	,302	,385	1,000	,535	1,206			
	PBC	,660	,248	7,089	1,000	,008	1,936			
	Habits	2,090	,247	71,776	1,000	,000	8,085			
								,296	65,94%	97,27%
NAM										
	AC	5,547	1,232	,197	1,000	,657	0,579			
	AR	-,965	,689	1,961	1,000	,161	0,381			
	PN	,072	,336	,046	1,000	,831	1,075			
								,008	83,34%	54,25%
NAM + Habits										
	ATT	−1,362	1,237	1,212	1,000	,271	0,256			
	SN	−1,341	,743	3,258	1,000	,071	0,262			
	PBC	,162	,383	,179	1,000	,672	1,176			
	Habits	2,213	,251	77,500	1,000	,000	9,139			
								,285	54,04%	45,85%