



Unconventional green transport innovations in the post-COVID-19 era. A trade-off between green actions and personal health protection

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ABSTRACT

Irrefutable evidence attributes environmental challenges, such as air and noise pollution, to unsustainable transportation, especially in urban settings. In this context, urban public transport is a sustainable mobility system with ecological benefits. However, limited research focuses on understanding the factors that promote urban public transport adoption in the face of disruptive events, such as the COVID-19 pandemic. This study integrates the push-pull-mooring (PPM) model and institutional theory to examine urban commuters' intentions to switch to urban public transport in the post-COVID-19 era. This study is the first to investigate the trade-offs consumers perceive between green actions and personal health protection in the COVID-19 context. Our results indicate that regulative and normative environments, public transport's economic viability and commuters' pro-environmental concerns and identities significantly influence their intentions to switch to public transportation. Furthermore, hygiene concerns and choice uncertainty partially moderate the tested associations. The study thus provides unique insights into the nuances of individual decision-making regarding public transport use. Leveraging our findings, we present implications for theory and practice. We also offer a possible framework for classifying consumers of green urban public transport, which can be used to create targeted communication to encourage commuters to switch to routine public transport use for sustainability and environmental protection.

1. Introduction

The COVID-19 pandemic has established a new normal for urban life (Lee et al., 2020). The pandemic has affected travel behaviour and transport choices at the community and individual levels, causing an unprecedented decline in urban public transport (Suess et al., 2022). Among various forms of travel, however, public transportation infrastructure experienced an especially ferocious decline (Campisi et al., 2020), with health experts worldwide recommending pandemic control measures, such as social distancing and working from home (H. Dong et al., 2021). These measures and rapid responses to prevent the pandemic's spread significantly affected the utilisation of urban public

transportation (or green mobility; Eriksson & Forward, 2011). These measures also reshaped the travel behaviour of commuters who turned away from public transport to avoid exposure to COVID-19 (Yau et al., 2020) and address their fear of infection (Przybylowski et al., 2021). Indeed, commuters have adopted strict preventive measures to avoid personal exposure (Mouratidis et al., 2021) and conform to regulatory directives (Jenelius & Cebecauer, 2020).

Among developing countries, for example, China has faced a 50.9 % decline in passengers for public transport (Cui et al., 2021) while, in India, 35 % of the commuters indicated a change in their mode of transportation in the post-COVID-19 era (Singh et al., 2020). Similar trends are also evident in developed economies. Finland experienced a

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40 to 60 % decline in public transport ridership across different regions (Tiikkaja & Viri, 2021), while Sweden reported a similar percentage decline in public transport use compared to other forms of commuting, i.e. mobility. Unfortunately, these reductions in public transport use, even as the world recovers from the pandemic, have raised the spectre of reversing the sustainability-related gains associated with public transport use (Campisi et al., 2020). The curtailed use of public transport raises significant implications for environmental protection because public transport significantly reduces energy consumption and carbon emissions that damage the environment (Sajjad, Chu et al., 2020).

While relevant stakeholders, especially in urban settings, emphasise green mobility, evidence indicates that COVID-19 has negatively affected green mobility initiatives in many countries (Bhaduri et al., 2020). The pandemic's effects have thus called the future of green mobility and the use of public transport into question (Singh et al., 2020), thus raising significant concerns for individual well-being (Molina et al., 2020). Scholars have highlighted the need to understand the pandemic's influence on the use of public transport and the personal health and safety-induced behavioural changes in individuals' evaluations of this commuting option (e.g. see Jenelius & Cebecauer, 2020).

Recent studies have attempted to answer these calls. However, their focus has been limited to explicating nuances in commuters' attitudes, habits and tendencies to avoid health and safety risks (Awad-Núñez et al., 2021; Beck & Hensher, 2020; Cui et al., 2021; H. Dong et al., 2021). We assert that scholars must broaden such investigations to consider the environmental conditions, personal beliefs (e.g. green identity) and economic concerns arising from the loss of income and livelihood during pandemic-related lockdowns. In addition to the fear and risk of infection highlighted in prior studies, we contend that these factors can also impact individuals' choices to commute via public transport. It is, moreover, imperative to understand whether, and if so, how the pandemic has changed commuters' consideration of the 'green behaviour' (Davis et al., 2020) aspect of public transport use (C. Zhang et al., 2019) because such changes entail implications for green mobility initiatives. For example, Shokouhyar et al. (2021) recommended that similar empirical studies provide evidence-based policy feedback to support authorities in maintaining environmental sustainability efforts in light of prevailing crises and health risks.

This study aims to address the above research gaps by adopting two robust theoretical frameworks—institutional theory and the push-pull-mooring framework—to understand commuters' intentions to use public transport. We simultaneously focus on personal (i.e. green self-identity and affordability) and institutional (i.e. regulative and normative environment) factors' influence on individuals' intentions to switch to public transport use in the post-pandemic context where health concerns and uncertainty remain viable concerns. We address two research questions (RQs): **RQ1**. What is the role of the individual (i.e. affordability), pro-environmental (i.e. green self-identity) and institutional factors in explaining commuters' intentions to switch to public transport after the COVID-19 pandemic? **RQ2**. How do health concerns (i.e. hygiene concerns) and psychological beliefs (i.e. choice uncertainty) affect the association between the abovementioned factors and consumers' switching intentions towards public transport after the COVID-19 pandemic?

To answer these RQs, we collected cross-sectional data from 668 commuters based in the United States and analysed the data through structural equation modelling (SEM). Our study makes novel contributions at the intersection of environment, transportation and public policy by focusing on public transport, which has been promoted as a green solution to urban transportation challenges. Additionally, we contribute to three broader ongoing debates: (a) whether pro-environmental factors remain as influential in predicting the use of public transport as a mode of green mobility as they were in the pre-COVID-19 era; (b) how individual and institutional factors induce changes in public transport use amidst the health risks prevalent in the

post-COVID-19 era and among other mobility choices; (c) the extent to which perceived health concerns and choice uncertainty predict commuters' switching intentions towards public transport. Ultimately, our study has the potential to contribute to redesigning or even proposing new strategic initiatives to make public transport sustainable in the post-COVID-19 era.

The following section reviews the relevant literature. Section 3 discusses the conceptual framework and hypotheses tested in our study. Our methodology is detailed in Section 4, while Section 5 analyses the results. Next, we discuss our study's findings and practical and theoretical implications in Section 6. We present our concluding remarks in the last section, along with the study's limitations and future research avenues to extend our work.

2. Public transport and the COVID-19 pandemic

Compared to private mobility options, public transport (or shared/green mobility) significantly improves environmental degradation and supports sustainability efforts (Donald et al., 2014). Previous studies have confirmed that environmental factors are significantly related to commuters' attitudes towards public transport (Sajjad, Chu et al., 2020) and changes in commuters' behaviours (i.e. reductions in car use; Y. Zhang et al., 2020). Such environmental factors thus play a decisive role as a pro-social motivation towards public transport adoption.

Our review of the prior literature on public transport indicates that a handful of preliminary studies have examined the significant role of commuters' risk perception on their attitudes and intentions towards public transport. Risk refers to the possibility of event occurrence and related consequences of these events' severity (Becker et al., 2014). For example, Roche-Cerasi et al. (2013) found that commuters considered public transport riskier than private transport. Similarly, Lund et al. (2016) identified urban commuters' risk perception as a significant factor impacting their travel mode choices in urban areas.

The COVID-19 pandemic has, however, induced various behavioural changes in inter- and intra-city travel despite travel restrictions (Yau et al., 2020) implemented to protect travellers from the risk of exposure. The pandemic has prompted individuals to alter their attitudes (Blustein et al., 2020), travel rationales, and adopt measures to prevent exposure and infection (Jittrapirom & Tanaksaranond, 2020). For example, commuters who have continued travelling during the pandemic perceive that vehicles with good ventilation pose a lower risk of infection. If such options are not available, these consumers prefer private rides or active transportation modes (Das & Ramachandran, 2021). In attempting to reduce the spread of COVID-19, restrictive policy measures strongly discouraged public transport use globally (Tirachini & Cats, 2020). Consequently, the use of private transportation modes surged by as much as 84.5 % (Singh et al., 2020). Meanwhile, the use of shared mobility modes declined during the COVID-19 pandemic by 35 % from pre-COVID-19 levels (Campisi et al., 2020). Shakibaei et al. (2021) linked the decline in public transport use with commuters' preference to travel in private cars for limited social, recreational and leisure activities. Beck and Hensher (2020) also observed a decline in public transport use and a sharp increase in active modes of transportation. Thus, multiple studies have reported the significant impact of COVID-19 on public transport. Table 1 briefly reviews these studies.

3. Theoretical framework and hypotheses development

This study employs the theoretical lens of the push-pull-mooring framework, which is rooted in migration theory. The push-pull-mooring framework enables scholars to study individuals' movement between places (i.e. leaving the current location for a new site) at a particular time (Sajjad, Asmi et al., 2020). Push factors promote migration from the current location, whereas pull factors attract individuals to the new site (Jung et al., 2017). However, scholars reason that migration is a complex phenomenon that cannot be fully explained

Table 1

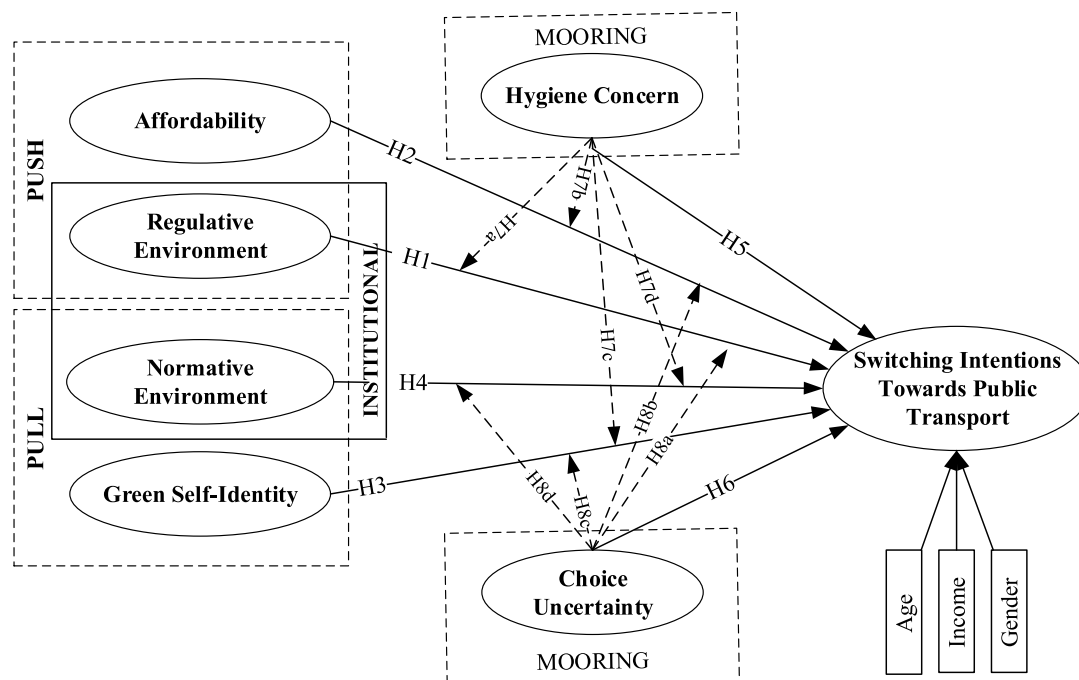
Brief review of the impact of COVID-19 on public transport.

Study	Study timeline	Region	Method	Key findings
Bhaduri et al., 2020	March and April 2020	India	Multiple discrete choice extreme value method	In a significant behavioural shift from the pre-COVID era, commuters prefer private cars to shared modes of mobility. Consumers' high fear of infection on public transport is accompanied by other situational factors—e.g. a 26 % decrease in discretionary activities.
Shakibaei et al., 2021	Early stages of the pandemic	Turkey	Longitudinal panel data and descriptive analysis	Self-regulation and governmental measures are reducing public transportsocial, recreational and leisure activities, while car use is increasing in urban areas.
J. Zhang et al., 2021	Second quarter of 2020	Worldwide	Expert survey designed to collect views on COVID impact on transport	A significant shift in transport choices from public to private vehicles has necessitated increasing risk communication. Sustainability will improve in the future if effective behavioural interventions support it.
Przybylowski et al., 2021	Pre-pandemic and during the pandemic	Poland	Heuristic methods and diagnostic survey method	Forty-four% of the respondents engaged in limited public transport use, 49 % had stopped travelling, and 22 % had shifted their primary travelling mode to private cars. Interestingly, 75 % intended to use public transport after the pandemic.
Cui et al., 2021	First quarter of 2020	China	Economic impacts through CGE model	The transport sector has experienced severe shocks with a significant decline in output between 1.03 and 2.85 %, while the passenger transport sector has declined by 3.08–11.44 %
Awad-Núñez et al., 2021	Second quarter of 2020	Spain	Explorative survey and binary logit framework	Respondents with higher incomes prefer private cars. Older people are more likely to adopt sustainable mobility modes.
Luan et al., 2021	June 2020	China	Willingness questionnaires targeted towards various cohorts with RRM model	Commuters tend to utilise private cars for short-distance travel while preferring metro transport for long distances. A sharp increase in electric two-wheelers is also evident. Commuters' willingness to use public transportation is expected to rebound.
Eisenmann et al., 2021	April 2020	Germany	Self-assessment survey	Only 13 % of the respondents reported using public transport. Two-thirds of the respondents noted that inconvenience in using public transport had increased their use of private cars.
H. Dong et al., 2021	March 2020	China	Cross-sectional survey and model-based statistical analysis	Commuters' perceptions about public transport safety enhance satisfaction, while state anxiety negatively influences safety and increases due to perceived psychological closeness to COVID-19. Public knowledge is important for increasing the adoption of preventive measures.
Das & Ramachandran, 2021	2020	India	Equation-based risk estimator measuring average exposure concentration	Commuters prefer modes of transport with high ventilation over other transport modes. Shared mobility modes with air conditioning have a higher infection rate than non-air-conditioned modes of shared mobility.

through push and pull factors alone (Moon, 1995). Thus, other intervening factors (i.e. situational factors), termed mooring factors, are required to explain and understand the phenomenon of migration (Moon, 1995).

Switching refers to an individual's shift between two options based on socio-economic, psychological, institutional and contextual factors

(Sajjad, Chu et al., 2020). Switching between two products, for example, involves the complete or partial replacement of the original product with available substitutes that better serve the individual's critical needs (Bhattacharjee et al., 2012). Further, Peng et al. (2016) indicate that the online switching behavior of consumers can be considered a form of physical migration. Thus, the push-pull-mooring framework can explain

**Fig. 1.** Proposed model to study public transport switching intentions.

individuals' switching intentions between services or products and their migration decisions (Bansal et al., 2005). For example, this framework has been used to analyze patients' switching from traditional healthcare to cloud healthcare (Lai et al., 2012), consumers' multi-channel switching, their free-riding behaviour (Chou et al., 2016) and their switching between various cloud storage services (Y. Sun et al., 2017).

The push-pull-mooring framework helps to explain the effect of socio-economic, political, demographic, psychological and environmental factors on individual decisions. This framework has produced robust results when individuals encounter situations where they must choose between mobility and vulnerability (Black et al., 2013), such as in the COVID-19 context. Thus, we believe this framework is well suited to studying public transport switching behaviour in the post-COVID-19 context.

To enhance the novelty of the proposed conceptual model (see Fig. 1), we integrate institutional theory with the push-pull-mooring framework. We utilise this hybrid theoretical lens to examine the external environmental factors that shape public transport switching intentions. The institutional theory examines the influence of regulative and normative environments on social behaviour (Christensen et al., 1997). Furthermore, it postulates acceptability and solidity through regulative, normative and cognitive perspectives (Palthe, 2014). These three perspectives can influence individuals' actions and decision-making processes in any socio-economic environment. The regulative environment entails rules and processes that are more explicit and formal. In contrast, the normative environment encompasses informal rules imposed upon individuals to restrict their behaviour as a social obligation (Palthe, 2014). The cognitive environment, finally, represents wider beliefs, the sense of who an individual is and the actions in which they engage. Because our model adopts green self-identity as an individual's description of him or herself as environmentally friendly, it only includes institutional theory's notions of institutional and normative environments. Scholars have suggested the influential role of institutional factors in better understanding green entrepreneurial switching intentions (Ye et al., 2020) and green vehicle switching intentions (Sajjad, Chu et al., 2020).

The push-pull-mooring model does not propose fixed variables as push, pull and mooring components. Rather, the model allows scholars to select theoretically meaningful variables for the particular context under study (Bansal et al., 2005). Li (2018) suggested that categorising a factor as a pull or push factor depends upon the significance of the factor concerning the destination or origin in a context (Bansal et al., 2005). Leveraging this flexibility and based on the institutional response to the pandemic, we conceptualise the regulative environment (i.e. an institutional factor) and affordability (i.e. an individual belief) as push factors and the normative environment (i.e. an institutional factor) and green self-identity (i.e. a pro-environment belief) as pull factors. We further propose choice uncertainty (i.e. a psychological belief) and commuters' hygiene concerns (i.e. health concerns) as contingent boundary conditions (i.e. mooring factors). We believe that the comprehensiveness of our framework strengthens its explanatory power and enriches the existing literature on public transport switching behaviour. Fig. 1 and Table 2 present the proposed model and its measures, respectively.

3.1. Push factors

Policymakers can increase the appeal of public transport by highlighting its economic and environmental value (Sohail et al., 2006). Consequently, scholars have suggested the influence of the regulative environment (Huang et al., 2017) and affordability (Sovacool et al., 2019) in motivating commuters to switch to public transport. In the post-COVID-19 era, when old routines, including increased mobility, will resume and regulatory authorities refocus on urban environmental problems, these attributes can compel commuters to switch from private to public modes of transport.

Table 2

Descriptions and definitions of study variables.

Theory component	Definition	Variable	Context-specific definition
Push	These are compelling factors that stimulate consumers' switching behaviours based on products or services' current attributes or characteristics (Moon, 1995).	Affordability	The financial capability to traverse the geographical distances required to reach the office, school, health and other social or personal proceedings (Litman, 2013). For example, scholars have reasoned that public transport offers economical to travel with affordable prices (i.e. in ride /bike shares, etc.; Donald et al., 2014).
		Regulative environment	The set of regulatory policies, initiatives and measurable actions undertaken by governments or institutions to plan, develop and improve the use of public transport (Sajjad, Chu et al., 2020). Scholars have suggested that the regulative environment can restrict or encourage commuters' behaviour (Sajjad, Chu et al., 2020).
Pull	These are attributes that positively influence or appeal to individual intentions to switch towards another product and service (Lai et al., 2012).	Green self-identity	The extent to which individuals describe themselves as an environmentally responsible persons (Arli et al., 2018). Commuters with a strong green self-identity identify themselves as green consumers and are internally motivated to perform green actions—e.g., switch to public transport (Trivedi et al., 2015) and thereby mitigate urban environmental issues.
		Normative environment	The influence of significant others from peers and family groups, whom an individual perceives to use or be inclined to use green products or services (Mohd Suki, 2016). Switching to public transport will increase when commuters inhabit a normative environment that encourages pro-environmental behaviour (Sajjad, Chu et al., 2020).
Mooring	These are contextual and situational factors that facilitate or restrict any switching decision (Moon, 1995).	Hygiene concerns	The fear of getting COVID-19 infection from high-touched public transport (Jiayun et al. 2020). Commuters have

(continued on next page)

Table 2 (continued)

Theory component	Definition	Variable	Context-specific definition
		Choice uncertainty	significant health concerns due to varied opinions regarding COVID-19 transmission in closed environments with improper ventilation. These concerns can affect commuters' decisions to switch to shared mobility—e.g. public transport (Das & Ramachandran, 2021). Choice uncertainty in decisions is high when the attributes of the alternatives appear dissimilar—e.g. when commuters must choose between public and private transport (Ghiassaleh et al., 2020). Choice uncertainty reflects the extent to which an individual believes in and understands the information (Machina, 2006), which is leveraged to inform their choice of transportation modes in the context of their pandemic-related fears.

Gijsenberg and Verhoef (2019) found that an effective regulative environment can stimulate public switching towards public transport. Scholars have also reported that the regulative environment, including driving restrictions, congestion bills and parking fees, was influential in averting new car purchases and encouraging the switch towards green transport (Huang et al., 2017; Sajjad, Chu et al., 2020). C. Sun et al. (2014) recommended that the regulative environment focuses on investing in the public transport sector to encourage green mobility while also strengthening vehicle emission standards. Similarly, Mouratidis et al. (2021) suggested that making green mobility options, such as public transport, cycling and ride-sharing, readily available to commuters can increase the adoption of public transport. However, any regulative strategy aimed at increasing public transport adoption requires the support of environmental and health-focussed communication between regulators and commuters (Liu & Cirillo, 2018). Health-focussed communication becomes essential when society faces disruptive events, such as the COVID-19 pandemic. Consistent with this contention, Xie et al. (2018) asserted the regulative environment's influential role in developing the public transport ecosystem during disruptive events. Based on this discussion, the current study hypothesises a positive association between the regulative environment and commuters' switching intentions towards public transport.

H1. The regulative environment is positively associated with commuters' switching intentions towards public transport.

Public transport is affordable and sustainable and offers flexible access for commuters travelling in urban areas (Mouratidis et al., 2021). The affordability of such transport options can affect commuters' freedom to move, and the unavailability of such affordability can lead to income-based exclusion and inequality (Sovacool et al., 2019) among commuters. Indeed, the extant evidence suggests that transportation affordability is a significant obstacle to commuters' decisions to adopt public transport (Falavigna & Hernandez, 2016). Affordability refers to an alignment among the cost of transportation (i.e. public transport

fare), services and a commuter's income (Litman, 2013). Commuters are likely to opt for public transport over personal transport when the alignment between public transport costs and consumer income is strong (Litman, 2013), and the economic affordability factor of public transport can compel commuters to switch from private to public transport (Sohail et al., 2006). Green commuting establishes the pro-social intentions and reflects financial and resource affordability without any negative impact on fitness (Elliott, 2013), or consumers' ability to bear costs. Singer (2021) indicates that individuals' transportation costs are often seen as a trade-off for lifestyle preferences and comprised to manage household expenses. Thus, we suggest that the financial affordability of transportation continues to play a significant role in commuters' adoption of public transport. Therefore, we propose the following hypothesis:

H2. Affordability is positively associated with commuters' switching intentions towards public transport.

3.2. Pull factors

Self-identity refers to the effect of the social and personal identity that defines a person (Dermoddy et al., 2018) on their consumption decisions. Self-identity includes consumers' motivation to maintain their identities when consuming (X. Dong et al., 2018). Similarly, green self-identity, which refers to a commuter's overall perceived identification with the typical green consumer, is closely related to various pro-environmental actions, such as responsible shopping, green transport use, energy conservation and recycling behaviour (Bradley et al., 2020; Ockwell et al., 2009). Commuters travelling via public transport seek to maintain their green self-identity and relate themselves with similar others (X. Dong et al., 2018). Given this interrelatedness, scholars have highlighted the influential role of green self-identity and a supportive normative environment (Neys et al., 2014) on consumers' tendency to perform pro-environmental behaviours—e.g. switching to public transport. In the post-pandemic era and in the context of a normative environment that encourages green actions, these factors are likely to pull commuters towards public transport by enabling them to mitigate transport-related environmental issues and thereby maintain their green identities.

Prior research has demonstrated that green self-identity facilitates consumers' purchase and adoption of eco-friendly and sustainable products (Y.-S. Chen et al., 2014; Guo et al., 2019). Pawaskar et al. (2020) suggested that green self-identity positively influences consumers' behavioural intentions towards responsible consumption—e.g. public transport. Transport-related research has also underscored the role of consumers' identification and intrinsic motivation in protecting the environment via public transport adoption (De Vos et al., 2020). Thus, we propose that commuters with a strong green self-identity are likely to switch towards public transport because they consider it a green action and a sustainable way to commute.

H3. Green self-identity is positively associated with commuters' switching intentions towards public transport.

The normative environment—called social influence—is a strong predictor of human decision-making both social influence in the Northern and Southern hemispheres (Páez et al., 2008; Sreen et al., 2018). Prior scholarly work has suggested the normative environment's positive influence on individuals' decisions to purchase and consume green products (Mohd Suki, 2016). Norms are categorised into descriptive and injunctive (Thøgersen, 2006), with these dimensions indicating what the majority of the public does and what should be done, respectively (Sajjad et al., 2020). Manca et al. (2019) confirmed the influence of these normative influences on travel choice behaviour, and Ye et al. (2020) indicate that the normative environment significantly increases an individual's willingness to engage in green behaviour (e.g. public transport adoption). While the US is considered an individualistic society, the pandemic has forced individuals to act collectively. In this context, societal awareness has the potential to alter individual attitudes and behaviour towards green transportation (Sajjad, Chu et al., 2020).

To examine the normative environment as an antecedent of behavioural change, we rely on Axsen and Kurani's (2012) behavioural framework, which refers to reflexive layers of influence. This behavioural framework highlights the connections between social interaction processes and individual layers to explain switching intentions adequately. Thus, we propose the following hypothesis:

H4. The normative environment is positively associated with commuters' switching intentions towards public transport.

3.3. Mooring factors

The prior transport literature suggests the influence of commuters' choices (Shatu et al., 2019) and health-related risks (H. Dong et al., 2021) on commuters' public transport use. Conflicting information regarding the impact of proximity among public transport passengers on COVID-19 transmission has heightened uncertainty and exacerbated commuters' health concerns (Bhaduri et al., 2020). Therefore, the current study integrates choice uncertainty and hygiene concerns as mooring factors that may affect public transport switching intentions.

Uncertainty in choices and outcomes can be objective and subjective, reflecting various fixed outcomes and an individual's beliefs and scope of understanding, respectively (Machina, 2006). D'Amico et al. (2020) suggested that people tended to seek additional information to reduce the uncertainty and various types of risk they encountered in their daily lives during the pandemic. The desired and obtained information used to make decisions (Zhou et al., 2019) can potentially create psychological distance and push consumers with a prevention focus to reduce decisional risks (Ghiassaleh et al., 2020). Scholars have observed that when commuters make decisions after seeking additional information, they are likely to face choice uncertainty (Shatu et al., 2019). Furthermore, choice uncertainty in decisions increases when the attributes of alternatives appear dissimilar—e.g. when commuters must choose between public and private transport (Ghiassaleh et al., 2020). Based on these studies, we examine choice uncertainty's direct influence on switching intentions towards public transportation and its moderating effect on the associations between push factors, pull factors and switching intentions towards public transport.

The highly contagious nature of COVID-19 has increased commuters' and the general public's hygiene standards (Fa-Chun et al. 2020). Noting public transportation's poor air ventilation and recirculating indoor air, which significantly increases the potential of COVID-19 transmission, public transport commuters express significant hygiene concerns (Das & Ramachandran, 2021; Jianyun et al. 2020). Scholars have identified good hygiene as an essential step towards staying protected (i.e. healthy), especially during the current pandemic (Wang et al., 2020). Individuals thus tend to avoid sharing resources, maintain the advised distance and wear masks while commuting (Tan et al., 2020; Machida et al., 2020). Scholars have also noted a high fear of COVID-19 infection among commuters on public transport (Bhaduri et al., 2020). Influenced by this fear, commuters prefer modes of transportation with increased ventilation because they believe that such environments protect them from exposure (Das & Ramachandran, 2021). Therefore, health concerns can be considered influential in explaining commuters' decisions to utilise public transport (Wu et al., 2020). The current study proposes to examine hygiene concerns' direct influence on commuters' switching intentions towards public transportation and these concerns' moderating effect on the associations of push and pull factors with switching intentions towards public transport.

H5. Hygiene concerns are negatively associated with commuters' switching intentions towards public transport.

H6. Choice uncertainty is negatively associated with commuters' switching intentions towards public transport.

H7a–d. Choice uncertainty and hygiene concerns moderate the associations between push factors and commuters' switching intentions towards public transport.

H8a–d. Choice uncertainty and hygiene concerns moderate the

associations between pull factors and commuters' switching intentions towards public transport.

4. Data and methods

4.1. Data collection

We used a survey questionnaire to measure the variables and test our proposed model. We collected 668 valid responses through a survey conducted via *Prolific Academic*, a high-quality platform for recruiting research participants from diverse demographic groups (Chotpitayasu-nondh & Douglas, 2018; Kaur et al., 2021). With its rapid speed of data collection and customisable features, the *Prolific Academic* platform provides access to potential research participants that meet each research project's specific needs (Kaur et al., 2021). Previous studies have reported using *Prolific Academic* to gather data from geographically and demographically targeted samples (Tandon, Dhir et al., 2022). We drew our respondents from metropolitan areas in the United States of America (US). We chose this study context for two reasons: (a) public transportation in US metropolitan areas offers commuters a variety of options, including buses, light rail, subways, trains, trolleys and ferries, and (b) investment in public transport infrastructure in the US provides substantial economic and health safety benefits for the government and the public (APTA, 2020).

We recruited respondents from *Prolific Academic* using two screening criteria based on our study's objectives: (a) the respondents were living in US metropolitan areas, and (b) the respondents owned and used a private vehicle as their primary mode of transportation. We informed the respondents at the beginning of the survey that their participation was voluntary and anonymous. We also assured them that we would not retain personal information and would use the collected data solely for academic purposes. By communicating this information to the participants, we sought to counteract potential social desirability bias. Because we sought to measure commuters' switching intentions from private to public modes of transportation, we did not need to ensure their previous use of public transportation.

4.2. Instrument

We assessed the respondents' socio-demographic background (i.e. age, gender and household income) using questions with an ordinal scale and pre-determined classifications (see Table 3). We adapted well-established scales and items to measure the primary variables under study (see Table 4 for items). The respondents rated their answers to the individual items on a five-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Having adapted the items to suit our study context, we approached three marketing, public health and environmental psychology experts to gauge the developed instrument's face and content validity. The experts suggested minor modifications in the sentence structure and wording of seven items, which we incorporated to ensure their validity. In addition, we conducted a pilot study with ten respondents representing the target population further to assess the modified instrument's clarity and face validity. The pilot study confirmed that the items were clear and valid in the present context. Table 3 reports the respondents' demographic profile.

5. Findings

5.1. Normality testing, multicollinearity and common method bias

We examined the normality of the data by calculating the skewness and kurtosis scores for the various measurement items. Both the skewness and kurtosis values were within the suggested threshold limits. We then tested for multicollinearity by computing the variance inflation factor (VIF) scores, which fell between 1.03 and 1.16. Finally, we performed Harman's single-factor analysis to check for common method

Table 3

Descriptive profile of the study respondents.

Demographics	Detail	Percentage	Frequency
Gender	Male	46.3	309
	Female	53.7	358
Age	20 years or younger	5.7	38
	21–25 years	43.3	289
	26–30 years	22.0	147
	30–35 years	12.9	86
	35–40 years	7.3	49
	40–45 years	5.2	35
	45–50 years	2.7	18
	50 years or older	0.7	5
Income	Below \$10,000	25.8	172
	\$10,000–\$29,999	18.1	121
	\$30,000–\$49,999	18.0	120
	\$50,000–\$69,999	19.5	130
	\$70,000–\$89,999	7.8	52
	Greater than \$90,000	10.7	71
Education	High school diploma or less	13.1	88
	Some college	22.8	152
	Bachelor's degree	36.1	241
	Master's degree	22.5	150
	Professional degree	3.0	20
	Doctorate	2.4	16
COVID-19 disturbed my regular transport preference.	Yes	40.4	270
	No	59.4	397
Environmental concerns affect my daily activities	Yes	69.5	464
	No	30.4	203

bias (Podsakoff et al., 2003). The maximum variance extracted from a single construct was 17.91 %, below the upper cut-off limit of 50 % recommended by Podsakoff et al. (2003). Therefore, we determined that the data were normally distributed and free from multicollinearity and common method bias.

5.2. Measurement model assessment

Using SPSS AMOS v.26, we performed a confirmatory factor analysis (CFA) to examine the measurement model by computing the factor loadings of each item (see Table 4). The CFA revealed the measurement model's acceptable goodness-of-fit indices (chi-square (X^2)/degree of freedom (df) = 1.60, CFI = 0.98, TLI = 0.98, RMSEA = 0.03). Specifically, we evaluated the validity and reliability of the constructs using the factor loadings, composite reliability (CR) and average variance extracted (AVE) values. The factor loadings were between 0.56 and 0.96, thus exceeding the lower cut-off of 0.50 (Ahmadreza et al., 2021). The measures' AVEs were between 0.51 and 0.84 and thus above the acceptable value of 0.50 (Fornell & Larcker, 1981). Finally, the CR values ranged from 0.72 to 0.95 and were thus well above the recommended cut-off of 0.70 (Hair et al., 2010). Based on this evidence, we deemed the measurement model acceptable convergent validity.

To examine the discriminant reliability and validity, we followed Fornell and Larcker's (1981) recommendation to compare the pair-wise correlations of the study measures and the square roots of the AVEs. The highest correlation score between any two study measures was 0.41 and thus below the limit of 0.70 (Podsakoff et al., 2003). Moreover, the square root of each construct's AVE exceeded the respective correlations (see Table 5). Consistent with Henseler et al.'s (2014) recommendation, we then performed a heterotrait-monotrait (HTMT) analysis to assess the discriminant validity. The results from the HTMT testing fell below the upper cut-off of 0.85. Thus, we confirmed the discriminant validity of the study measures (see Table 6).

Table 4

Study measures, measurement items and factor loadings.

Study measures	Measurement items	CFA	SEM
Regulative environment (REG) (Sajjad, Chu et al., 2020)	REG1. Government organisations in this country assist citizens to use public transport with safety measures.	0.78	0.78
	REG2. The government deploys additional staff/volunteers to guide and assist in adopting safety measures.	0.84	0.84
	REG3. Local and national governments have special support available for individuals who want to adopt safety measures (i.e. hand sanitiser).	0.75	0.75
	REG4. Even in case of not having personal protective equipment, the transport service provider assists in adopting health-protective measures (i.e. hand sanitiser and face masks).	0.72	0.72
Affordability (AFF) (H. Zhang et al., 2014)	AFF1. It is expensive to use public transport.	0.84	0.84
	AFF2. It is expensive to buy a day-pass that I can use to use public transport every day.	0.74	0.74
	AFF3. The traveling fare for using public transport is not reasonable.	0.82	0.82
Hygiene concern (HC) (Shiu et al., 2011)	HC1. I avoid touching the open surfaces in public transport.	0.77	0.77
	HC2. I wash my hands immediately after coughing, sneezing and rubbing my nose on public transport.	0.78	0.78
	HC3. I cover my mouth when coughing and sneezing on public transport.	0.56	0.56
	HC4. I am often not certain about choosing a time for using less crowded public transport.		
Choice uncertainty (CU) (Shiu et al., 2011)	CU1. I am often not certain about which model of transport I choose.	0.77	0.77
	CU2. I am often not certain about which type of public transport I choose (share-bike, taxi or bus).	0.85	0.85
	CU3. I am often not certain about the particular time when I will travel (peak hours, off-peak hours).	0.89	0.89
	CU4. I am often not certain about choosing a time for using less crowded public transport.	0.75	0.75
Green self-identity (GSI) (Tung et al., 2017)	GSI1. I think of myself as an 'environmental consumer'.	0.74	0.74
	GSI2. I am a socially responsible consumer.	0.77	0.77
Normative environment (NOE) (Sajjad, Chu et al., 2020)	NOE1. When I am faced with difficulties, some people are always on my side with me.	0.78	0.78
	NOE2. When I am faced with difficulties, some people comfort and encourage me.	0.79	0.79
	NOE3. When I am faced with difficulties, some people listen to me talk about my private feelings.	0.86	0.86
	NOE4. When I am faced with difficulties, some people express interest and concern in my well-being.	0.70	0.70
Switching intentions towards public transport (SWI) (Jung et al., 2017)	SWI1. I am intending to switch to public transport in the near future.	0.86	0.86
	SWI2. I have a plan to switch to public transport in the near future.	0.95	0.95
	SWI3. I want to switch to public transport in the near future.	0.96	0.96
	SWI4. It is likely that I will switch to public transport in the near future.	0.89	0.89

5.3. Structural model assessment

The structural model returned acceptable goodness-of-fit indices (chi-square (X^2)/degree of freedom (df) = 1.60, CFI = 0.98, TLI = 0.98,

Table 5
Validity and reliability.

	CR	AVE	MSV	ASV	GSI	SWI	CU	NOE	REG	AFF	HC
GSI	0.72	0.56	0.16	0.06	0.75						
SWI	0.95	0.84	0.13	0.03	0.36	0.92					
CU	0.89	0.67	0.08	0.02	−0.02	−0.08	0.82				
NOE	0.86	0.62	0.03	0.01	0.18	−0.02	0.02	0.79			
REG	0.86	0.60	0.05	0.02	0.22	0.19	−0.08	0.10	0.77		
AFF	0.84	0.64	0.08	0.02	0.04	0.10	0.28	−0.10	0.00	0.80	
HC	0.75	0.51	0.16	0.04	0.40	0.13	0.04	0.17	0.12	−0.04	0.71

Note: GSI = Green self-identity, SWI = Switching intentions, CU = Coice uncertainty, NOE = Normative environment, REG = Regulative environment, AFF = affordability, HC = Hygiene concerns.

Table 6
Heterotrait-monotrait (HTMT) analysis.

Study measures	1	2	3	4	5	6	7
1. Switching intentions towards public transport							
2. Choice uncertainty	0.08						
3. Normative environment	0.03	0.00					
4. Regulative environment	0.19	0.07	0.11				
5. Affordability	0.11	0.28	0.10	0.02			
6. Hygiene concerns	0.15	0.02	0.17	0.10	0.06		
7. Green self-identity	0.37	0.02	0.19	0.21	0.03	0.45	

RMSEA = 0.03). The R^2 of the endogenous construct represents the model's predictive power. The findings indicate that the proposed model accounted for 16.7 % of the variance in public switching intentions towards public transport. The path analysis of the proposed model showed four of the six proposed hypotheses to be significant: **H1** ($\beta = 0.11$, $p < 0.01$), **H2** ($\beta = 0.11$, $p < 0.05$), **H3** ($\beta = 0.35$, $p < 0.001$) and **H6** ($\beta = -0.10$, $p < 0.05$) (see Table 7). Surprisingly, we found a significant negative association between normative environment and switching intentions ($\beta = -0.08$, $p < 0.05$), while we had hypothesised a positive one; this left **H4** unsupported. Finally, the results—showing an insignificant effect of hygiene concerns on switching intentions—also failed to support **H5** as shown in Fig. 2.

5.4. Role of mooring (moderation)

We used PROCESS macro Model 1 to examine the moderating effects of two mooring factors—choice uncertainty and hygiene concerns—on the relationships among push factors, pull factors and commuters' switching intentions towards public transport. According to the results, hygiene concerns moderated the relationship between normative environment and public transport switching intentions (**H7d**: $\beta = 0.27$, $p < 0.01$; see Table 8). Similarly, choice uncertainty moderated the relationship between affordability and public transport switching intentions (**H8b**: $\beta = 0.19$, $p < 0.001$). Fig. 3a reports that users with varied intensities of hygiene consciousness exhibited similar switching intentions in a low-support normative environment. On the other hand, users with low choice uncertainty (see Fig. 3b) demonstrated higher switching intentions under low affordance conditions than those with high choice uncertainty. Finally, the results for H7a–c, H8a, H8c and H8d did not indicate any significant moderating effects (see Fig. 2).

Table 7
Results of hypotheses testing.

Hypothesis	Path	β	p	Outcome
H1	REG → SWI	0.11	<0.01	Supported
H2	AFF → SWI	0.11	<0.05	Supported
H3	GSI → SWI	0.35	<0.001	Supported
H4	NOE → SWI	−0.08	<0.05	Not supported
H5	HC → SWI	0.01	>0.05	Not supported
H6	CU → SWI	−0.10	<0.05	Supported

6. Discussion

Our tested model's unique consideration of push-pull-mooring factors, including individuals' concerns (hygiene, choice, environmental and self-identity) and environment (regulative and normative), provides valuable insights for promoting sustainable public transportation to support climate change action.

We conceptualised the regulative environment (**H1**) and affordability (**H2**) as push factors influencing individuals' intentions to switch to public transport. The results provide statistical support for both hypotheses, confirming our hypotheses. Compared to affordability, the regulative environment more strongly predicts such intentions, indicating that governmental and institutional initiatives for promoting public transport can significantly influence individuals' contemplation of its use. This finding aligns with prior research, which has shown the regulative environment's ability to encourage pro-environmental behaviour and the pursuit of green actions (e.g. Ranta et al., 2018; Sajjad, Chu et al., 2020). This finding is especially critical for the US economy, where commuters have avoided public transport due to COVID-19 (Statista, 2020a) and exhibited an increasing preference for using personal vehicles to commute to work or school (Statista, 2022). COVID-19 has been a 'path-changing disruption' that has led to the adoption of new structures and practices in the socio-economic sphere (Marsden & Docherty, 2021); specifically, regulative restrictions to control the virus's spread have reduced public transport ridership (Tiikkaja & Viri, 2021). However, the results of our study indicate that the regulative environment has the potential to reverse this trend and encourage individuals to return to the use of public transport. However, reversing this trend also requires initiatives that focus on improving users' perceived psychological distancing and thus their satisfaction with public commuting options (H. Dong et al., 2021).

Similarly, our results demonstrate that affordability can encourage individuals to switch to public transport (**H2**). These results align with prior research, indicating that individuals' perception of public transport as an affordable, flexible and economical travel option can influence their decision to use it (Sovacool et al., 2019; Falavigna & Hernandez, 2016; Mouratidis et al., 2021). Because the pandemic significantly affected the livelihoods of individuals in the US and significantly curtailed their incomes (Statista, 2020b), our findings on the influence of affordability are unsurprising. Despite continuing fears of contracting COVID-19 through public transport, US-based commuters may expect to gradually recover from these pandemic-related economic losses (YouGov, 2020). Such expectations may encourage them to conserve monetary resources by leveraging affordable lifestyle options, such as public transport. We further contend that individuals in the US will be more inclined to pursue entertainment and leisure-related activities, such as attending public sports events (Morning Consult, 2021), as pandemic-related restrictions are loosened. Under these circumstances, individuals may consider using public transport because its affordability may allow them to save their income for leisure activities. Our contention finds some support in prior studies that consider public transport a sustainable form of commuting for most people, even during disruptive events such as COVID-19 (Orro et al., 2020). Therefore, we

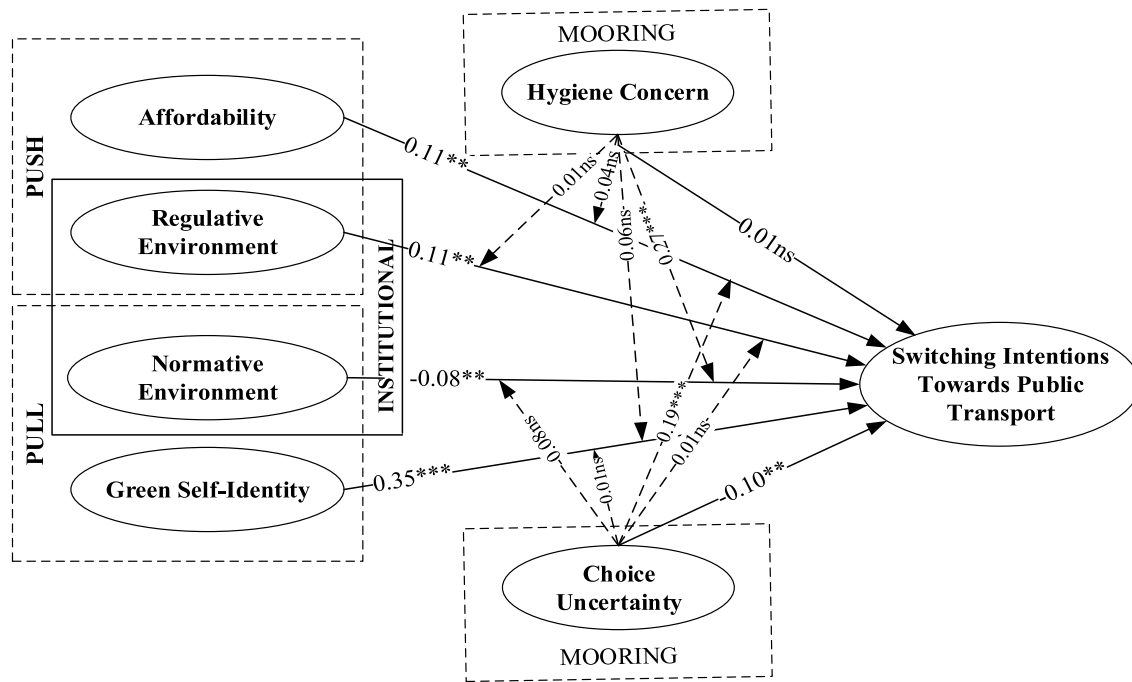


Fig. 2. Graphical explanation of the tested model.

Table 8
Results of moderation analysis.

Hygiene concerns							
		β	t	ρ	LLCI	ULCI	Moderation
H7a	REG → SWI	0.01	0.12	0.905	-0.10	0.11	Not supported
H7b	AFF → SWI	-0.04	-0.74	0.459	-0.14	0.06	Not supported
H7c	GSI → SWI	0.06	1.06	0.290	-0.05	0.16	Not supported
H7d	NOE → SWI	0.27	3.74	0.000	0.13	0.41	Supported
Choice uncertainty							
		β	t	ρ	LLCI	ULCI	Moderation
H8a	REG → SWI	-0.01	-0.03	0.974	-0.08	0.08	Not supported
H8b	AFF → SWI	0.19	4.25	0.000	0.10	0.28	Supported
H8c	GSI → SWI	0.01	0.10	0.917	-0.90	0.10	Not supported
H8d	NOE → SWI	-0.08	-1.20	0.230	-0.21	0.05	Not supported

posit that affordability may be an asset protecting public transport as an urban and economic resource during such disruptive events (Tiiikkaja & Viri, 2021).

As with the push factors, the results confirm that our hypothesised pull factor of green self-identity (H3) increases individuals' intentions to switch towards using public transport. In fact, among all proposed antecedents, green self-identity emerged as the most robust predictor of commuters' switching intentions, indicating that pro-environmental inclinations are a vital reason for individuals' use of public transport. This result aligns with prior research (e.g. Bradley et al., 2020; Guo et al., 2019; Pawaskar et al., 2020), which suggests that green self-identity is critical to encouraging individuals' pro-environmental and responsible consumption actions, which in our study, refer to their intentions to use public transport. However, this finding is surprising and insightful in the US context because pre-pandemic surveys identified convenience-related and economic factors, such as the unavailability of

parking spaces or their cost, as key motivations for individuals' use of public transport (APTA, 2016). Since the pandemic began, mass media reports have posited that COVID-19 and its myriad devastating consequences may have heightened consumers' environmental concerns and thus increased their engagement in sustainable, responsible and ethical consumption (Kachaner et al., 2020). Our reports lend credence to such suppositions and suggest a compelling shift in US consumers' behaviour towards a focus on sustainability and the environmental impact of their actions, including using public transport or other pro-environmental commuting options, such as electric vehicles (Luan et al., 2021).

In contrast to our hypothesised positive association, the results reveal that the normative environment is negatively but significantly associated with switching intentions for public transport use (H4). This hypothesis was thus unsupported by our findings, which also contradict prior research indicating a plausible positive influence of the normative environment (e.g. Manca et al., 2019; Ye et al., 2020). We attribute this contradictory result to, the individualistic culture of the USour sample's context specificity, and the US's individualistic culture (Mourad et al., 2020). Recent research on the cultural symbolism of using public transport indicates that public transport is—for individuals in individualistic cultures—a generic form of commuting with no symbolic meaning (Ashmore, Pojanii et al., 2019). Thus, public transport usage may depend more on personal preferences (Ashmore, Thoreau et al., 2020) than social or normative cues. As Zuberi (2016) hypothesises, individualistic cultural norms may cause individuals to perceive sharing enclosed spaces on mass transit systems as a violation of personal space and, by extension, their individualism. Our results indicate that Zuberi's (2016) supposition may hold value, and individuals in the US may perceive social cues that emphasise the use of public transport as violating their individualist ideals, as we observed. However, we must look into future research before making any conclusive remarks.

Next, we sought to determine whether the mooring factors of hygiene concerns (H5) and choice uncertainty (H6) were negatively associated with switching intentions. Surprisingly, hygiene concerns (H5) shared an insignificant direct association with switching intentions. These results indicate that US-based individuals may have become so attuned to hygiene-related precautions due to the COVID-19 pandemic that such precautions may have become routine. Our results

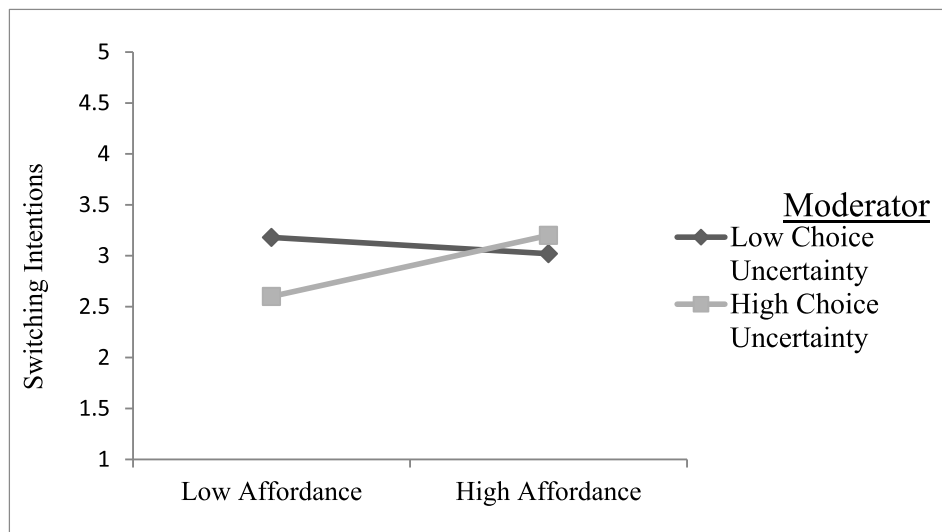


Fig. 3a. Hygiene Concern (mooring) moderating Normative Environment.

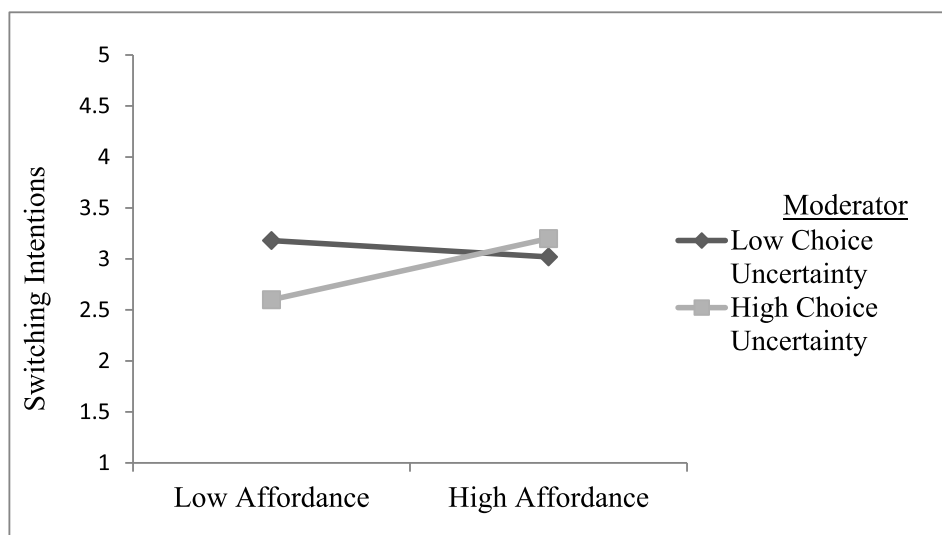


Fig. 3b. Choice uncertainty (mooring) moderating Affordance.

support the findings of a recent survey in the US, where 42 % of participants reported no likely change in their behaviour towards public transport use (Morning Consult, 2020). Another recent report in the US context shows that hygiene-related behaviours, such as using hand sanitisers and disinfectants (Ipsos, 2021), have remained constant since 2020, further supporting our contention that such actions have become a routine daily activity. Nevertheless, further study is required before drawing any definitive conclusions.

Next, we did find support for **H6**, indicating that personal evaluations of commuting options are critical for travellers in the US in the face of disruptive events, such as the COVID-19 pandemic. Recent reports suggest that individuals in the US have many transport means available, including rentals, ride-shares, owned transport and taxis (Statista, 2022). The majority, however, prefer options for personal (Statista, 2022) or self-driving vehicles over ride-sharing and public transport use (American Automobile Association, 2021). Such reports indicate that individuals expend great efforts to carefully evaluate the benefits and challenges of each commuting option. The availability of highly diverse options may reduce their intentions to use public transport and increase the likelihood that they will continue their current behaviour (which, in our case, is suggested to be the use of their own or personal vehicles). It

further strengthens our previous contention that US-based consumers are individualists, and personal preferences significantly influence their actions. However, additional investigations are required to draw any generalisations.

Finally, we tested whether hygiene concerns (**H7a–d**) and choice uncertainty (**H8a–d**) moderated the associations of push and pull factors with intentions to switch to public transport use. We found partial support for these moderation hypotheses, with hygiene concerns and choice uncertainty moderating only the associations of the normative environment (**H7d**) and affordability (**H8b**) with switching intentions. These interesting and novel findings significantly contribute to the extant knowledge on public transport use in the US. The significance of **H7d** indicates that increased hygiene concerns may dampens the negative association between normative environment and switching intentions for public transport use. This finding supports our contention that in the case of public transport, commuters may perceive sharing space to be unhygienic and infectious (Naveen & Gurtoo, 2020; Tsavdari et al., 2022), and may only switch to public transport use in case of high-support normative environments. We also find that increased choice uncertainty strengthens the positive association between affordability and switching intentions (**H8b**), which may be attributed to an

individual's identification of the choice that offers the most economic benefits in the long term. Both significant moderating effects, in our opinion, show that personal evaluative norms and contextual concerns may significantly determine the use of public transport and warrant more focused scholarly investigations in the future.

Additionally, the insignificant moderating effects of both mooring factors for the regulative environment and green self-identity indicate that regulatory policies and pro-environmental beliefs are unaffected by choice uncertainty or hygiene concerns. We posit that US-based individuals may view existing pandemic control-related regulatory policies as an acceptable form of protection. Thus, the regulative environment is neither affected by personal concerns for hygiene nor representative of choice uncertainty. Individuals can derive similar benefits from using other forms of public transport, such as driving their vehicles or using ride-shares. We further believe that in the case of public transport use, green self-identity may be driven solely by internal beliefs or norms and may, therefore, remain unaffected by external factors, such as the availability of other commuting choices. Our contention is supported by [Le Grand et al. \(2021\)](#), who found that belief in fair trade was unaffected by external concerns, and by [Valko \(2021\)](#), who found that individuals' green behaviour could resist contextual interventions in some situations. As with the significant moderating effects of the mooring factors, these insignificant associations, which could illuminate the nuances of individuals' decision-making processes regarding public services and infrastructure, deserve further investigation.

6.1. Theoretical implications

Although our study raises several important implications for theory, the foremost is its conjoint application of the push-pull-mooring framework and institutional theory to understand the concurrent effects of personal and institutional factors on commuters' decisions to use public transport. To the best of our knowledge, we have pioneered the application of these theoretical lenses to understand post-COVID-19 travel behaviour. In contrast, prior research in this context has been limited to descriptive analyses or app-based monitoring ([Przybyłowski et al., 2021](#)). Our findings highlight the need to adopt a strategic perspective on how regulative, normative, and context-specific personal factors may induce individuals to utilise public facilities in the context of disruptive events and crises that limit their mobility and raise mortality concerns. As the COVID-19 virus mutates and the possibility of its continuance as an endemic persists ([Charumilind et al., 2022](#)), we recommend that scholars further investigate the factors that can inhibit or encourage the continued use of public transport facilities as a viable and sustainable option for controlling the environmental damage that results from transportation.

Second, the emergence of green self-identity as the strongest predictor of commuters' intentions to switch to public transport is a unique contribution. It points to a 'bright side' to the COVID-19 pandemic and its resultant tragedies—i.e. possible incremental progress towards pro-environmentalism and sustainable consumption among consumers. With climate change and environmental protection as critical agendas for the global community, understanding the pandemic's potential role in strengthening green self-identities becomes particularly valuable. Even more critical is the need to explain how these identities can be maintained to encourage individuals' ecologically sustainable choices—not just in transport but in allied sectors, such as tourism and hospitality. Thus, our study opens a viable area of future inquiry and urges scholars to explore ways to strengthen pro-environmental behaviours in the post-COVID-19 era.

Third, building upon the previous implication, we urge scholars to investigate why US commuters' actual adoption of this mode remains low despite their positive intentions to use public transport. US commuters' actual adoption of this mode remains low despite their positive intentions to use public transport. Such investigations are critical

because the US is the second-largest global contributor to carbon dioxide emissions, with approximately 4.7 billion metric tons of emissions reported in 2020 alone ([Global Carbon Project, 2021](#)), and the most significant contributor to transportation-related emissions worldwide ([IEA, 2021](#)). Understanding the nuances of factors and mechanisms that may encourage or discourage public transport use in this economy may also apply in other countries with similar economic and infrastructural development levels.

Fourth, because some of our findings (e.g. the negative association between the normative environment and switching intentions) may be attributed to cultural norms of individualism, we encourage scholars to explore the implications of symbolism and cultural norms for the transport and tourism sectors. Such investigations have the potential to illuminate the reasons public transport has—despite public campaigns to promote sustainable travel and the availability of infrastructural support—failed to captivate commuters' attention in a developed economy such as the US.

Finally, we underscore the need to integrate additional theoretical lenses in studying COVID-19's impact on individuals' daily lives, habits and routines; this is especially necessary when looking individuals' use of public facilities and services. We emphasise, in particular, the need to acknowledge individuals' joint consideration of the advantages and disadvantages of possible actions, such as using public transport. Therefore, scholars should utilise behavioural reasoning theory ([Westaby, 2005](#)) and dual-factor theory (e.g. see [Tandon, Jabeen et al., 2021](#)) that facilitate this duality of perspectives.

6.2. Practical implications

Our study also offers practical implications—primarily for public transportation entities and policymakers who can leverage our findings to develop initiatives that promote the use of public transport. First, we assert the need for such stakeholders to adopt a strategic perspective to attract commuters towards public transport. We conceptualise the framework presented in [Fig. 4](#) to classify commuter types based on the proposed mooring factors. Because these mooring factors can dampen commuters' willingness to change transport options, they are vital and must be addressed. In conjunction with public transportation entities, policymakers can leverage our framework to design targeted marketing campaigns that address specific commuter concerns related to their use of public transport. These efforts, too, are essential in light of information paradoxes and fake-news propagation that can prevent individuals from adopting public modes of transportation by increasing their anxiety or fear of using them.

Second, policymakers should capitalise on the importance of the regulative environment by promoting its safety and accessibility and its environmental and economic viability. Potential initiatives could include public awareness and marketing campaigns to increase consumers' knowledge of monthly travel plans (i.e. to enhance perceived affordability) and hygiene maintenance (i.e. to alleviate commuters' fears of contracting virulent diseases). To assure commuters that their personal space and privacy are protected to the utmost degree, such campaigns could also emphasise the importance of continued social distancing practices on public transport. These initiatives, in our view, could positively impact the normative environment for commuters in individualistic cultures, such as the US.

Third, recognising the exceptional strength of green self-identity's influence on commuters' switching intentions, we encourage policymakers to emphasise the environmental benefits of public transport. To strengthen this attitudinal aspect, campaigns could highlight individuals' contributions to pollution control via their daily, monthly and annual use of public transport rather than private passenger vehicles. In addition, educational institutes and commercial (i.e. private) organisations could effectively participate in such public campaigns by designing and conducting 'green behaviour' programmes and workshops to encourage students and privately employed professionals to utilise

Choice Uncertainty			
Health Concerns		Low	High
	Low	Push Through Extrinsic Motivations Towards Public Transport Provide rewards and financial attractions To switch towards public transport	Push Through Eco Concerns Towards Public Transport Provide information about potential consumers' ecological footprints
	High	Push Through Health Protective Measures Towards Public Transport Provide information about Health protective initiatives taken by public transport system	Toughest To Switch Towards Public Transport Provide information about Health protective initiatives taken by public transport system and potential consumers' ecological footprints

Fig. 4. Conceptual framework reflecting the expected degree of communication required to support switching towards public transport.

public transport.

Finally, we suggest the need to involve the community and leverage positive symbolism to increase the use of public transport. To this end, individual community members should offer constructive feedback and social support to encourage their peers and family members to use public transport options. It is especially important in the US, where reports indicate a growing emphasis on individual contributions to sustainability (Statista, 2021a) and increased efforts to consume products sustainably, such as groceries and beverages (Statista, 2021b).

7. Conclusions, limitations and future work

The impact of COVID-19, in ways that are both subtle and drastic, is undeniable. The individual use of public transport and the personal, as well as contextual factors estimated while choosing its usage, are aspects of individuals' daily lives that have undergone significant changes due to the pandemic. While the pandemic led governments to restrict the use of public transport and shared mobility to limit the risk of contagion, individuals' efforts to cope with the resulting restrictions on their mobility have altered their evaluative stance and intentions to use public commuting options. Despite these behavioural and attitudinal changes, limited research has focused on understanding them and the factors that may encourage commuters to consider private vs public transport options. It is a critical lacuna because public transport has significant implications for promoting sustainability and pro-environmental actions to control climate change and the pollution associated with transportation.

This study attempted to fill this gap by incorporating institutional theory and the push-pull-mooring framework to understand the factors influencing US-based commuters' switching intentions towards public transport. Testing six direct and two indirect hypotheses, we found that the regulative environment, psychological factors related to individuals' pro-environmental stance and economic concerns significantly influenced intentions to switch to public transport. Offering unique insights into US commuters' evaluations of social cues in the context of public transport use, we determined that the normative environment negatively influenced such intentions. We also found that hygiene-related actions may have become a routine activity in the post-pandemic U.S. Consumers seem more aware of regulatory directives and of their own

actions' impact on the environment and its sustainability.

While our insights are exciting and add considerable value to the extant knowledge, they must be interpreted in light of our study's limitations. First, because our study was based on a single geographic location—i.e. the US, its findings' generalisability to culturally and economically distinct economies is limited. Future scholars should address this limitation by testing our model in developing nations with effective public transport infrastructures, such as China, and in developed nations, such as Finland, where public transport was the predominant form of pre-pandemic travel. Second, the cross-sectional data we used is prone to respondent biases, such as social desirability bias. While we worked to prevent such biases, future scholars might consider more observation-based data collection methods and longitudinal investigations to explore the nuances and temporality of the studied associations. Finally, we acknowledge that our sole focus on public transport options limited the conceptual boundary of the study. Future investigations can transcend this limitation by considering other forms of shared mobility, such as -sharing, which, compared to private vehicle use, are also viable commuting options promoting pro-environmentalism and sustainability. In sum, we call for future research in the post-pandemic world, especially regarding individuals' choices to commute and live more sustainably.

CRedit authorship contribution statement

Muhammad Azfar Anwar: Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing. **Amandeep Dhir:** Conceptualization, Data curation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Fauzia Jabeen:** Writing – review & editing, Writing – original draft, Conceptualization. **Qingyu Zhang:** Methodology, Project administration, Writing – original draft, Writing – review & editing. **Ahmad Nabeel Siddiquei:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

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