Göransson and Andersson
European Transport Research Review (2023) 15:32
https://doi.org/10.1186/s12544-023-00609-x

European Transport Research Review

REVIEW

Open Access

Factors that make public transport systems attractive: a review of travel preferences and travel mode choices

Jessica Göransson[1,2,3*] and Henrik Andersson[4]

Abstract

Background Many regions worldwide are struggling to create a mode shift from private cars to more sustainable transport modes. While there are many reviews regarding travellers' preferences and travel mode choices, there is a lack of an updated review that provides a comprehensive overview of the factors that make public transport systems attractive.

Aim This review aims to fill the knowledge gap by offering insights into the factors influencing travel behaviour and the demand for public transport. It has two primary objectives: • Summarize general conclusions drawn from international literature reviews. • Present specific insights on the topic pertaining to the Nordic countries. To the best of our knowledge, this is the first review with a Nordic focus regarding public transport preferences and travel mode choices. The special focus on these countries is motivated by their relatively more ambitious policies for reducing emissions in the transport sector compared to many other countries, and their relatively high usage of public transport today.

Methods To achieve these objectives, we conducted a review of existing literature. This review encompassed international literature reviews and included an examination of results from the Nordic countries.

Findings The findings show that reliability and frequency are important factors for creating an attractive public transport supply. However, there is only limited evidence regarding the impact of improvements in these attributes on public transport demand, so this needs more research. This review highlights the importance of understanding the underlying motivations for travel mode choice and provides recommendations on areas for further investigation to understand the attractiveness of public transport supply.

Keywords Travel preference, Public transport, Travel mode choice, Travel demand, Travel behaviour, Systematic review, Nordic countries

*Correspondence:
Jessica Göransson
jessica.goransson@vti.se
Full list of author information is available at the end of the article

1 Introduction

Transportation accounts for 24% of direct $C0_2$ emissions from fuel combustion worldwide, with road vehicles accounting for nearly 75% of this total [26]. To achieve the United Nations 2030 agenda for sustainable development and the Paris Agreement on climate change, actions need to be taken. The European Commission has responded to this need by introducing the European Green Deal to achieve climate neutrality by 2050. One crucial element of achieving this goal is a shift towards more sustainable transportation modes (European Environment [16]. Although travellers' preferences and travel mode choices have been studied for decades, many regions around the world are struggling to create a mode shift from private cars to more sustainable travel modes.

Although there exist several reviews regarding travellers' preferences and travel mode choices, to the best of our knowledge an up-to-date review that provides a broad perspective of what makes public transport (PT) systems attractive is missing. For example, Redman et al. [51] review what quality attributes of PT that attract car users, Hansson et al. [23] review preferences in regional PT systems, and Iseki and Taylor [29] review PT preferences concerning transfers. Therefore, by summarizing findings from existing international literature reviews, we will contribute to the literature by presenting some general conclusions and rules of thumb.

In addition, we will contribute by drawing insights from the Nordic countries. First, the goals for emission reduction in the transport sector in the European Union (EU) and other European countries differ with policies being more ambitious in the Nordic countries compared to the other EU countries [9]. Second, the Nordic countries, and especially the Scandinavian[1] ones have some common characteristics regarding PT: They have a relatively high use of PT today, an ambitious plan for the role that PT plays in emission reduction in the transport sector, and PT strategies that are in harmony with broader national and subnational objectives for economic development, land use planning, and social cohesion [52]. Nordic countries also have similarities in PT supply, population density, climate, norms, and socioeconomic factors, which allows us to treat the countries as one "global region". Moreover, the Nordic countries outperform the rest of the world regarding The World Economic Forum´s *Global Social Mobility Index*,[2] which means that they have more equally shared opportunities compared to other countries [30]. We have not found any literature review that focuses on factors that make PT systems attractive in the Nordic countries, which is noteworthy as they have a relatively high use of PT today, high ambition levels regarding PT, and many similarities with each other. Hence, by reviewing results from the Nordic countries and by understanding what makes PT systems successful in the Nordic context we: (1) gain insights into the factors that contribute to the attractiveness of PT systems in these countries, and (2) facilitate comparisons and draw conclusions between the experiences and findings in the Nordic and other countries. The aim of this review is to provide insights into the current state of knowledge regarding what affects travel behaviour and travel demand for existing and potential PT users. This knowledge is important to create an attractive PT system, which enables a travel mode shift from car to PT. This review addresses two research questions: (1) *What makes the public transport system attractive?* and (2) *What factors encourage us to travel more with public transport and less with private cars?* These questions are addressed from two perspectives: one general and one with a focus on Nordic countries. We believe that this review provides good insight into the research about travellers' preferences for someone new in the field, and that it will inspire new research in the area.

The structure of the article is as follows: In Sect. 2, the examined literature and the search method are introduced. Section 3 provides a summary of the international and Nordic results relevant to research question (1) *What makes the public transport system attractive?* Similarly, Sect. 4 summarizes the international and Nordic results relevant to research question (2) *What factors encourage us to travel more with public transport and less with private cars?* Sect. 5 presents a discussion, followed by conclusions in Sect. 6.

2 Literature examined

In this section, the examined literature and the search method are described. This section is divided into two subsections: International reviews and Nordic literature.

2.1 International reviews

A literature search was performed in August 2022 to identify previous reviews in the research area. In Table 1, the four search strings used in Web of Science, Scopus and Transport Reviews are presented. The search in

[1] The Scandinavian countries, i.e., Denmark, Norway, and Sweden, are part of the Nordic countries. The Nordic countries include Finland and Iceland as well.

[2] Economies with greater social mobility provide more equally shared opportunities that are independent regarding socioeconomic background, geographic location, gender, or origin. The index is based on the performance of five dimensions: health, education, technology, work, protection and institutions.

Table 1 Search strings used in the international review

	Search strings used in the international review
1	(preference* OR attitude*) AND ("transportation mode" OR "travel mode choice" OR "mode use" OR "mode choice")
2	(preference* OR attitude*) AND ("public trans*" OR "mass trans*" OR "bus rapid transit*" OR "bus" OR "train" OR "subway" OR "metro")
3	(preference* OR attitude*) AND ("transportation mode" OR "travel mode choice" OR "mode use" OR "mode choice") AND ("public trans*" OR "mass trans*" OR "bus rapid transit*" OR "bus" OR "train" OR "subway" OR "metro")
4	(preference* OR attitude*) AND ("public trans*" OR "mass trans*" OR "bus rapid transit*" OR "bus" OR "train" OR "subway" OR "metro") AND ("service upgrad*" OR "service improvement*" OR "demand management" OR "demand measure*" OR "demand polic*")

Table 2 International findings

References	Travel mode*	Studies included in the review	Monetary value of attribute	Travel demand effect	Travel mode shift effect
Aguilera and Cacciari [3]	C, O	64			
Ben-Akiva and Morikawa [2]	PT	20**			
Diab et al. [14]	PT	42	x		
Fatima et al. [17]	PT, C, A	130**			
Gunther et al. [21]	PT, C, A	40**			
Hansson et al. [23]	PT	37			
Heinena and Bohte [24]	PT, C, A	39**			
Iseki and Taylor [29]	PT	69**	x		
Jamal and Newbold [30]	PT, C, A	78			
Li and Yang [32]	PT	20**			
Li and Hensher [33]	PT, C, A	20	x	x	x
Lierop et al. [34]	PT	21			
Luiu et al. [36]	PT, C, A	54			
McCarthy et al. [38]	PT, C, A	28			
Mitra [39]	C, A	42			
Molander et al. [40]	PT	60			
Muñoz et al. [41]	A	54	x	x	
Pronello and Gaborieau (2018)	PT, C, A	130**			
Redman et al. [51]	PT, C	74		x	x

*PT = Public transport, C = Car, A = Active mode (cycling and walking) O = Other/Not specified

**The number of studies included in the review is not stated. The number in this table presents all studies in the reference list, which means that the number of studies included in the review are overestimated

Web of Science was set as TOPIC, in Scopus as TITLE-ABS-KEY and in Transport Reviews as ALL. None of the searches were limited in timespan. The document type was restricted to "review".

The search resulted in 190 findings. Titles and abstracts were screened. Articles were selected for further reading if they included travellers' preferences or attitudes, and articles were excluded if they addressed only tourist travel. After relevant duplicates were removed (21 reviews), the screening process resulted in 28 reviews, and they were read in full. Reviews that did not follow the above criteria were excluded (9 reviews). In total, 19 reviews were found, which are summarized in Table 2. The reviews consist of 20–130 international studies each. More than half of the reviews (10/19) were published in 2016 or later, and none of the reviews were published before 2000. In 16 of the studies, PT was included, car usage and ownership were included in eleven studies, and active modes (walking and bicycling) were included in ten studies. Four of the reviews included monetary values of attributes, three included travel demand effects, and two included travel mode shift effects.

2.2 Nordic literature

The literature search was performed in August 2022 to identify travel preferences, demand, and customer satisfaction studies in Nordic countries. In Table 3, the four search strings used in Web of Science and Scopus

Table 3 Search strings used in the Nordic review

Search strings used in the international review
1 ("stated preference" OR "SP" OR "discrete choice experiment*" OR "mode choice model") AND (Sweden OR Norway OR Denmark OR Finland OR Iceland OR Scandinavia* OR Nordic) AND ("public trans*" OR "mass trans*" OR "bus" OR "train" OR "subway" OR "metro" OR "tram")
2 ("stated preference" OR "SP" OR "discrete choice experiment*" OR "mode choice model") AND (Sweden OR Norway OR Denmark OR Finland OR Iceland OR Scandinavia* OR Nordic) AND ("transportation mode" OR "transit mode" OR "mode choice" OR "mode use")
3 ("stated preference" OR "SP" OR "discrete choice experiment*" OR "mode choice model") AND (Sweden OR Norway OR Denmark OR Finland OR Iceland OR Scandinavia* OR Nordic) AND (travel* OR commute* OR passenger*)
4 ("Stated preference" OR "SP" OR "Revealed preference" OR "RP" OR "discrete choice experiment*" OR "mode choice" OR "customer satisfaction" OR "public trans*demand") AND (Sweden OR Norway OR Denmark OR Finland OR Iceland OR Scandinavia* OR Nordic) AND (("public trans*" OR "mass trans*" OR "bus" OR "train" OR "subway" OR "metro" OR"tram") OR ("transportation mode" OR "transit mode" OR "mode choice" OR "mode-use") OR (travel* OR commute* OR passenger*))

are displayed. The search in Web of Science was set as TOPIC and in Scopus as TITLE-ABS-KEY. No limitation in timespan was used.

The search resulted in 336 findings. The screening process involved examining the title and abstract of articles, and those that included travel preferences or explaining factors that influence travel behaviour, travel demand, customer satisfaction or travel mode choice in Nordic countries were chosen for further reading. After relevant duplicates were removed (111 articles), 76 articles remained, and they were read in full. Articles were excluded if they only addressed preferences for different car types, active modes or the mode share between car and active modes (41 articles). After the complete screening, the search resulted in 35 articles, which are summarized in Table 4. All articles contained quantitative data, while only two included in-depth interviews. The methods used to elicit preferences are broadly classified as belonging to two approaches: revealed preferences (RP) and stated preferences (SP). RP studies use individuals' actual behaviour to elicit preference, whereas SP studies elicit preferences by asking individuals in hypothetical scenarios. The use of SP data and RP data in the articles were quite equal, with eleven SP studies and ten RP studies. Most of the articles with RP data included data from national travel surveys (7/10). Seven customer satisfaction studies were included in this review, a majority of which were from Sweden (5/7). Nine of the studies included monetary values, five included travel demand effects, and six included travel mode shift effects. Seventeen studies included results from Sweden, eleven from Norway, seven from Denmark, one from Finland, one from Iceland and one from Scandinavia as a group.

3 What makes PT systems attractive?

This section summarizes the international and Nordic research findings related to the research question mentioned in the section title. It is divided into five subsections. Each subsection begins with the international findings that reflect general knowledge on the subject. This is then followed by a subsection that provides a summary of insights from Nordic countries on the same topic.

3.1 Preferences regarding waiting time, transfer, and comfort

Studies show that travellers dislike walking, waiting and transferring more than in-vehicle time. A common rule of thumb is that walking and waiting time have twice the burden than in-vehicle time for nonbusiness trips, even if some studies find the burden to be higher and some studies find the burden to be lower. The burden is higher if the wait takes place in an unpleasant or threatening environment [29]. Studies show that PT users have a greater disutility for unexpected and unpredictable delays compared to expected and predictable waits. Studies also show that the disutility for transfers is higher than the disutility for waiting time [29]. Iseki and Taylor [29] and Diab et al. [14] refer to a review by Reed [50] that found that the disutility of waiting time ranges from 1.5 to 12 times that of the disutility in-vehicle time.

3.1.1 Nordic findings

Björklund and Swärdh [7] estimated policy values for comfort (getting a seat) and crowding reduction on board local PT in the three largest urban areas in Sweden, i.e., Stockholm, Gothenburg, and Malmö, by analysing SP data with 2003 participants. No geographical differences were found, which indicates that the same value for comfort and crowding can be used throughout Sweden. The value of the travel time savings (VTTS) multiplier for the worse scenario (standing, high level of crowding) was 2.9 compared to that of the reference scenario (sitting, low level of crowding). Sitting when there was a high level of crowding had a lower VTTS multiplier compared to standing with a low level of crowding. Differences were found depending on age, income, travel purpose and transport mode. For example, the willingness to pay

Table 4 Nordic findings

References	Mode of transport*	Country**	Data	Analytical sample of participants	Monetary value of attribute	Travel demand effect	Travel mode shift effect	Customer satisfaction
Fearnley et al. [18]	PT	N	SP	406	x			
Fröidh and Byström [19]	PT	S	SP	1896	x	x	x	
Mabit et al. [37]	PT, A, C	O[a]	SP	340	x			
Vautard et al. [58]	PT	S	SP	554	x			
Björklund and Swärdh [7]	PT	S	SP	2003	x			
Carlsson [10]	PT	S	SP	457				
Andersson et al. [5]	C, O	S	SP	994				
Thorhauge et al. [56]	PT, C, A	D	SP	249		x		
Pursula and Weurlander [48]	PT	F	SP & RP	562 and 294	x			
De Gruyter et al. [13]	PT	N, S, O[b]	Metanalysis (SP, RP, other)	28 articles	x			
Halse et al. [22]	PT, C	N	RP (review of SP)	17,822		x		
Fyhri and Hjorthol [20]	PT, A, C	N	RP***	1775				
Hjorthol et al. [25]	PT, A, C	D, N, S	RP***	Not specified				
Nielsen et al. [43]	PT	D	RP***	4810	x			
Prato et al. [45]	PT, A, C	D	RP***	7958				
Ahanchian et al. [4]	PT, A, C	D	RP***	29,089		x	x	
Thorhauge et al. [57]	PT, A, C	D	RP***	10,784			x	
Isacsson et al. [28]	PT, A, C	S	RP*** and other	99,877	x		x	
Chee et al. [12]	PT	S	Survey	574				
Abenoza et al. [2]	PT	S	Survey	911–16,481				x
Abenoza et al. [1]	PT	S	Survey	453,564				x
Börjesson and Rubensson [8]	PT	S	Survey	407,858				x
Cats et al. [11]	PT	S	Survey	405,340				x
Tanko et al. [54]	PT	S	Survey	859				x
Ingvardson et al. [27]	PT, A, C	D	Survey	1481				x
Julsrud and Denstadli [31]	PT	N	Survey	1215				x
Nordfjærn et al. [44]	PT, A, C	N	Survey	441		x		
Pritchard and Frøyen [46]	PT, A, C	N	Survey	195			x	
Rasca and Saeed [49]	PT, C	N	Survey	1849				
Lind et al. [35]	PT, A, C	N	Survey	1043				
Eriksson and Forward [15]	PT, A, C	S	Survey	620				
Westman et al. [59]	C, O	S	Survey	245				
Naess et al. [42]	C, O	I	Survey + interviews	1 148 + 13				
Strömberg et al. [53]	PT, A, C	S	Survey + interviews	151 + 17			x	
Thogersen et al. [55]	PT, C	N	Survey	2607				

*PT = Public transport, A = Active mode (walk, bicycle), C = Car, O = Other/Not specified

**S = Sweden, N = Norway, F = Finland, D = Denmark, I = Iceland, O = See footnote

***Includes data from national travel survey

[a] Scandinavia to central Europe

[b] Australia, India, New Zealand, United Kingdom

(WTP) for sitting instead of standing was lower for tram passengers than for bus and commuter train passengers.

Pursula and Weurlander [48] analysed SP and RP data with 294 participants from Helsinki in Finland. The results showed that the disutility of two transfers was more than twice the disutility of one transfer and that the disutility of standing was higher than that of one transfer but less than that of two transfers.

Nielsen et al. [43] analysed RP data with 4810 observations in the Greater Copenhagen Region in Denmark to investigate whether the transfer penalty depends on transfer attributes, i.e., wayfinding, shopping availability, escalators and shelter. The transfer penalty was found to differ between 3.5 and 30 min of in-vehicle time, depending on the transfer attributes. The transfer penalty for one transfer varied from 5 min of in-vehicle time for the best possible transfer (easy wayfinding, shopping available and two escalators) to 12 min for the worst possible transfer (difficult wayfinding, no shops, and no escalators). Few observations included waiting times over ten minutes per transfer, which indicates that the participants dislike routes with long waiting times.

Vautard et al. [58] performed an SP study with 554 train passengers in Sweden and found that departure time adjustments were valued less than in-vehicle time. The time multipliers varied from 0.1 to 0.7. Passengers with high multipliers were nonflexible passengers, and passengers with low multipliers preferred a decreased travel time over a favourable departure time. Passengers with high multipliers were morning travellers, business travellers, passengers aged 45 or older, parents and middle-income travellers, whereas passengers with low multipliers were low-income travellers, passengers aged 25–44, females, two-person households and those without car access.

3.2 The impact of trip distance on preferences

Regional and local travellers have similar preferences with some differences. Attributes that are highlighted as important in many studies regarding regional PT are reliability, frequency, comfort, travel time and network coverage. The importance of frequency and reliability seems to decrease to some extent with longer travel distances, and the importance of comfort increases when travel time is longer. For regional PT, comfort is more important than frequency. Studies indicate that station facilities are more important than on-board comfort for regional trips shorter than 25 km [23].

3.2.1 Nordic findings

Mabit et al. [37] performed an SP study with 340 international travellers between Scandinavia and central Europe and found that VTTS decreased with trip distance and travellers' duration of stay at the arrival point. They found that VTTS is not transferable from urban to long-distance international travel contexts. The results showed that VTTS decreased with distance for long-distance international journeys, while the literature on daily travel often shows that VTTS increases with distance. This was found by, e.g., Fröidh and Byström [19], who revealed that the importance of travel time for interregional journeys in Sweden increased with trip distance. Fröidh and Byström [19] also found that the importance of comfort and travel time increased with trip distance.

3.3 Preferences related to soft factors

Only Nordic findings were found regarding this topic.

3.3.1 Nordic findings

De Gruyter et al. [13] performed a meta-analysis, with results from Norway, Sweden, Australia, India, New Zealand and United Kingdom, regarding preferences for soft factors in the PT system. Soft factors included in the meta-analysis were divided into six categories: access (e.g., universal design and access to the station), facilities (e.g., ticket machines), security (e.g., lighting and staff), environment (e.g., noise and temperature control) and conditions (e.g., cleanliness). The results showed that preferences for soft factors in Norway and Sweden were much higher than in the other countries. They state that previous studies also show that Scandinavian countries value soft factors more highly for PT compared to other countries.

Fearnley et al. [18] analysed SP data from 408 Norwegian participants to estimate values for universal design in local PT. Universal design was defined as factors that make PT accessible to as many passengers as possible, e.g., seating, shelter, and information accessibility. They estimated WTP for five main categories: information at stop/stations, information on board, improved boarding, shelter, cleanliness and ice/snow removal. Each main category had 2–4 subcategories, e.g., shelter with and without a sitting place. The WTP for improved universal design showed a higher value compared to the time value (0.08–0.9 USD/minute compared to 0.07 USD/minute). The WTP for shelter with a sitting place at the bus stop (0.9 USD/minute) and ice/snow removal (0.88 USD/minute) was relatively high compared to the other attributes. The monetary values appear to be higher than those in previous international studies. This might be explained by the high standard of PT in urban areas in Norway and a large share of PT users, which means that these users have a relatively high income, which might lead to a higher WTP.

3.4 PT demand

In PT improvement studies, the attributes of reliability, frequency, travel time, price, comfort, access and convenience are commonly studied. PT demand is highly influenced by individuals' previous experience of PT, their demographics, and socioeconomic factors [51]. For instance, high income increases the likelihood of owning a car [51], car access decreases PT demand [30, 51] and the number of dependent children in the household increases car use [38].

Reliability [14, 23, 51] and frequency [23, 51] are attributes with a strong impact on PT demand. If the PT has a low frequency or requires multiple transfers, the PT system fails to attract new users, and a mode shift from PT to private car can occur [6]. The Mohring effect, coined by the economist Herbert Mohring, posits that an increase in PT users leads to higher frequency, which leads to more passengers. Conversely, a decrease in PT users leads to a lower frequency, which leads to fewer passengers [32]. Moreover, prices [51] and travel time [40, 51] also affect the PT demand. The effect that price changes have on demand is strongly influenced by other PT attributes such as frequency, travel time and access. Price changes can lead to an initial increase in demand, but the duration of the effect is affected by the quality attributes of PT [51].

Travellers compare the ticket price with their expectation of a reasonable price for the service they believe is provided [51]. Travellers' knowledge and experience of the PT system influence their perception of the PT cost and the travel time [29], and studies show, e.g., that PT users tend to overestimate their waiting time at bus stops [14, 29].

3.4.1 Nordic findings

In 2009, the train supply between Malmö and Gothenburg in Sweden improved due to the deregulation of interregional passenger rail services in Sweden, the ticket prices decreased, and the frequency increased. This led to a significant increase in train demand; the market share for trains compared to cars and airplanes increased from 21 to 28% between 2008 and 2010 on the route [19]. Fröidh and Byström [19] conducted an SP study onboard trains with different attributes between Malmö and Gothenburg to evaluate what affects travel mode choice between three different trains on the same route. The results showed that price, followed by travel time, had the highest impact on travel mode choice. Other factors evaluated were train types, train operator, and the quality of food and beverage services. The three trains attracted different travellers: the cheaper and slower train attracted younger passengers to a greater extent, whereas the more expensive trains with a shorter travel time attracted business passengers to a greater extent.

Findings in earlier SP studies show that there is a WTP for more reliable transport. Halse et al. [22] used RP data to examine whether this was also true in the Oslo metropolitan area in Norway, where there is a high level of competition between trains, cars and express buses. The results showed that train delays had a negative impact on PT demand; a 1% increase in average delay resulted in a 0.04% to 0.1% decrease in demand. The results are in line with previous results in the UK. The demand elasticity calculated in the RP study is lower than that in previous SP studies in Norway, which varied between -0.06 and -0.65. The study concludes that reliability has some effect on PT demand, but an improvement in reliability alone will not lead to a large increase in PT demand.

In 2021, an automated shuttle service was introduced at the Technical University of Denmark between the PT stop and campus as a complement to PT for the first-last mile. During the test period, Thorhauge et al. [56] conducted an SP study among 249 students and employers at the campus to analyse how improvements in the first-last mile trip affect the overall travel mode choice. The results show that automated shuttles do not have an overall effect on PT market share, but they might shift some existing PT users to use shuttle services.

3.5 Customer satisfaction

Factors that influence customer satisfaction in PT are mainly related to the travel experience [34]. Reliability [14, 23, 51] and frequency [23, 51] are highlighted as factors with a high impact on customer satisfaction. The most frequently mentioned factors that influence customer satisfaction are on-board cleanliness, comfort, safety, behaviour of the personnel [23, 34], reliability, frequency [34], travel time and price [23]. Factors that influence overall loyalty to the PT system are factors more associated with a trusting relationship between the user and the agency, e.g., the perception of value for money, on-board safety, cleanliness and interaction with personnel [34].

3.5.1 Nordic findings

Studies show that travel satisfaction is perceived differently by different groups. Börjesson and Rubensson [8] found that women in Stockholm, Sweden, rated crowding to be more important than men and that passengers over age 30 rated reliability to be more important than younger passengers. Cats et al. [11] and Abenoza et al. [2] found that pensioners/passengers older than 64 years were more satisfied than other travellers in Sweden. Ingvardson et al. [27] found indications that the younger generation in Denmark has a more negative attitude

towards PT than the older generation. Cats et al. [11] found that frequent PT users in Sweden were more satisfied than other travellers and that passengers who travelled longer distances were less satisfied than passengers who travelled shorter distances. Julsrud and Denstadli [31] found that PT users in Norway had different expectations of using travel time productively depending on their media usage. Passengers who actively used mobile devices had higher expectations of using travel time more productively than those who used mobile devices more passively or not at all. The active mobile user group expressed the lowest customer satisfaction among the PT users.

Abenoza et al. [1], Cats et al. [11] and Börjesson and Rubensson [8] found that reliability and frequency are important attributes affecting customer satisfaction. Abenoza et al. [1] and Cats et al. [11] found that frequency, reliability, and travel time were more important attributes in Sweden than suitable PT lines, which indicates a higher preference for direct, punctual and frequent lines over many low-frequency lines that minimize transfers. Börjesson and Rubensson [8] found that customer satisfaction with crowding and reliability was affected by the actual performance of these attributes. They also found that reliability and frequency were the most important factors affecting customer satisfaction, unless there was a high level of crowding, crowding was the most important attribute. Tanko et al. [54] found that the factors calmness on the journey, punctuality, cleanliness, access (relative ease of access to boat piers for respondents) and frequency were highlighted as the most important attributes for water PT users in Stockholm County, Sweden. The respondents placed low importance on the factors related to the ability to work on board but were satisfied with how the factor performed.

4 What factors encourage us to travel more by PT and less by private cars?

This section summarizes the international and Nordic research findings related to the research question mentioned in the section title. It is divided into four subsections. Each subsection begins with the international findings that reflect general knowledge on the subject. This is then followed by a subsection that provides a summary of insights from Nordic countries on the same topic.

4.1 The influence that lifestyle, life stage and generation have on preferences

Life events, such as child birth, relocation and retirement, interrupt habits and provide a valuable opportunity to influence travel behaviour and travel mode shifts [3, 38, 51]. Studies show that it is more common for a household to reduce the number of cars when the household size decreases because of a divorce, a child moving out, or the death of one of the partners. A decrease in household income also affects the likelihood of reducing the number of cars, especially due to retirement or residential relocation [3].

Research on travel behaviour for different generations has increased in recent years. The results show that travel behaviour and travel preferences differ between generations. It is important to remember that generations are not a homogenous group even if some general conclusion can be made [30].

The car is the preferred mode of transport by many elderly [17, 30, 36]. The main reason for traveling by car is often reported as a lack of valid alternatives [17, 36]. The most reported barriers for using PT are unsuitable routes, timetables, and scheduling. Other commonly mentioned factors are low reliability, the risk of having to stand, crowded vehicles, long walking distances, difficulties in understanding timetables, low accessibility, and affordability. PT demand is also affected by bus driver behaviour [36], and car ownership has a negative effect on PT demand [30].

The younger generation uses PT and active transport modes more than the older generation. They use multiple transport modes to a larger extent than other generations, e.g., a mix of cycling, driving and PT usage. The difference in travel behaviour between men and women is lesser for the younger generation compared to other generations. An increased income, having car access and holding a driver's licence increase car usage for this group [30].

Car is the preferred mode of transport by many families with young children. Car usage increases when the PT system has low accessibility, walking and cycling opportunities are low, or the number of dependent children in the household increases. Household income influences transport mode choice; higher income increases car usage, and lower income increases trips made by foot. PT cost is identified as a hindrance to the use of PT when travelling as a family [38].

Some studies have found a distinction in travel behaviour for adults and children/youths, e.g., a walk-friendly environment can be perceived differently by the two groups. Studies indicate that car access increases the likelihood for parents to drive their children to school. Moreover, the likelihood for a child/youth to be driven to and from school is affected by the parents' preference for car usage. If parents perceive cars as a convenient and socially acceptable mode of transport, the child is more likely to be driven to and from school. As the distance between school and residence increases, children and youths are less likely to use active modes of

transportation. The likelihood for the child/youth to walk and cycle to and from school increases with age and is affected by the perceived traffic safety and "walkability" on the route [39].

4.1.1 Nordic findings

Prato et al. [45] used data from the Danish National Travel Survey to evaluate preferences for short trips (< 22 km) in Copenhagen, Denmark. The results showed that lifestyle influenced travel mode choice and the perception of travel modes. Four heterogeneous groups were identified: *car-oriented individuals, bicycle-oriented individuals, walking- and PT-oriented individuals,* and *PT-averse individuals*. The groups had different perceptions of travel time; e.g., the *car-oriented group* evaluated 1 min of car travel as 2.6 min of cycling, whereas the *bicycle-oriented group* evaluated 1 min of cycling as 2.3 min of car travel. The perception of transfer penalties also differed between the groups, with the *PT-averse group* having the highest transfer penalty and the *walking- and PT-oriented group* having the lowest. Socioeconomic factors influenced which group an individual belonged to. For instance, individuals in the *car-oriented group* were mostly working men living with other adults, with high income and young children, whereas individuals in the *walk- and PT-oriented group* were mainly young female workers or students without children.

Thorhauge et al. [57] examined how travel mode choice is affected by trip complexity, activity participation, subjective constraints, and perceived mobility needs by creating a mode choice model based on RP data from Denmark. The results showed that the perceived mobility necessities were influenced by the number of daily activities and how flexible an individual was with arrival time to and from work. Individuals with high perceived mobility necessities (many daily activities and/or low flexibility in activities) were more likely to travel by car and bike and less likely to travel by PT. When using the model to predict the effect of a decrease in travel time for buses and an increase in travel time for cars, it was shown that individuals with high levels of perceived mobility necessities shifted from cars to bikes to a greater extent than those with lower perceived mobility necessities, who mostly shifted from cars to PT.

Rasca and Saeed [49] found that the probability of commuting by bus to work decreases when the respondents had a person in care, e.g., small children. Two Nordic studies were found that analysed children's travel behaviour. An analysis of children's (aged between 6–12) travel independence in Norway was conducted by Fyhri and Hjorthol [20] using data from a survey of 1775 parents and their children. The study revealed variances in travel patterns between school trips and leisure trips, with 17% of school trips using PT and 25% being by car. Conversely, leisure trips predominantly rely on cars, with 66% of sport activity trips being made by car and only 1% by PT. The results showed that the child's age and the distance to school had the greatest influence on their travel independence, and parental tendencies to frequently use cars raised the probability of driving their child to school. The most stated reasons for driving the child to school were "on the way to the parents' work" (58%), followed by "dangerous traffic" (21%) and "most convenient" (18%), and the least stated reasons were "the child wants to be chauffeured" (12%), "have much to carry" (12%), "the way to school is unsafe for other reasons" (5%), and "friends are being driven" (2%).

By examining data from a survey of 245 parents in the Värmland region of Sweden, Westman et al. [59] analysed the choice of parents to transport their children (aged between 10 and 15) to school by car. According to the findings, social convenience, i.e., parents' desire to spend time with the child (and driving them is perceived as the convenient way to do so), was the primary determining factor in deciding whether to drive them to school. The child's ability to travel independently also played a role in this regard. On the other hand, safety, security, and distance to school were not found to be statistically significant variables to predict whether parents would drive their children to school.

4.2 The impact that distance has on travel mode choices

Only Nordic findings were found regarding this topic.

4.2.1 Nordic findings

Empirical results from Nordic countries show that the distance between residence and workplace or city centre affects travel mode choice. Ahanchian et al. [4] found that the main competitor to car usage in Denmark differs depending on trip length: For short-distance (up to 25 km) trips metro, cycling and walking were the main competitors for cars, whereas for longer distances, trains and buses were the main competitors.

Pritchard and Frøyen [46] analysed data from a survey that asked 195 workers at a large company in Norway about their commuting behaviour before and after the company relocated from a location 10 km outside the city centre to the city centre. The results showed that relocation led to a decrease in commuting trips made by car/motorcycle (from 72 to 25%) and an increase in commuting by PT (from 12 to 32%) and by active modes (from 16 to 43%). The likelihood of travelling by car and PT increased when the distance between workplace and residence was greater than 7.5 km. Three similar case studies in Norway found that commuting by car decreased when companies relocated to a more central location.

Naess et al. [42] analysed data from 1148 respondents from the Reykjavik capital region in Iceland and found that the probability of being a regular car commuter increased when the distance between residence and city centre increased. Nordfjærn et al. [44] performed a cross-sectional survey among 441 students on the two largest university campuses in Trondheim, Norway; one of the campuses is 2 km from the city centre and the other 6.5 km from the city centre. The results showed that a longer distance between the respondents' residence and the university was correlated with more PT usage and less usage of active transportation modes. Isacsson et al. [28] created a mode choice model for Swedish men travelling to and from work by analysing RP data and employee-establishment data. They found that the likelihood for Swedish men to commute by PT compared to by car, motorcycle and active modes increased with an increased distance to work. Rasca and Saeed [49] analysed what affects the use of PT for employees in the region of Adger, Norway, by analysing data from a regional travel survey that consisted of 1849 respondents. The results show that the probability of commuting by PT increased with an increased distance between residence and workplace and that the probability of using PT increased when living five minutes or less from a PT stop with a frequency of at least 20 min between departures. They found that respondents with children were less willing to change from cars to PT.

4.3 Psychological factors and intention to use

Only Nordic findings were found regarding this topic.

4.3.1 Nordic findings

In 2018, a trial operation for a first-/last-mile automated bus service took place in Stockholm, Sweden. The automated buses were free of charge and operated on a 750-m route with flexible timetables from 6 a.m. to 6 p.m. every day. During the trial period, a survey was conducted with 574 passengers who lived, worked, or studied near the trial operation area to determine factors that influenced the intention to use the service. The results showed that frequency had the greatest impact on the intention to try the service, and comfort had the greatest impact on the intention to keep using the service [12].

Eriksson and Forward [15] examined how well an expanded version of the *theory of planned behaviour* predicts the intention to use cars, buses, and bicycles. They analysed data from a survey with 620 participants from Falun, Sweden. The results showed that attitude, subjective norms, and perceived behavioural control explained 48% of the intention to use a car, 41% of the intention to use a bus and 38% of the intention to use a bicycle. When car access was included in the model, the model better predicted the intention to use the different modes. Car access had a negative influence on the intention to use buses and bicycles. Car drivers were less willing to use other transport modes than bus and bicycle users.

Lind et al. [35] examined how travel mode choices are affected by the relative importance of situational factors and personal norms by analysing data from a survey with 1043 participants in urban areas in Norway. The results showed that socioeconomic factors, personal norms, values and beliefs affected travel mode choice and that values and beliefs explained 58% of the variance in personal norms. For example, the participants who stated a strong feeling of moral obligation to sustainable travel modes more often used PT, walked, or cycled, whereas those who stated a low feeling of this moral obligation more often used cars.

Mobility as a Service (MaaS) is an approach to attract car users to more sustainable travel habits. Strömberg et al. [53] analysed data based on 151 local travellers who participated in a MaaS trial for six months in Gothenburg, Sweden. The participants completed three online questionnaires (before, during and after the trial). The results showed that 42% of the participants reported a behavioural change regarding travel mode choice, and 36% of the participants did not report a behavioural change. Four subgroups were identified that differed depending on socioeconomic factors, motivation to join the trial and expectations of the trial. Participants who used cars before the trial reduced their car usage and increased the usage of more sustainable travel modes. The results showed that participants had difficulties predicting how their own behaviour would change before the trial since they had little knowledge about their preconditions, travel needs and behaviour when joining the trial. The fact that individuals have difficulties in predicting their own behavioural changes indicates the complexity of predicting behaviours.

Andersson et al. [5] conducted an SP study in Sweden to evaluate how marketing messages motivate a mode shift from car to sustainable transport. The results showed that environment and health messages motivated more than economic and status-related messages and that messages focusing on collective efficacy elicited higher motivations than messages focusing on self-efficacy. The marketing messages had different effectiveness in different groups, which highlights the importance of adapting the message to fit the preferences and behaviour of the selected target group. The results suggested that individuals' preferences and current behaviour affect their responses to the messages. In line with previous studies, campaigns did not seem to affect devoted drivers and should therefore focus on other target groups who more open to changes [5].

4.4 Car users

There is no simple solution to attract car users to PT since they are not a homogenous group. To attract them to PT, it is important to understand the underlying motivation for car use for that specific target group [3, 23, 38, 51]. An example of a target group can be middle-class families with young children in a specific suburb who work in the closest large city. Several of the reviews directly or indirectly state that more research is needed to understand how to attract car users to the PT system [3, 36, 38, 41, 47, 51].

As previously mentioned, PT demand is strongly influenced by reliability and frequency. Since car users already have these qualities in their current travel mode, a PT system with high punctuality and high frequency is not enough to create a mode shift. To attract car users to the PT system, it must provide a cost-competitive alternative to the car with basic levels of accessibility and reliability together with attributes viewed as important by the target group. It is important to show car users the benefits they can obtain by travelling by PT. Habit-interrupting transport policies and reduced PT prices can lead to an initial mode shift. However, the duration of the effect is affected by how the PT system is perceived [51].

4.4.1 Nordic findings

Isacsson et al. [28], Eriksson and Forward [15], Pritchard and Frøyen [46], Nordfjærn et al. [44], Rasca and Saeed [49], Thogersen et al. [55] and Hjorthol et al. [25] found evidence suggesting that car access has a negative effect on PT usage and/or a positive effect on car usage. Rasca and Saeed [49] found that if the respondent had difficulty finding a parking spot, the likelihood of using PT to commute to work is higher. Thogersen et al. [55] analysed data from 2607 commuters in Norway to investigate why they drive conventional cars and not more climate-friendly alternatives to and from work/school. Their findings showed that a greater PT frequency reduces the likelihood of travelling by car, while an increased requirement for transfers in PT increases the likelihood of travelling by car.

Using data from the Danish National Transport Survey (2010–2015; 29 089 journeys) and information from the Danish National Transport Model, Ahanchian et al. [4] created a model to predict the modal shift effect in Denmark. Different scenarios were tested in the model to analyse how three different transport policies would affect travel demand compared to the reference scenario in 2050. The results showed that an increase in the cost of travelling by car had the highest effect on reduced car use (− 30%), followed by reduced costs for sustainable travel modes (− 19%) and expansion of PT infrastructure (− 7%). The greatest effect was found when all three policies were adopted (− 49%). The results also showed that the easiest group to influence was the low-income group.

5 Discussion

The aim of this review was to provide insights into the current state of knowledge regarding what affects travel behaviour and travel demand for existing and potential PT users. This was done by reviewing existing international reviews and reviewing results from Nordic counties. The restriction to published international reviews is considered to capture the general knowledge and rules of thumb in a comprehensive way. By limiting our review to high-quality, English-language articles that target an international audience, we can ensure that we are summarizing the most relevant and valuable information available. However, some may argue that we risk missing out on relevant articles written in other languages.

No major contradictions in the results were found between the international and Nordic studies. However, certain empirical evidence from Nordic studies was not analysed in international studies. Only the Nordic studies examined preferences related to soft factors, the impact that distance has on travel mode choices, psychological factors and intention to use, and crowding. However, only the international review examined travel preferences for elderly individuals. Most studies included in this review focused on specific contexts such as a municipality, a region, or a country. Only one Nordic study examined how stable preferences were between contexts: Björklund and Swärdh [7] analysed how stable preferences for comfort and crowding were between the three largest cities in Sweden. It is noteworthy that Sweden's data constitute half of the Nordic findings, whereas Finland and Iceland contributed only one study each.

The results show that travellers dislike walking, waiting and transferring more than in-vehicle time. The burden is higher if the wait takes place in an unpleasant or threatening environment. From an international perspective, Hansson et al. [23] found indications that station facilities were more important than on-board comfort for shorter regional trips. In the Danish context, Nielsen et al. [43] found that transfer penalties depend on transfer attributes, with better station standards leading to less disutility for transfers. In the Finnish context, Pursula and Weurlander [48] found that the disutility of two transfers was more than twice the disutility of one transfer and that the disutility of standing was higher than one transfer but less than two transfers. No Nordic study was found that compared improvements in PT stops/stations versus more classical PT improvements, such as lower travel times or higher reliability.

Travellers have a greater disutility for unexpected and unpredictable delays compared to expected and predictable waits. From an international perspective, Diab et al. [14], Hansson et al. [23] and Redman et al. [51] concluded that reliability has a strong impact on PT demand. Only one Nordic study was found that evaluated the impact reliability has on PT demand: Halse et al. [22] concluded that reliability has some effect on PT demand in Norway, but an improvement in reliability alone will not lead to a large increase in PT demand. The demand elasticity calculated in the RP study is lower than in previous SP studies in Norway. Hansson et al. [23] and Redman et al. [51] similarly found that frequency has a strong impact on PT demand. In Norway, Thogersen et al. [55] found that a greater PT frequency reduces the likelihood of travelling by car. Empirical findings from both international [23, 51] and Nordic [1, 8, 11] studies show that reliability and frequency are important factors affecting customer satisfaction.

Evidence from both the international and Nordic perspectives shows that preferences are heterogeneous, and travellers can be classified into distinct subgroups based on their characteristics and preferences. Therefore, improvements and campaigns will have different efficiencies in different subgroups, and the answers to the research questions depend on which subgroup is of interest. While there may not be an easy answer for the two research questions, we believe that it is valuable to gain knowledge from previous research to create a deeper understanding of the factors that influence travel behaviour.

6 Conclusions

The empirical findings show that reliability and frequency are important attributes for creating an attractive PT supply. However, the extent to which improvements in these attributes affect PT demand remains uncertain. Notably, potential PT users have high levels of reliability and flexibility in their current travel modes. Not degrading the current level of reliability and frequency is important to keep existing users, and a high level of reliability and frequency is crucial to make PT a reasonable travel mode for potential users. Car users are not a homogenous group, and to attract them to PT, it is important to understand the underlying motivation for their current travel mode choice. Life events interrupt habits and provide a valuable opportunity to influence travel behaviour and travel mode shifts. Habit-interrupting transport policies and reduced PT prices can lead to an initial mode shift effect. However, the duration of the effect is affected by how the PT system is perceived. To attract car users to the PT system, it is important to show them the benefit they can receive by travelling by PT.

Only one study was found that examined the stability of preferences across different contexts. If preferences remain stable across contexts, then preferences found in one context can be applied to other contexts. Assuming identical preferences across regions or locations can result in suboptimal PT planning that does not reflect the preferences and needs of the local populations. From a policy perspective, it is therefore recommended to further examine how stable preferences are between different contexts since findings from one study/context are often used for other contexts, especially within countries.

In line with many of the previous reviews, we also acknowledge the need to create a deeper understanding of the underlying motivations for travel mode choice for potential PT users. Additionally, it is recommended to investigate the extent to which PT stops or stations contribute to the attractiveness of the PT supply. From a policy perspective, it would be valuable to understand when investing in PT stops or stations is more beneficial than investing in traditional PT improvements such as reduced travel time or improved reliability. On a similar note, more research is recommended to explore the impact of reliability and frequency on PT demand. We believe these recommendations would improve input parameters for PT planning, thus enabling planners to invest in the most effective PT improvements to increase the attractiveness of PT.

Acknowledgements
Financial support from the Swedish Transport Administration is gratefully acknowledged. Henrik Andersson acknowledges funding from VTI and the French National Research Agency (ANR) under grant ANR-17-EURE-0010 (Le Programme d'investissements d'avenir (PIA)). We would also like to thank the reviewers and the editor for their comments that helped us improve the manuscript. The usual disclaimers apply.

Author contributions
JG and HA together developed the aim and objectives of the study. JG performed the literature review and prepared the original draft. HA supervised the process. JG and HA together edited and finalized the manuscript. Both authors have approved the manuscript for submission.

Funding
This study was funded by the Swedish Transport Administration (grant number TRV 2020/26424).

Availability of data and materials
All reviewed articles are available in Web of Science, Scopus or Transport Reviews.

Declarations

Competing interests
The authors declare that they have no competing interest.

Author details
[1]VTI - Swedish National Road and Transport Research Institute, Box 55685, 102 15 Stockholm, Sweden. [2]K2 – The Swedish Knowledge Centre for Public Transport, Bruksgatan 8, 222 36 Lund, Sweden. [3]Department of Technology and Society, Lund University, Box 118, 221 00 Lund, Sweden. [4]Toulouse School of Economics, University of Toulouse Capitole, 31015 Cedex 6, Toulouse, France.

Received: 1 September 2022 Accepted: 14 September 2023
Published online: 25 September 2023

References

1. Abenoza, R. F., Cats, O., & Susilo, Y. O. (2017). Travel satisfaction with public transport: Determinants, user classes, regional disparities and their evolution. *Transportation Research Part A: Policy and Practice, 95*, 64–84. https://doi.org/10.1016/j.tra.2016.11.011
2. Abenoza, R. F., Liu, C., Cats, O., & Susilo, Y. O. (2019). What is the role of weather, built-environment and accessibility geographical characteristics in influencing travelers' experience? *Transportation Research Part A: Policy and Practice, 122*, 34–50. https://doi.org/10.1016/j.tra.2019.01.026
3. Aguilera, A., & Cacciari, J. (2020). Living with fewer cars: Review and challenges on household demotorization. *Transport Reviews, 40*, 796–809. https://doi.org/10.1080/01441647.2020.1772405
4. Ahanchian, M., Gregg, J. S., Tattini, J., & Karlsson, K. B. (2019). Analyzing effects of transport policies on travelers' rational behaviour for modal shift in Denmark. *Case Studies on Transport Policy, 7*, 849–861. https://doi.org/10.1016/j.cstp.2019.07.010
5. Andersson, A., Winslott Hiselius, L., & Adell, E. (2020). The effect of marketing messages on the motivation to reduce private car use in different segments. *Transport Policy, 90*, 22–30. https://doi.org/10.1016/j.tranpol.2020.02.006
6. Ben-Akiva, M., & Morikawa, T. (2002). Comparing ridership attraction of rail and bus. *Transport Policy, 9*, 107–116. https://doi.org/10.1016/S0967-070X(02)00009-4
7. Björklund, G., & Swärdh, J.-E. (2017). Estimating policy values for in-vehicle comfort and crowding reduction in local public transport☆. *Transportation Research Part A: Policy and Practice, 106*, 453–472. https://doi.org/10.1016/j.tra.2017.10.016
8. Börjesson, M., & Rubensson, I. (2019). Satisfaction with crowding and other attributes in public transport. *Transport Policy, 79*, 213–222. https://doi.org/10.1016/j.tranpol.2019.05.010
9. Calmfors, L., Hassler, J., Nasiritousi, N., Bäckstrand, K., Silbye, F., Birch Sørensen, P., et al. (2019). *Nordic Economic Policy Review 2019: Climate Policies in the Nordics*. Nordic Council of Ministers.
10. Carlsson, F. (2003). The demand for intercity public transport: The case of business passengers. *Applied Economics, 35*, 41–50. https://doi.org/10.1080/00036840210158921
11. Cats, O., Abenoza, R. F., Liu, C., & Susilo, Y. O. (2015). Evolution of satisfaction with public transport and its determinants in Sweden: Identifying priority areas. *Transportation Research Record, 2538*, 86–95. https://doi.org/10.3141/2538-10
12. Chee, P. N. E., Susilo, Y. O., & Wong, Y. D. (2020). Determinants of intention-to-use first-/last-mile automated bus service. *Transportation Research Part A: Policy and Practice, 139*, 350–375. https://doi.org/10.1016/j.tra.2020.06.001
13. De Gruyter, C., Currie, G., Truong, L. T., & Naznin, F. (2019). A meta-analysis and synthesis of public transport customer amenity valuation research. *Transport Reviews, 39*, 261–283. https://doi.org/10.1080/01441647.2018.1461708
14. Diab, E. I., Badami, M. G., & El-Geneidy, A. M. (2015). Bus transit service reliability and improvement strategies: Integrating the perspectives of passengers and transit agencies in North America. *Transport Reviews, 35*, 292–328. https://doi.org/10.1080/01441647.2015.1005034
15. Eriksson, L., & Forward, S. E. (2011). Is the intention to travel in a pro-environmental manner and the intention to use the car determined by different factors? *Transportation Research Part D: Transport and Environment, 16*, 372–376. https://doi.org/10.1016/j.trd.2011.02.003
16. European Environment Agency. (2021). Transport and environment report 2020: train or plane? Publications Office, LU.
17. Fatima, K., Moridpour, S., De Gruyter, C., & Saghapour, T. (2020). Elderly sustainable mobility: Scientific paper review. *Sustainability, 12*, 7319. https://doi.org/10.3390/su12187319
18. Fearnley, N., Flügel, S., & Ramjerdi, F. (2011). Passengers' valuations of universal design measures in public transport. *Research in Transportation Business & Management, Accessibility in passenger transport: Policy and management, 2*, 83–91. https://doi.org/10.1016/j.rtbm.2011.07.004
19. Fröidh, O., & Byström, C. (2013). Competition on the tracks—Passengers' response to deregulation of interregional rail services. *Transportation Research Part A: Policy and Practice, 56*, 1–10. https://doi.org/10.1016/j.tra.2013.09.001
20. Fyhri, A., & Hjorthol, R. (2009). Children's independent mobility to school, friends and leisure activities. *Journal of Transport Geography, 17*, 377–384. https://doi.org/10.1016/j.jtrangeo.2008.10.010
21. Gunther, M., Jacobsen, B., Rehme, M., Goetze, U., & Krems, J. F. (2020). Understanding user attitudes and economic aspects in a corporate multimodal mobility system: Results from a field study in Germany. *European Transport Research Review, 12*, 64. https://doi.org/10.1186/s12544-020-00456-0
22. Halse, A. H., Østli, V., & Killi, M. (2020). Revealed and stated preferences for reliable commuter rail in Norway. *Transportation Letters, 12*, 288–292. https://doi.org/10.1080/19427867.2019.1586088
23. Hansson, J., Pettersson, F., Svensson, H., & Wretstrand, A. (2019). Preferences in regional public transport: A literature review. *European Transport Research Review, 11*, 38. https://doi.org/10.1186/s12544-019-0374-4
24. Heinen, E., & Bohte, W. (2014). Multimodal commuting to work by public transport and bicycle: Attitudes toward mode choice. *Transportation Research Record, 2468*, 111–122. https://doi.org/10.3141/2468-13
25. Hjorthol, R. J., Levin, L., & Sirén, A. (2010). Mobility in different generations of older persons: The development of daily travel in different cohorts in Denmark, Norway and Sweden. *Journal of Transport Geography, Special issue: The mobility of older people, 18*, 624–633. https://doi.org/10.1016/j.jtrangeo.2010.03.011
26. IEA. (2020). Tracking Transport 2020, IEA, Paris https://www.iea.org/reports/tracking-transport-2020. Accessed 2021 May 30.
27. Ingvardson, J. B., Kaplan, S., de Abreu e Silva, J., di Ciommo, F., Shiftan, Y., & Nielsen, O. A. (2020). Existence, relatedness and growth needs as mediators between mode choice and travel satisfaction: evidence from Denmark. *Transportation, 47*, 337–358. https://doi.org/10.1007/s11116-018-9886-3
28. Isacsson, G., Karlström, A., & Swärdh, J.-E. (2013). The value of commuting time in an empirical on-the-job search model—An application based on moments from two samples. *Applied Economics, 45*, 2827–2837. https://doi.org/10.1080/00036846.2012.678981
29. Iseki, H., & Taylor, B. D. (2009). Not all transfers are created equal: Towards a framework relating transfer connectivity to travel behaviour. *Transport Reviews, 29*, 777–800. https://doi.org/10.1080/01441640902811304
30. Jamal, S., & Newbold, K. B. (2020). Factors associated with travel behavior of millennials and older adults: A scoping review. *Sustainability, 12*, 8236. https://doi.org/10.3390/su12198236
31. Julsrud, T. E., & Denstadli, J. M. (2017). Smartphones, travel time-use, and attitudes to public transport services. Insights from an explorative study of urban dwellers in two Norwegian cities. *International Journal of Sustainable Transportation, 11*, 602–610. https://doi.org/10.1080/15568318.2017.1292373
32. Li, X., & Yang, H. (2016). Dynamics of modal choice of heterogeneous travelers with responsive transit services. *Transportation Research Part C: Emerging Technologies, 68*, 333–349. https://doi.org/10.1016/j.trc.2016.04.014
33. Li, Z., & Hensher, D. A. (2012). Congestion charging and car use: A review of stated preference and opinion studies and market monitoring evidence. *Transport Policy, Urban Transport Initiatives, 20*, 47–61. https://doi.org/10.1016/j.tranpol.2011.12.004
34. van Lierop, D., Badami, M. G., & El-Geneidy, A. M. (2018). What influences satisfaction and loyalty in public transport? A review of the literature. *Transport Reviews, 38*, 52–72. https://doi.org/10.1080/01441647.2017.1298683
35. Lind, H. B., Nordfjærn, T., Jørgensen, S. H., & Rundmo, T. (2015). The value-belief-norm theory, personal norms and sustainable travel mode choice in urban areas. *Journal of Environmental Psychology, 44*, 119–125. https://doi.org/10.1016/j.jenvp.2015.06.001
36. Luiu, C., Tight, M., & Burrow, M. (2018). Factors preventing the use of alternative transport modes to the car in later life. *Sustainability, 10*, 1982. https://doi.org/10.3390/su10061982
37. Mabit, S. L., Rich, J., Burge, P., & Potoglou, D. (2013). Valuation of travel time for international long-distance travel—Results from the Fehmarn Belt stated choice experiment. *Journal of Transport Geography, 33*, 153–161. https://doi.org/10.1016/j.jtrangeo.2013.10.003

38. McCarthy, L., Delbosc, A., Currie, G., & Molloy, A. (2017). Factors influencing travel mode choice among families with young children (aged 0–4): A review of the literature. *Transport Reviews, 37*, 767–781. https://doi.org/10.1080/01441647.2017.1354942
39. Mitra, R. (2013). Independent mobility and mode choice for school transportation: A review and framework for future research. *Transport Reviews, 33*, 21–43. https://doi.org/10.1080/01441647.2012.743490
40. Molander, S., Fellesson, M., Friman, M., & Skalen, P. (2012). Market orientation in public transport research—A review. *Transport Reviews, 32*, 155–180. https://doi.org/10.1080/01441647.2011.633248
41. Muñoz, B., Monzon, A., & Daziano, R. A. (2016). The increasing role of latent variables in modelling bicycle mode choice. *Transport Reviews, 36*, 737–771. https://doi.org/10.1080/01441647.2016.1162874
42. Naess, P., Stefansdottir, H., Peters, S., Czepkiewicz, M., & Heinonen, J. (2021). Residential location and travel in the Reykjavik Capital Region. *Sustainability, 13*, 6714. https://doi.org/10.3390/su13126714
43. Nielsen, O. A., Eltved, M., Anderson, M. K., & Prato, C. G. (2021). Relevance of detailed transfer attributes in large-scale multimodal route choice models for metropolitan public transport passengers. *Transportation Research Part A: Policy and Practice, 147*, 76–92. https://doi.org/10.1016/j.tra.2021.02.010
44. Nordfjærn, T., Egset, K. S., & Mehdizadeh, M. (2019). "Winter is coming": Psychological and situational factors affecting transportation mode use among university students. *Transport Policy, 81*, 45–53. https://doi.org/10.1016/j.tranpol.2019.06.002
45. Prato, C. G., Halldórsdóttir, K., & Nielsen, O. A. (2017). Latent lifestyle and mode choice decisions when travelling short distances. *Transportation, 44*, 1343–1363. https://doi.org/10.1007/s11116-016-9703-9
46. Pritchard, R., & Frøyen, Y. (2019). Location, location, relocation: How the relocation of offices from suburbs to the inner city impacts commuting on foot and by bike. *European Transport Research Review, 11*, 14. https://doi.org/10.1186/s12544-019-0348-6
47. Pronello, C., & Gaborieau, J.-B. (2018). Engaging in pro-environment travel behaviour research from a psycho-social perspective: A review of behavioural variables and theories. *Sustainability, 10*, 2412. https://doi.org/10.3390/su10072412
48. Pursula, M., & Weurlander, M. (1999). Modeling level-of-service factors in public transportation route choice. *Transportation Research Record, 1669*, 30–37. https://doi.org/10.3141/1669-04
49. Rasca, S., & Saeed, N. (2022). Exploring the factors influencing the use of public transport by commuters living in networks of small cities and towns. *Travel Behav. Soc., 28*, 249–263. https://doi.org/10.1016/j.tbs.2022.03.007
50. Reed, T. B. (1995). *Reduction in the burden of waiting for public transit due to real-time schedule information: A conjoint analysis study*. Paper presented at the 6th Vehicle Navigation and Information Systems Conference (1995, Seattle, WA) at Piscataway, NJ. Refereed in Iseki and Taylor (2009) and Diab et al. (2015).
51. Redman, L., Friman, M., Garling, T., & Hartig, T. (2013). Quality attributes of public transport that attract car users: A research review. *Transport Policy, 25*, 119–127. https://doi.org/10.1016/j.tranpol.2012.11.005
52. Rye, T., Velde, D., Wretstrand, A., Nordheim, B., Sørensen, C., & dellenbag, J. (2017). *The Scandinavian way to better public transport*. Available at: https://www.researchgate.net/publication/343181207_The_Scandinavian_way_to_better_public_transport
53. Strömberg, H., Karlsson, I. C. M., & Sochor, J. (2018). Inviting travelers to the smorgasbord of sustainable urban transport: Evidence from a MaaS field trial. *Transportation, 45*, 1655–1670. https://doi.org/10.1007/s11116-018-9946-8
54. Tanko, M., Cheemarkurthy, H., Hall Kihl, S., & Garme, K. (2019). Water transit passenger perceptions and planning factors: A Swedish perspective. *Travel Behaviour and Society, 16*, 23–30. https://doi.org/10.1016/j.tbs.2019.02.002
55. Thogersen, J., Vatn, A., Aasen, M., Dunlap, R. E., Fisher, D. R., Hellevik, O., & Stern, P. (2021). Why do people continue driving conventional cars despite climate change? Social-psychological and institutional insights from a survey of Norwegian commuters. *Energy Research & Social Science, 79*, 102168. https://doi.org/10.1016/j.erss.2021.102168
56. Thorhauge, M., Fjendbo Jensen, A., & Rich, J. (2022). Effects of autonomous first- and last mile transport in the transport chain. *Transportation Research Interdisciplinary Perspectives, 15*, 100623. https://doi.org/10.1016/j.trip.2022.100623
57. Thorhauge, M., Kassahun, H. T., Cherchi, E., & Haustein, S. (2020). Mobility needs, activity patterns and activity flexibility: How subjective and objective constraints influence mode choice. *Transportation Research Part A: Policy and Practice, 139*, 255–272. https://doi.org/10.1016/j.tra.2020.06.016
58. Vautard, F., Liu, C., Fröidh, O., & Byström, C. (2021). Estimation of inter-regional rail passengers' valuations for their desired departure times. *Transport Policy, 103*, 183–196. https://doi.org/10.1016/j.tranpol.2021.02.005
59. Westman, J., Friman, M., & Olsson, L. E. (2017). What drives them to drive?-Parents' reasons for choosing the carto take their children to school. *Frontiers in Psychology, 8*, 1970. https://doi.org/10.3389/fpsyg.2017.01970
60. World Economic Forum. (2020). *The Global Social Mobility Report 2020*. World Economic Forum.

Publisher's Note