

# ***The Impact of Free Public Transport in Luxembourg***

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**Abstract:** *In recent years free or affordable public transport (PT) policies have been adopted to increase ridership, reduce car dependency, achieve social and environmental goals, as well as to improve overall travel satisfaction. In March 2020, Luxembourg became the first country to implement nationwide fare-free public transport (FFPT), attracting international attention. This paper explores how FFPT influences passenger satisfaction and travel behavior by comparing some of the results from a mobility survey conducted in 2020 by the Institute of Socio-Economic Research—just before FFPT—with a survey performed in 2024 by the University of Luxembourg, targeting students and staff. Both surveys covered bus and train use, enabling a comparison of perceptions before and after FFPT. Main results indicate that overall satisfaction levels have increased in most of the travelling aspects and determinants. However, the comparison is only seen as a promising indication and trend in this study, but the data collected so far in 2024 is limited in geographical context and in the type of respondents. To more accurately evaluate long-term and broader impacts, future research will involve a larger and more diverse population sample.*

**Keywords:** public transport, travel behavior, free public transport, travel satisfaction, perceived quality, policy mobility

## **1. Introduction**

Public transport (PT) is a key component and the backbone of any sustainable urban and regional mobility system (Porru et al., 2021; Ceder, 2021). PT contributes to significantly reduce traffic congestion, lower greenhouse gas emissions, and enhance social inclusion by improving accessibility to jobs, education, and services. In addition to these structural benefits, the perceived quality and affordability of PT systems – particularly in terms of reliability, comfort, and affordability – directly affect users’ travel satisfaction, which in turn can influence user loyalty, individual mobility choices and longer-term behavioral intentions (Eboli and Mazzulla, 2007; Tyrinopoulos and Antoniou, 2008; dell’Olio et al., 2011; de Oña et al., 2013; Redman et al., 2013; de Oña et al., 2015; Widiandi et al., 2015).

In recent years, various governments and local authorities have introduced free or affordable fares through heavily subsidized PT policies to promote modal shift from private cars to collective transport, with the dual aim of addressing environmental challenges and improving equity in access to mobility (Cats et al., 2017; Hess, 2017; Van Goeverden et al., 2006). Among these, the case of Luxembourg is particularly notable: in March 2020, it became the first country in the world to implement nationwide

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fare-free public transport (FFPT), eliminating ticket costs across all bus, train (except first-class) and tram services (Ministry of Mobility and Public Works, 2020). This bold policy decision attracted global attention, especially in Europe, where PT financing models and fare policies vary widely (BBC News, 2019).

While FFPT has been praised for its symbolic and equity-related implications, empirical evidence on its long-term effects, particularly regarding travel satisfaction and behavior change, remains limited. Some studies suggest that fare abolition alone may not significantly affect mode choice without concurrent improvements in service quality and infrastructure (Cats et al., 2017; Fearnley, 2013).

In this context, the present study addresses the following research questions: *To what extent does FFPT affect changes in travel behavior? And how does it influence passengers' satisfaction?* To investigate these issues, we analyze and compare data from two mobility surveys. The first was conducted in 2020 by the Institute of Socio-Economic Research (LISER), just prior to the implementation of FFPT (Maciejewska et al., 2023). The second, carried out by the University of Luxembourg in collaboration with the University of Campania "Luigi Vanvitelli" in December 2024, acts as a follow-up study. This first data collection campaign focused on analysing travel satisfaction among university students and staff members, distinguishing between residents of Luxembourg and cross-borders from Belgium, France and Germany, a specific yet relevant segment of public transport users. Both surveys include similar questions regarding bus and train use, which are the two main modes of public transport in the country, allowing for a meaningful comparison of perceptions before and after FFPT. Additional questions in the 2024 survey were included to gain deeper insight into how the free-fare policy impacts mobility budgets and mobility resource ownerships, especially in terms of other mobility services such as shared transport modes. The analysis of these questions is however left for future papers.

The present study adopts a mixed-methods approach, combining documentary research, quantitative data analysis, and survey-based fieldwork. By examining the Luxembourg case, this research contributes to the broader debate on the effectiveness of fare-free PT policies, offering evidence-based insights that may inform transport planning and policymaking in other national and regional contexts. The paper is structured as follows. Section 2 provides an overview of the existing literature on fare-free public transport and its impact on user satisfaction and travel behavior. Section 3 outlines the research methodology and describes the data collection process. Section 4 presents the main findings, focusing specifically on the socio-economic characteristics of respondents and their travel patterns and behavioral intentions. Moreover, it explores passengers' satisfaction with public transport services in relation to the introduction of FFPT. Finally, Section 5 summarizes the key conclusions and offers reflections for future research and policy development.

## **2. Literature review**

The implementation of fare-free public transport (FFPT) has been experimented globally, motivated by diverse objectives such as improving accessibility, reducing congestion, enhancing social equity, or shifting modal behavior.

One of the earliest large-scale efforts was trialed in the town of Hasselt, Belgium (1996–2012), where fare removal resulted in a tenfold increase in PT ridership, although car traffic impacts were less measurable (Van Goeverden et al., 2006). In Tallinn, Estonia, FFPT was introduced in 2013 to support low-income residents and reduce car use and the policy is still adopted. Studies in this city show a 14% increase in public transport (PT) use and a 10% reduction in car trips, although some undesirable shifts from walking to PT were also noted (Cats et al., 2017; Hess, 2017).

In the Netherlands, free transport schemes for students (e.g., OV-Studentenkaart) significantly increased PT share and reduced car and bike use. Notably, the Leiden-The Hague corridor saw a 40% increase in PT users in 2004, but no measurable congestion relief (Van Goeverden et al., 2006). The city of Santiago, Chile, tested FFPT through a trial (2016–2017) where randomly selected participants of a free transit pass increased PT use by 28%, especially during off-peak hours. The main impact of FFPT was the generation of new trips rather than substitution from other modes or periods. However, no significant modal shift from car use was found (Bull et al., 2021). In Catania, Italy, the “*You Study, You Travel Free*” program (2018–2020) targeted university students, resulting in PT use rising from 27% to 46% and car use dropping from 50% to 26% (Inturri et al., 2020; Inturri et al., 2021). In Frankfurt (Germany), the “*State Ticket*” introduced in 2015 for state employees led to increased PT use, particularly among low-income staff, though it didn’t reduce car availability or usage (Busch-Geertsema et al., 2021). In Bogotá, Colombia, targeted PT subsidies for low-income populations (2017–2019) significantly increased ridership, indicating that income-sensitive fare reductions can be effective in promoting equitable mobility (Guzman and Cantillo-Garcia, 2024).

Whereas all above examples are limited to a city or to specific user groups, recently Germany introduced the “9-Euro Ticket” nationwide in 2022, boosting PT use by 35%, though only 3% shifted systematically from car to PT (Loder et al., 2023). Its successor, the “Deutschlandticket”, which offers unlimited use of public transport for 49 Euro (2023-2024), showed limited mode shift effects, with only 20% of new users decreasing car use (Loder et al., 2024). Still, both programs highlighted stronger adoption among lower-income and non-metropolitan populations.

Luxembourg stands out as the first and only country worldwide to implement FFPT at a national level, making all public transport free for residents, cross-border commuters, and tourists alike since March 2020. The policy was not primarily driven by environmental or mobility concerns, but by a political opportunity to combine territorial marketing with a socially inclusive measure that did not challenge the country’s strong car culture (Bigi et al., 2023). The study of Gillard et al. (2024) emphasizes both the post-political nature of the reform, minimizing dissent, and its political dimension, as FFPT became a tool of public debate and ideological negotiation.

These global experiences suggest that while FFPT can significantly boost PT ridership, especially among disadvantaged groups, its impact on reducing car use or congestion is less consistent and depends heavily on contextual factors like communication, complementary policies, and service quality.

### **3. Methodology and data collection**

Our study builds upon previous online survey data collected in 2020 in Luxembourg (less than 1964 responses) from the Institute of Socio-Economic Research (LISER) and Vrije Universiteit Brussel (VUB), and financially sponsored also by the University of Luxembourg (uni.lu). The survey, meant to be used as benchmark for future studies post-free fare policy implementation, provided insights into travel satisfaction, concerns, and perceptions of the country’s transport policy, as well as intention to use public transport in the future, recommendation of public transport just before the adoption of FFPT. Methodological approaches were based on previous studies (Maciejewska et al., 2023), linking past travel experiences to future usage intentions. This study is used in our work as a benchmark since it represents the situation just before the policy implementation.

With the goal of assessing the impact of FFPT on users’ satisfaction and on people mode choices, an online survey was launched in December 2024 to collect data from

students and staff members of the University of Luxembourg, and also from the LISER and LIST, which are the two research institutes located in the same area of the newest university campus Belval. The survey include both residents and cross-border commuters from Belgium, France and Germany but that are studying or working in Luxembourg.

The questionnaire was distributed via University channels and flyers and contains different sections aiming at collecting information about respondents’ socio-economic characteristics (e.g., country of residence, gender, age, employment status, household income), travel habits (e.g., origin and destination, trip frequency and purpose, primary transport mode used) and perceptions related to public transport services in Luxembourg. The core section of the questionnaire focuses on users’ satisfaction and perceived service quality aspects of public transport service, such as travel time, punctuality, cost, information, safety, cleanliness, comfort, accessibility, focusing on the main transport mode that they regularly use from their origin to destination. A section was dedicated to exploring perceived changes in travel behavior and attitudes following the introduction of FFPT. It investigates whether this policy has influenced the choice of transport mode and examines users’ willingness to continue using public transport in the future as well as their likelihood of recommending it to others. Responses related to satisfaction and behavioral intentions are measured using a 5-point Likert scale. For satisfaction-related items, the scale ranges from 1 – Very dissatisfied to 5 – Very satisfied, while for behavioral intention items, it ranges from 1 – Strongly disagree to 5 – Strongly agree.

While the 2024 survey targeted a smaller and more specific user group and served primarily as a preparatory phase to refine the questionnaire design and test its effectiveness, the upcoming nationwide survey will be conducted on a broader scale, aiming to gather more representative data on mobility behavior and satisfaction with public transport services across Luxembourg.

**4. Results**

**4.1. Socio-economic characteristics and travel behavior**

Table 1 presents the socio-demographic statistics of both datasets, which highlights the limitation of the sample collected in 2024 not only in the geographical extent of the respondents workplace (mainly the Belval area and the two campuses in Luxembourg city, Kirchberg and Limpertsberg) but also in terms of age categories, where the younger category of respondents is clearly over-represented.

For both the surveys, the majority were residents of Luxembourg (76.0% ex-ante and 78.1% ex-post) while cross-borders from Belgium, France and Germany represent respectively 24.0% in ex-ante and 21.9% in ex-post survey. The 2020 and 2024 samples distribution closely reflect the composition of the target population at that time (2020), as indicated by national statistics (STATEC) and social security data (IGSS), which reported that around 75% of users were residents and 25% cross-border commuters (Maciejewska et al., 2023).

**Table 1 : Socio-economic characteristics**

	2020	2024
<b>Residence</b>		
Resident of Luxembourg	76.0%	78.1%
Cross-border commuter (BE, FR and DE)	24.0%	21.9%
<b>Gender</b>		
Female	48.5%	47.9%

Male	51.5%	49.3%
Non-binary		1.4%
Prefer not to say		1.4%
<b>Age</b>		
18-24	7.7%	31.2%
25-34	31.9%	38.2%
35-49	39.5%	18.8%
50-64	17.4%	11.8%

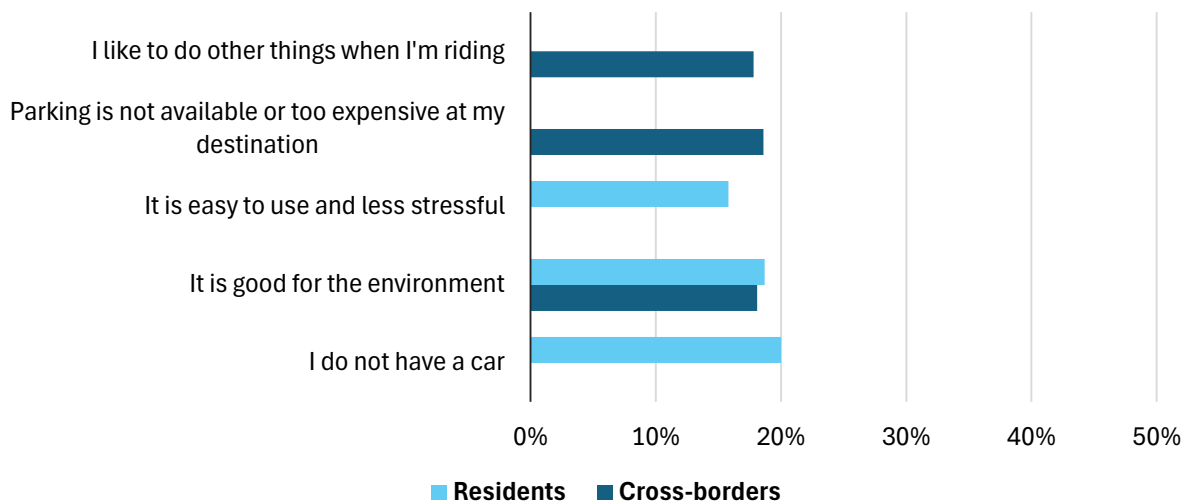
\* Due to missing values, most variables have less than 1,964 responses.

\*\* The age percentages for 2020 do not sum to 100% because only age groups shared with the 2024 survey were included.

A key aspect of this analysis concerns how the introduction of FFPT has reshaped the underlying motivations for using public transport, thus influencing travel behavior and their future intentions.

In the ex-ante survey, residents primarily reported using public transport due to not possessing a car (20.0%), for its environmental benefits (18.7%), and the perceived ease and lower stress when using PT (15.8%). For cross-border commuters, the dominant factors were the unavailability and high cost of parking in Luxembourg (18.6%), the possibility to do other activities while riding (17.8%) and environmental benefits (18.1%) (Figure 1).

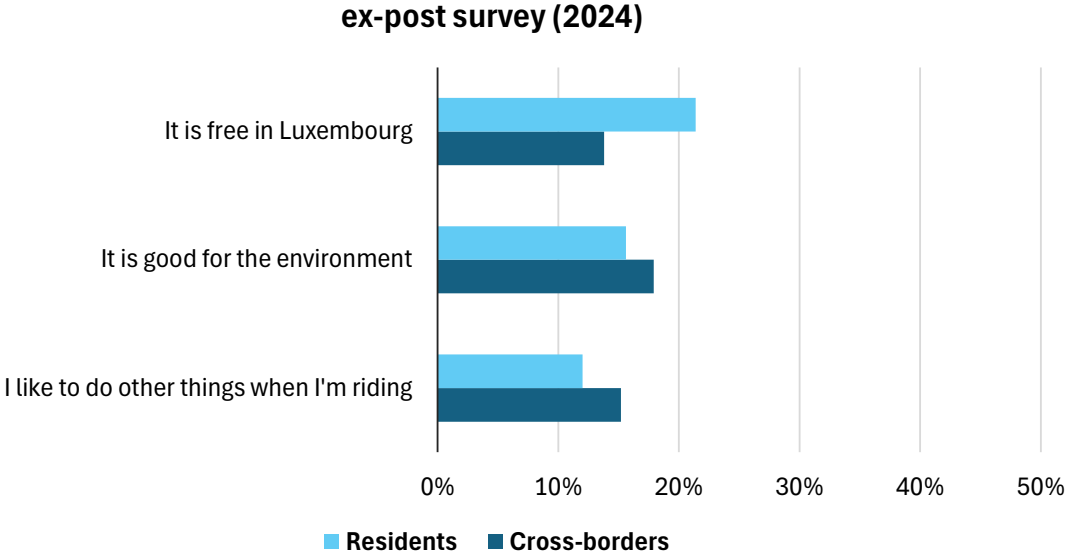
**Figure 1 : Top reasons why participants used PT in Luxembourg in 2020**  
ex-ante survey (2020)



The 2020 survey explored behavioral intentions by asking participants about their expected use of public transport in the near future, with separate questions for buses and trains. Among both residents and cross-borders who used the bus, 65% stated they planned to maintain their current usage level, while 13% anticipated using it more frequently. For train users, 51% indicated to continue using it at the same level, and 10% expected to increase their train use. Among those who declared a more frequent use of public transport, the top three reasons for increased bus use among residents were: the introduction of free fares (53.5%), personal life changes such as a new job or relocation (22.6%), and improved bus service (10.7%). Cross-border respondents cited similar motivations: 48.8% mentioned the fare-free policy, 24.4% referred to personal changes, and 7.3% pointed to better bus service. Similar trends were found for trains, where residents most frequently cited free fares (44.4%), followed by personal life changes (24.2%) and other reasons (15.3%), while cross-border

commuters prioritized free fares (33.3%), personal changes (27.8%), and other reasons (22.2%). These data reveal that, even before the actual introduction of FFPT, a significant share of respondents considered cost as a key driver of future behavioral change.

**Figure 2 :Top reasons why participants used PT in Luxembourg in 2024**



The 2024 survey reveals a notable shift in answers. Among residents who mainly use the bus, free access became the most frequently cited reason for using public transport (21.4%), overtaking more structural or habitual factors like car ownership. Although environmental concerns (15.6%) and the ability to multitask while commuting (12.0%) remained important, the emergence of cost removal as the primary motivator suggests that FFPT has directly influenced travel priorities. This indicates that, for some residents, financial barriers had previously constrained PT use, and the elimination of fares provided a new incentive to adopt or increase public transport usage. In terms of cross-border commuters, the ability to do other things during the journey (18.2%) remained the leading reason for using PT, followed by the attractiveness of free access (16.7%) and environmental benefits (15.2%), indicating that FFPT also impacted travel decisions beyond national borders and its growing relevance highlights how FFPT not only supports regular users but may also encourage more occasional or cost-sensitive individuals to shift away from private vehicles (Figure 2).

Comparing the 2020 intentions with the 2024 self-reported behaviors, a partial alignment emerges. Free fares, anticipated in 2020 as a major driver of increased PT use, have indeed become a leading reason in 2024, particularly among residents. However, the relatively modest share of respondents in 2020 who expected to use public transport more frequently (13% for buses, 10% for trains) contrasts with the strong role that free fares now play as a key motivator in 2024. This suggests that the actual behavioral impact of FFPT may have surpassed initial expectations, reinforcing the idea that removing fares at a national level can influence not only stated intentions but also real mobility choices over time.

**4.2. Satisfaction with bus and train services**

Figure 3 compares satisfaction levels with bus services before (2020) and after (2024) the implementation of FFPT, distinguishing between residents and cross-border

commuters. Overall, both groups show generally positive perceptions in both years, with some improvements observed in the ex-post results.

In 2020, satisfaction for price was high, particularly among cross-border commuters (5), reflecting the value of low fares already in place before the introduction of FFPT. In 2024, this remained one of the top-rated aspect, confirming continued appreciation for cost-free mobility. Residents rated price for cross-border trips consistently at around 4 across both surveys. Cleanliness, comfort, safety (both onboard and at stops) were among the best-rated aspects in both years by both groups, with stable scores also around 4. These elements appear to be strengths of the system, unaffected by the policy change. It is important to note that these aspects contribute to a more pleasant and user-friendly experience for all passengers, which likely plays a significant role in the overall satisfaction with public transport services in Luxembourg.

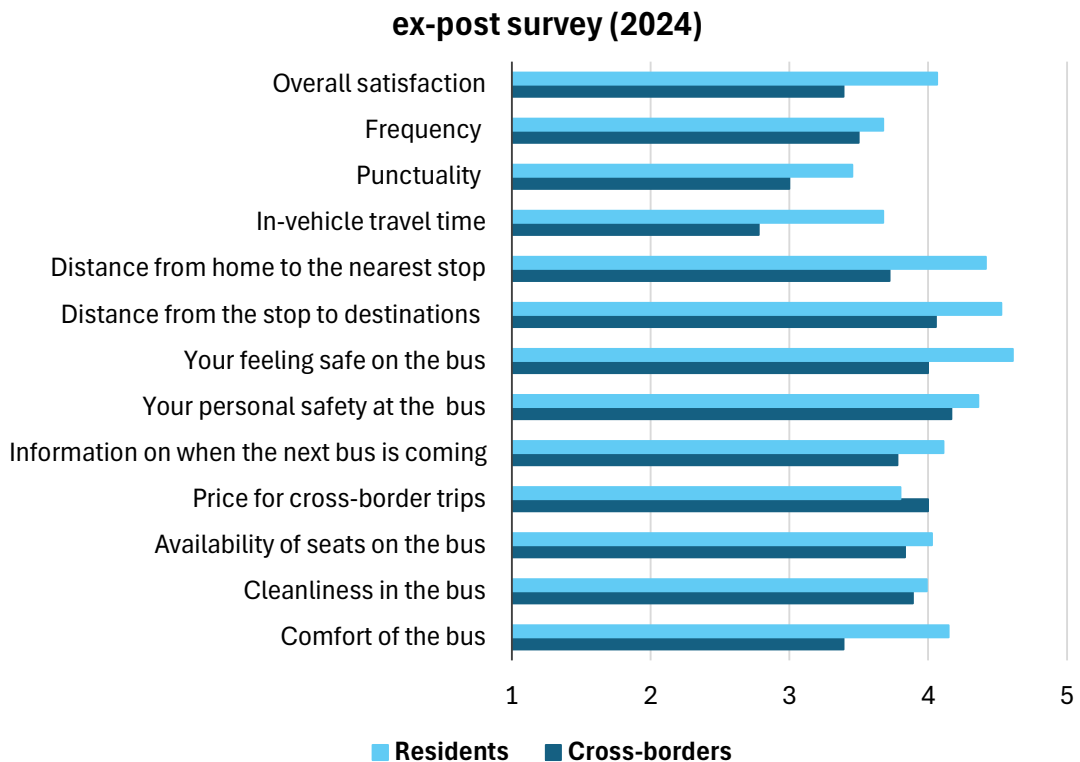
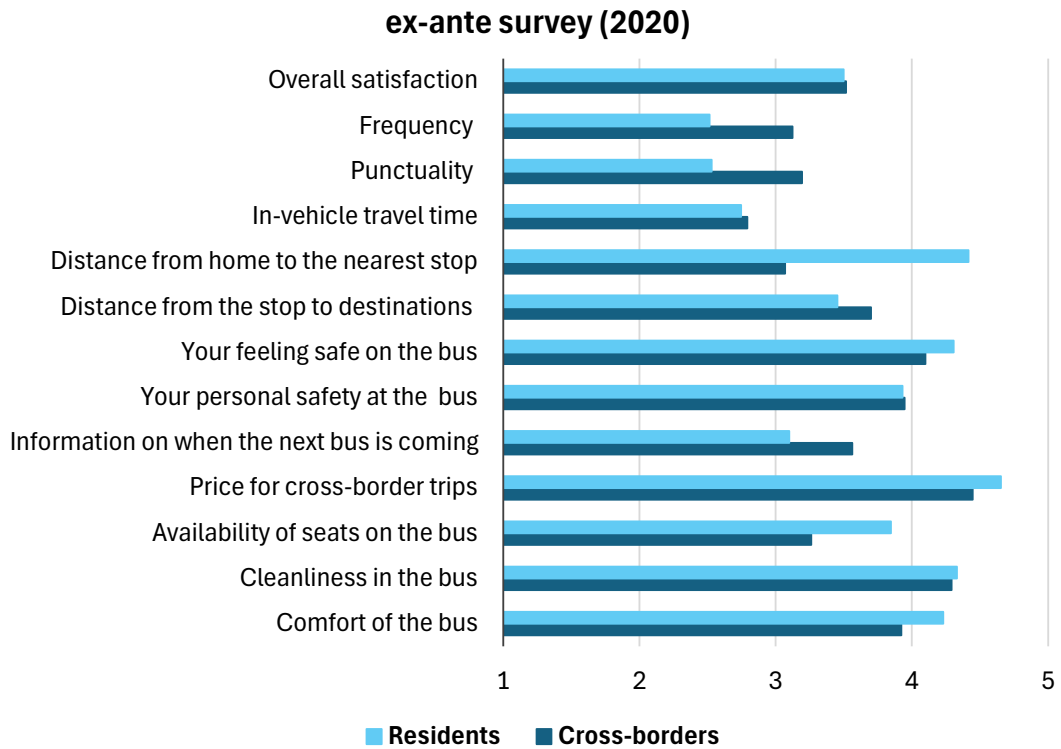
By contrast, frequency, punctuality, and in-vehicle travel time were the most criticized aspects in 2020, scoring around 3 both for residents and cross-borders. In 2024, these aspects showed modest improvements (closer to 3.5), especially among residents, but still represent areas where user expectations are not fully met. This suggests that while progress has been made, there are still challenges in ensuring that services meet the growing demand for efficient and timely public transport, particularly during peak hours. Satisfaction with accessibility, such as the distance from home to the nearest stop and from the stop to the destination, remained relatively stable, with residents generally more satisfied than cross-borders in both surveys. Notably, information on bus arrival times improved slightly from 2020 to 2024. Improved access and clearer information can significantly enhance the overall experience, helping users feel more confident in relying on public transport for their daily needs.

The introduction of FFPT did not drastically alter user perceptions of the bus services, cleanliness, and safety but it coincided with slight improvements in operational aspects such as frequency and punctuality. Core strengths such as comfort maintained, while cost satisfaction remained high, especially for cross-border commuters.

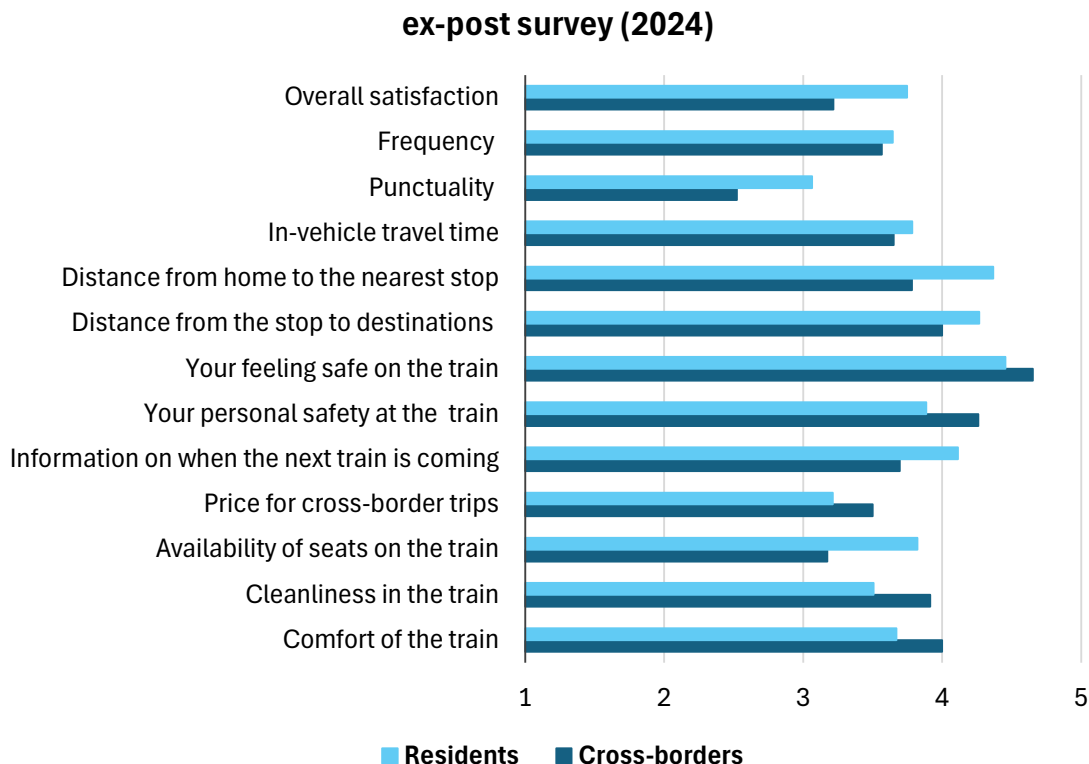
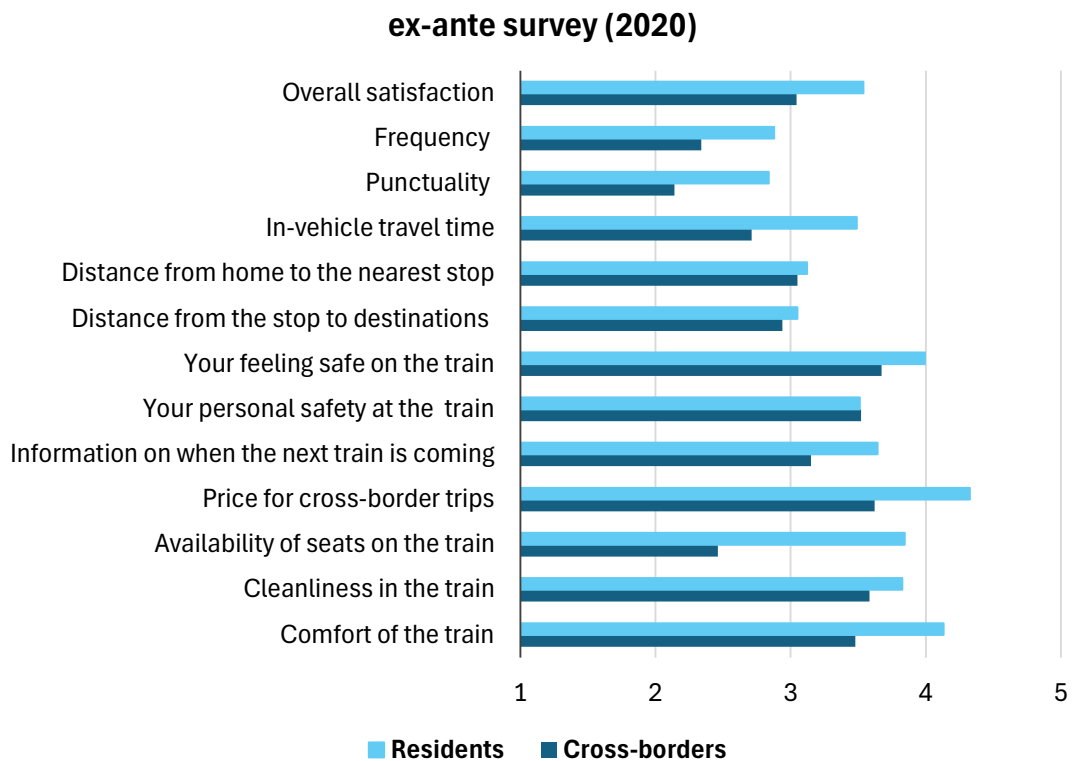
Figure 4 compares users' satisfaction with train services in the ex-ante and ex-post surveys. In 2020, satisfaction levels were mixed: both groups rated cleanliness, comfort and safety positively (around 4), while punctuality, frequency and in-vehicle travel time received the lowest scores, especially among cross-border commuters (as low as 2 for frequency). Residents consistently gave slightly higher ratings than commuters across most dimensions. In 2024, perceptions improved for cross-borders. The most notable gains concerned frequency, which rose from 2 to 4, and punctuality (from 2 to 3) reflecting better operational reliability. Safety at the stop reached its highest rating among cross-border commuters (5), while comfort, cleanliness and information about train arrival times maintained high and stable satisfaction levels for both groups. Satisfaction with ticket prices remained unchanged for cross-borders (4), but slightly decreased for residents (from 4 to 3), possibly because not all residents are aware of how much cross-border travelers pay for the train ticket to Luxembourg. Availability of seats slightly improved for commuters, while it remained constant for the residents.

Overall, while core strengths like safety, cleanliness, and comfort remained high, weaknesses observed in 2020, notably punctuality and frequency, showed measurable improvements by 2024. However, lingering gaps in performance and perception between residents and cross-border commuters suggest that further efforts in service reliability are still needed. The differences in satisfaction between residents and cross-border commuters also emphasize the importance of balancing the needs of both groups, ensuring that all users benefit from high-quality, efficient, and reliable public transport services.

**Figure 3 : Level of satisfaction with different attributes of bus services in Luxembourg**



**Figure 4 : Level of satisfaction with different attributes of train services in Luxembourg**



## 5. Conclusion

This study examined the impact of fare-free public transport (FFPT) in Luxembourg by comparing data from two surveys conducted before (2020) and after (2024) the policy's implementation. The findings indicate that the removal of fares has had a measurable

influence on mobility behavior, with free access emerging as a key motivator for using public transport, particularly among residents who may have previously faced financial or practical barriers. This suggests that FFPT has played a significant role in reshaping perceptions of public transport, making it more attractive and accessible.

In terms of user satisfaction, aspects such as cleanliness, comfort and safety consistently received high ratings, confirming their status as strengths of the system. However, operational issues, especially frequency and punctuality, remain areas of concern, although modest improvements were observed in the post-implementation period. These findings highlight that while fare abolition can stimulate increased usage and shift travel motivations, service quality remains a critical factor in sustaining user satisfaction and encouraging long-term modal change.

The policy aligns with broader sustainability objectives by promoting collective transport and potentially reducing car dependency. Finally, future research is already planned to expand the scope of the survey to a national level, targeting a more diverse and representative population beyond the University context. This will allow for a more comprehensive assessment of the long-term and system-wide impacts of FFPT in Luxembourg.

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