


1 **Germany's Newest Fare: The Deutschlandticket – First Insights on Funding and Travel**  
2 **Behavior**

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1 **ABSTRACT**

2 German public transport has an entirely new fare policy: following the “9-Euro-Ticket”, a na-  
3 tionwide season ticket for all local and regional public transport in second class for 9 Euro per  
4 month from June to August 2022, almost the entire nation demanded a permanent successor. This  
5 ticket, the “Deutschlandticket”, started in May 2023 and is priced at 49 Euro per mont. The ticket  
6 simplifies the complex fare structures and has an attractive price.

7 In this paper, we report on the genesis of this fare innovation, first insights on ridership  
8 and funding, as well as travel behavior impacts using data from our study “Mobilität.Leben” with  
9 passive waypoint tracking and survey responses before and after the ticket introduction. We find  
10 that public transport operators have innovated further and now offer “upgrades” for personalization,  
11 e.g., for First-Class or bicycle transport. Nationwide data suggests that season-ticket ownership  
12 increased by around 10% and ridership increased to almost pre-pandemic levels. Nevertheless,  
13 given the ticket’s introduction right before the summer period and some unsolved discount aspects,  
14 e.g., for low-income households, it is too early to assess funding impacts. In our study, 20% of  
15 new season-ticket customers reported less automobile and more public transport use, while 7% of  
16 existing customers do. Using our tracking data, we reveal that new and existing customers increase  
17 their public transport modal share by 5 and 7 percentage points, respectively. Daily savings in travel  
18 costs of 3-5 Euro result for ticket customers, but noteworthy carbon emissions savings are not yet  
19 observed.

20 *Keywords:* Public transport; Deutschlandticket; fare innovation; Survey; tracking; fare-free public  
21 transport; flat-fare public transport

## 1 INTRODUCTION

2 The German public transport system comprises local, regional, and long-distance services. Local  
3 services operate within cities or larger metropolitan areas, usually using buses, trams, subways,  
4 and trains; regional services connect villages, cities, and counties, usually using trains and buses;  
5 long-distance services connect large cities and metropolitan areas with only a few intermediate  
6 stops. There are more than 400 companies involved in operating all these services. Local and  
7 regional services typically operate within transit districts under the auspices of a single transit  
8 agency, which also sets the fare policy. There are around 70 such transit districts in Germany,  
9 which usually encompass areas around larger cities (read here for a detailed explanation of transit  
10 districts (*1*)). In each district, several companies are commonly working together. There are two  
11 critical differences between local and regional services on the one hand and long-distance services  
12 on the other hand. The former are public services that receive subsidies and are either state-owned  
13 utilities or operate following a tender, while the latter are private companies with a self-sufficient  
14 business model.

15 Travelers usually perceive all three services as one “public transport” system, as there is a  
16 natural hierarchy and interconnection between these services regarding operations. Nonetheless,  
17 from a regulatory perspective, there is a clear divide as aforementioned. Further, the organization  
18 in more than 70 transit districts with a further subdivision into multiple fare zones also divides  
19 the nation. Frustration for travelers then emerges regarding tickets: travelers can buy one-way  
20 tickets, return tickets, daily travel passes, and season tickets. If a traveler stays within a fare  
21 zone of a transit district, she or he usually has a complete set of tickets available to choose from.  
22 However, availability reduces the more zones or districts a person travels through. For example, for  
23 commuting between transit districts, usually, no season ticket exists. Then, travelers have to patch  
24 up tickets that is increasing travel costs and making commuting unattractive even though services  
25 would be available. Around Munich, for example, commuters would quickly have to pay around  
26 400-500 Euros per month to commute from the lakes south of Munich to the city center. Hence,  
27 the fare policy “gap” mainly consists of season tickets encompassing several transit districts and  
28 fare zones at a price that is not seen as a non-offer.

29 The lately introduced fare innovation of the “Deutschlandticket” in Germany closes this  
30 fare policy gap. For the first time, a nationwide season ticket can be acquired, allowing for unlim-  
31 ited travel on all local and regional services within and between all transit districts and fare zones. It  
32 is priced at 49 Euro per month, is only available as a digital ticket, is initially limited to three years  
33 before facing an evaluation. It reduces the average cost for a season ticket, simplifies the com-  
34 plex structure of transit districts and fare zones, and provides more travel opportunities, e.g., for  
35 commuters between two districts. Note that the “Deutschlandticket” is not valid for long-distance  
36 services. Consequently, it is not the same as the Austrian “Klimaticket” or the Swiss “General-  
37 abonnement”, but the Deutsche Bahn, the largest operator of long-distance services, integrated the  
38 “Deutschlandticket” in its long-distance season ticket product, hence creating for the first time an  
39 identical product to the “Klimaticket” and the “Generalabonnement”. The “Deutschlandticket” is  
40 a mobility tool and policy instrument. The mentioned advantages lead to the following hypothe-  
41 ses regarding mode shift. First, the price reduction, in some cases a drastic cut in travel costs, is  
42 expected to increase public transport use and decrease automobile use (*2*). Second, this unprece-  
43 dented simplification of the German fare policy system is expected to attract public transport users  
44 too (*3*). The ticket’s ability to encourage a shift from the automobile to public transport makes it a  
45 policy instrument. Its aim is clearly to reduce the externalities associated with automobile (*4, 5*),

1 but it does not reduce automobile dependence (6) and it must be part of a “*coordinated package*”  
2 (7) to become fully effective in reducing the share of automobile trips.

3 In this paper, we summarize the genesis of this fare innovation, starting from announcing  
4 the “9-Euro-Ticket” as a response to the cost-of-living crisis in early 2022, discuss first reports on  
5 ridership and funding impacts, and present first insights on travel behavior changes in the months  
6 before and after the introduction of the “Deutschlandticket” using data from our year-long panel  
7 study “Mobilität.Leben” with smartphone-based semi-passive travel diary (waypoint tracking) and  
8 questionnaires.

## 9 **GENESIS OF A FARE INNOVATION**

### 10 **A response to the cost-of-living crisis**

11 With the cost-of-living crises emerging from the geopolitical crisis in Ukraine in early 2022, several  
12 governments worldwide announced support packages that aimed at limiting the impact of inflation  
13 on households. In the European Union, a clear focus was on the support for energy bills (8); some  
14 countries also aimed at reducing transportation costs by reducing the cost of public transportation,  
15 e.g., Hungary (policy reference HU-2023-18/3201) and Spain (policy reference ES-2022-36/2799).  
16 However, one measure was clearly extraordinary, Germany’s fare policy of the “9-Euro-Ticket”. It  
17 was a monthly public transport season ticket for 9 Euro per month, approximately 10 US-Dollar,  
18 allowing unlimited travel in June, July, and August 2022 on all local and regional public transport  
19 lines. These services do not include long-distance and high-speed services like the ICE, TGV or  
20 railjet (9). It was extraordinary for two reasons. First, its price was less than the minimum hourly  
21 wage, making it almost fare-free public transport. Second, it drastically simplified the German fare  
22 system: one season ticket for the entire nation instead of season tickets limited to the zones and  
23 transit districts. Right from its announcement, the “9-Euro-Ticket” generated much public interest  
24 and led to public transport being discussed more positively.

### 25 **A first assessment of the 9-Euro-Ticket**

26 The dual nature of the “9-Euro-Ticket” of being almost flat-fare and having a nationwide validity  
27 led to the hypotheses that public transport ridership will increase during these three months (10–  
28 13), eventually re-activating some users to use public transport also after the ticket’s validity period  
29 (14). At the end of the validity period, the “9-Euro-Ticket” has been sold more than 52 million  
30 times across the three months. Additionally, around ten million public transport season-ticket sub-  
31 scribers received the ticket automatically (15). Assuming each of the “9-Euro-Ticket” purchased  
32 the ticket for June, July, and August would lead to an estimated 27 million users, including existing  
33 season-ticket subscribers. Hence, almost one-third of the German population had the ticket once  
34 within the “9-Euro-Ticket” validity period. However, a survey revealed that respondents bought,  
35 on average, 1.9 tickets, i.e., not all three months (16). This estimate then leads to in total of 38  
36 million users who had the ticket once within the “9-Euro-Ticket” validity period. In transit dis-  
37 tricts, ridership increased on average in June, July, and August by around 10-20% compared to  
38 May 2022, while regional trips, i.e., larger than 30 km, increased by 30-50% (16). Notably, the  
39 summer months of June, July, and August usually see less ridership due to the summer holidays,  
40 but 2022 reversed this trend (17).

41 This natural experiment has been observed by many. The official study has been organized  
42 by the Association of Public Transport Companies (VDV) with more than 70,000 respondents (18).  
43 Their study reports that 17% of all “9-Euro-Ticket” users shifted from other modes of transport to

1 public transport, reducing the number of automobile trips by around 1 billion trips per month.  
2 29% of trips of previous non-season-ticket owners and 23% of trips of previous season-ticket  
3 owners took place outside the home location's transit district. Overall, 16% of trips were induced.  
4 In one nationwide survey with around 2,500 respondents, others reported that out of all public  
5 transport trips, 6% were induced and 11% were shifted from other modes of transport, leading to  
6 a reduction of 53 million automobile trips per month (16). Similarly, a passenger survey in the  
7 Frankfurt metropolitan area with around 2,300 respondents revealed that out of all public transport  
8 trips made, 5% were induced, and 14% were shifted from other modes of transport (17). Two  
9 studies combined a mobility tracking panel with surveys, a nationwide approach using around  
10 2,100 tracking respondents with around 1,200 survey responses (19), and a study with a focus  
11 on the Munich metropolitan area with around 1,000 tracking responses and around 2,200 survey  
12 responses (20). Both studies reported a similar pattern: a general increase in public transport use in  
13 the first weeks of June, around 20% compared to May, followed by a decline to 80% of May levels  
14 until mid-August, before increasing again until the end of August, to around 90% of May levels,  
15 before dropping substantially after the ticket ended, to around 70% of May levels (19). This pattern  
16 might be intuitive given the usually less busy summer months (17). During the "9-Euro-Ticket"  
17 ticket period, a five percent shift in the modal share from the automobile to public transport was  
18 observed in the Munich metropolitan area (20). However, both studies note that no major change in  
19 daily mobility, e.g., for commuting or shopping, was observed. Overall, several studies concluded  
20 that carbon savings were made, which were somewhere in the order of magnitude of 300,000 to  
21 600,000 t CO<sub>2</sub> per month; when considering the ticket's costs of 2.5 billion Euro, this leads to  
22 carbon abatement costs of around 1,500 (21) to 2,000 Euro per t CO<sub>2</sub> (16).

### 23 **Finding a successor ticket**

24 The "9-Euro-Ticket" was a public success. It achieved its primary cost-saving objective and it  
25 attracted people to use public transport, at least for some trips. Nevertheless, people also liked  
26 its simplicity compared to the previous complex fare policies (18). This success prompted an  
27 immediate public debate about a successor: most politicians agreed that such a product should  
28 be permanently introduced; however, there was disagreement about the price. Prices from one  
29 Euro per day to 70 Euro per month were discussed. Finally, in September, the federal government  
30 announced that the price would be between 49 and 69 Euro per month.

31 The pricing discussion was accompanied by the discussion on funding public transport in  
32 general and how to subsidize the expected revenue losses, given that many season tickets would  
33 become cheaper. However, in this discussion, it appears that the price elasticity of demand has not  
34 been publicly considered. Clearly, the question of whether revenue losses occur or not depends on  
35 the uptake of the "Deutschlandticket" in the population, here various estimates exist: an increase  
36 in season ticket ownership of around 10% based on data from August 2022 (16), 20% based on  
37 data from September 2022 (22), and 40-50% based on data from April 2023 (21). Ultimately, this  
38 discussion and the requirement to find a final agreement between the federal government and state  
39 governments to fund the expected revenue losses before the start of the "Deutschlandticket" led  
40 to a step-wise postponement of the starting date from 1 January 2023 to 1 May 2023.

### 41 **Introduction of the "Deutschlandticket" and further fare innovation**

42 The "Deutschlandticket" went on sale on 3 April 2023, and its validity started on 1 May 2023.  
43 The ticket could be further subsidized by employers, leading to a price of 34.30 Euro per month.

1 As aforementioned, the “Deutschlandticket” was also integrated without a premium in Germany’s  
 2 long-distance season ticket, called “BahnCard 100” (23). Additionally, in some states or transit  
 3 districts, the “Deutschlandticket” was also introduced for low-income people, pupils, or students  
 4 for around 20-30 Euro per month (24).

5 Analyses show that two third of the German population can save money with the “Deutsch-  
 6 landticket” compared to the basic season ticket offered before and get an increased travel range. In  
 7 addition, the commuter tax allowance in the German income tax systems generates additional ben-  
 8 efits: for full-time employees who commute 40 km per day, the total ticket costs can be claimed,  
 9 while when commuting 60 km per day, the entire allowance can be claimed that substantially ex-  
 10 ceeds the costs of the “Deutschlandticket”, i.e., taxpayers can claim more than they paid (24).  
 11 Nevertheless, this cost analysis lacks the fact that previous season tickets usually came with fea-  
 12 tures that the “Deutschlandticket” does not include, at least not yet.

13 The “Deutschlandticket” can be considered a “core ticket” as it offers no additional fea-  
 14 tures or benefits, which are typical for German season tickets, e.g., bringing additional passen-  
 15 gers on weekends, transporting bicycles off-peak, and handing over the ticket to another traveler  
 16 (portability). It had been announced that additional features were not included because there was  
 17 not enough time to harmonize all terms and conditions for all of these features in all transit dis-  
 18 tricts. Nevertheless, the Association of Public Transport Companies (VDV) announced that they  
 19 are working on harmonization and expect this progress to end within two years after the intro-  
 20 duction of the “Deutschlandticket”. Consequently, to offer “Deutschlandticket” customers these  
 21 features, some companies and transit districts responded by offering additional services or “up-  
 22 grades” to the “Deutschlandticket”. Table 1 summarizes the most common upgrades. Importantly,  
 23 these upgrades are only valid within the issuing transit district or even state. Nevertheless, when  
 24 buying these upgrades, the savings from the “Deutschlandticket” compared to the season ticket can  
 25 be neutralized; costs can even increase.

**TABLE 1** : List of upgrades to the “Deutschlandticket”. Values taken from (24).

Upgrade	Typical additional costs
First-Class travel	40-50 Euro per month
Bicycle transport	20-40 Euro per month
Portability	10-15 Euro per month
Additional travelers on weekends /offpeak	10-15 Euro per month

## 26 **RIDERSHIP AND FUNDING**

27 The “Deutschlandticket” is not only expected to increase season ticket ownership and ridership  
 28 but also forces public transport companies to agree on a new approach for revenue sharing (25).  
 29 While many public transport companies and agencies set up studies to observe the impact of the  
 30 “Deutschlandticket” on ridership and travel behavior, many funding aspects are still unsolved, in  
 31 particular as many federal states and transit districts are still working on providing a further sub-  
 32 sidized “Deutschlandticket” to low-income people, students, and pupils, which strongly interferes  
 33 with funding.

34 The German Association of Public Transport companies (VDV) reported that around 11 mil-  
 35 lion “Deutschlandticket” subscriptions had been sold in the first two months, of which around 8%



1 are customers who did not use much public transport before; around 20% of customers reported  
2 that they want to reduce automobile usage due to the availability of the “Deutschlandticket” (26).  
3 So far, official results on travel behavior and ridership are only available for the Hamburg metropoli-  
4 tan area (27): season-ticket ownership increased by 22% and ridership increased from 89.3% to  
5 95.4% of the pre-pandemic levels from April to May 2023. Using a survey with around 1,000  
6 respondents, they find that out of all new trips made with the “Deutschlandticket”, 53% were pre-  
7 viously also made by public transport, but without a season ticket, 24% would have otherwise  
8 been made by the automobile, 2% would have otherwise been made by walking and 3% by cy-  
9 cling, while 6% are shifted from usually more expensive long-distance public transport services  
10 and the remaining more than ten percent of trips are induced demand. Using mobile phone data,  
11 Germany’s Department of Transport announced the number of regional train trips increased by  
12 25% since the introduction of the “Deutschlandticket” (28).

13 In 2018, local and regional public transport companies had revenues of around 14.2 billion  
14 Euro which constitute ticket sales, subsidies, and further surrogate payments (29). In comparison,  
15 with 11 million subscriptions, an annual revenue of around 6 billion Euro can be expected, and  
16 with 12 million subscriptions, an annual revenue of around 7 billion Euro. However, given the  
17 unknown development of season-ticket ownership in the course of the year as well as the unclear  
18 situation of further subsidized tickets and how transit companies are getting compensated for that,  
19 it is just speculation at this point whether this level of ownership suffices to avoid revenue losses.  
20 To reduce uncertainty, the federal government and all state governments agreed that each will  
21 provide 1.5 billion Euro, i.e., in total, 3 billion euro p.a., for the years 2023 to 2025, to compensate  
22 losses. In addition, the federal government also covers 50% of the additional costs related to the  
23 introduction of the ticket in 2023 (30). Nevertheless, the uncertainty of cash flow, in addition to  
24 the requirement of investing in digital hardware for ticket checking, can put in particular smaller  
25 companies at risk of bankruptcy.

## 26 **BEHAVIORAL RESPONSE**

### 27 **Data**

28 The data for the analysis of travel behavior in the months before and after the introduction of the  
29 “Deutschlandticket” has been collected as part of our “Mobilität.Leben”-study (German for mobil-  
30 ity+life). Initially designed to observe the travel behavior impacts of the “9-Euro-Ticket”, we ex-  
31 tended the study to also include the first weeks of the introduction of the “Deutschlandticket” (31).

32 The “Mobilität.Leben”-study comprises two elements: a smartphone-based travel diary  
33 app with passive waypoint tracking that generates semi-passive travel diaries and multiple ques-  
34 tionnaires. The smartphone app collects waypoints and sends them to the server that identifies trip-  
35 legs or stages, including mode detection and stays, which are returned to the user, who can edit and  
36 validate the entries in her or his travel diary. In this analysis, we focus on the time period of April  
37 and May 2023, i.e., the month before and after the introduction of the “Deutschlandticket”. In  
38 this period, we distributed a questionnaire before the introduction and after the introduction of the  
39 “Deutschlandticket”. The duration of each questionnaire is about ten minutes; the questionnaires  
40 collect information on stated travel behavior, season-ticket ownership, and attitudinal questions.  
41 Socio-demographic information has already been obtained through previous questionnaires of the  
42 “Mobilität.Leben” study.

43 The “Mobilität.Leben” study combines one panel with questionnaires and passive way-  
44 point tracking and one panel with only questionnaires. The first panel was recruited via a media

1 campaign in two steps, one in May 2022 and one in March/April 2023. The second panel was  
2 recruited through a professional agency; recruitment was only in May 2022. Out of the more than  
3 2,500 total study participants, we consider in this analysis the survey responses of 991 respondents  
4 who completed both questionnaires (571 from the media campaign recruitment, 420 from the pro-  
5 fessional agency recruitment). For the analysis of the waypoint tracking, we use data from 578  
6 respondents who provided at least one tracking point and who completed the questionnaire after  
7 the introduction of the “Deutschlandticket”, where they provided the information on whether they  
8 have bought the “Deutschlandticket”.

9       Regarding our sample’s representativeness, the media campaign in the Munich metropoli-  
10 tan area led to a sample biased towards this region with higher incomes and higher education levels.  
11 The recruiting via a professional agency aimed at a representative sample. Consequently, we can  
12 conclude that the survey results are more representative of the entire nation than the results from  
13 the tracking panel. Nevertheless, the sample covers all ages and genders from 18 to 70 years, and  
14 sample weighting can be done to make the findings more representative. This sample weighting is  
15 ongoing as data collection has only recently finished.

## 16 **Results**

### 17 *Survey*

18 From the 991 respondents who completed the two questionnaires, 25.5% are existing season-ticket  
19 customers, i.e., they already have season tickets in April, May, and June, while 11.7% are new  
20 season-ticket customers in May and June, i.e., they did not have a season ticket in April. To better  
21 understand the effects of related travel behavior variables on the choice of becoming a new season-  
22 ticket customer (32, 33), we estimate a Probit choice model for all those respondents who had no  
23 season ticket in April, i.e. before the introduction of the “Deutschlandticket”. As covariates, we use  
24 age (categorical variable), being male (binary variable), monthly household net income (categorical  
25 variable), the household has at least one automobile (binary variable), Regional statistical spatial  
26 typology of the household location (categorical variable), public transport usage frequency in April  
27 (categorical variable). We also control for the recruitment strategy using a binary variable. Table  
28 2 provides the levels of each variable as well as the model estimates. Due to missing data in the  
29 household income variable, only 717 out of 738 available observations are used for the parameter  
30 estimation.

31       The model estimates presented in Table 2 result from testing various model specifica-  
32 tions and interaction effects and comparing their performance using the Likelihood-ratio test. We  
33 find that being older than 30 years, having no automobile in the household, and not living in a  
34 metropolitan center as well as using public transport only 1 to 3 days per week significantly in-  
35 creases the probability of becoming a new customer. Note that all respondents with a season ticket  
36 are not included in this model. Using the results from Table 2, we can calculate some predictions  
37 of interest. For example, people living in rural areas, being older than 30 years, having no au-  
38 tomobile in their household, but using public transport 1-3 days per week have a probability of  
39 becoming a new customer of around 43%, which is reduced to 27% if the household owns at least  
40 one automobile. Contrary, people younger than 30 years and living in a metropolitan center, using  
41 public transport 1-3 days per week, and having no automobile have only a probability of 13% of  
42 becoming a new customer.

43       In each of the two questionnaires, respondents indicated their automobile (including mo-  
44 torbike and similar vehicles) and public transport mode use frequencies. In Figure 1, we show

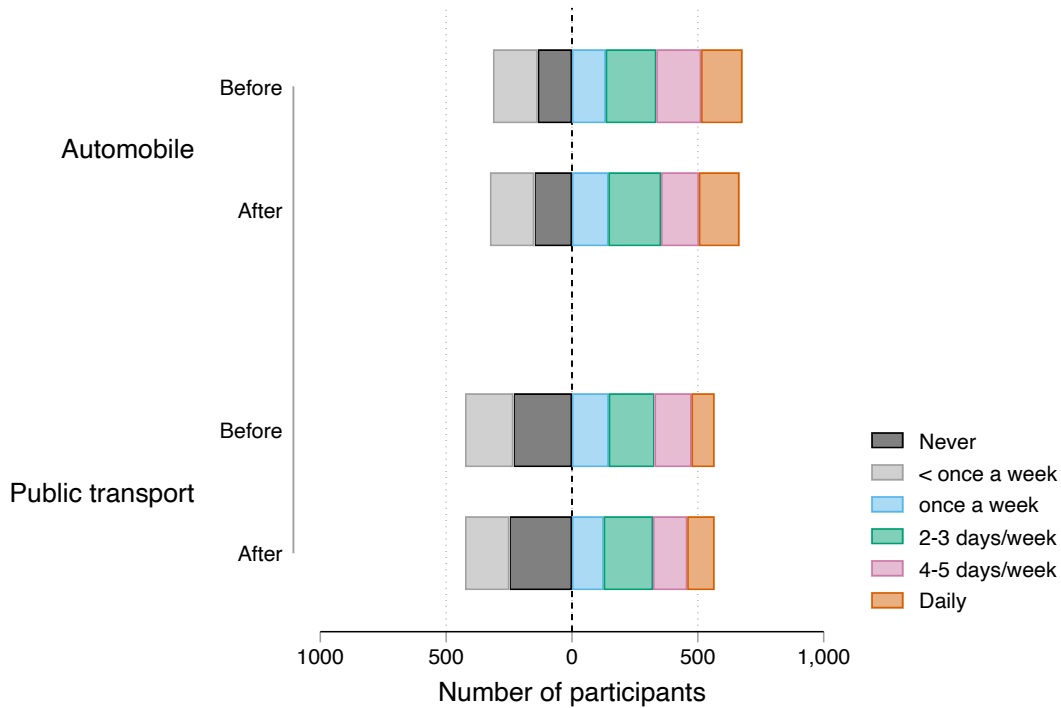


**TABLE 2** : Model estimates of a Probit choice model of becoming a new season-ticket customer.

	Dependent variable:	
	<i>new season-ticket customer</i>	
Age category		
Younger than 30 years (base)	-	(-)
30-50 years	0.416*	(1.95)
Older than 50 years	0.464**	(2.21)
Gender		
Non-male (base)	-	(-)
Male	0.0442	(0.34)
Net household income		
1499 Euro per month or less (base)	-	(-)
1500-2499 Euro per month	0.260	(1.07)
2500-3999 Euro per month	-0.0628	(-0.26)
4000 per month or more	-0.196	(-0.82)
Household automobile ownership		
Has no automobile	0.430**	(2.56)
Has at least one automobile (base)	-	(-)
Regional statistical spatial typology at household location		
Rural region	0.477**	(2.55)
Regiopolis, urbanized areas	0.412***	(2.64)
Metropolitan center (base)	-	(-)
Public transport mode usage frequency in April 2023		
Less than once per week (base)	-	(-)
One to three days per week	0.669***	(4.53)
More than four days per week	0.0253	(0.11)
Recruited through professional agency	-1.041***	(-6.90)
Constant	-1.610***	(-5.16)
Observations	717	
Pseudo $R^2$	0.171	
Log-likelihood at convergence	-257.7	
Log-likelihood constant only model	-309	

*t* statistics in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



**FIGURE 1** : Changes in the reported mode use frequencies for automobile and public transport use from before and after the introduction of the “Deutschlandticket”.

1 the responses. It can be clearly seen that more participants are using the automobile in general  
 2 compared to public transport, while no substantial differences between the time before and after  
 3 the introduction of the “Deutschlandticket” can be identified. Overall, 5.8% of respondents indi-  
 4 cated that they increased public transport usage while reducing automobile usage. Here, increase  
 5 or decrease is defined as changing the category shown in Figure 1.

6 In Table 3, we further separate the stated travel behavior changes by customer groups of  
 7 no-season-ticket customers, existing season-ticket customers, and new season-ticket customers.  
 8 Here, we define “more public transport” as a binary variable that is equal to one if a respondent  
 9 reported a higher public transport usage frequency in June compared to April (in the levels shown  
 10 in Figure 1), and zero otherwise; similarly, we define “less automobile” as a binary variable that  
 11 is equal to one if a respondent reported a lower automobile usage frequency in June compared to  
 12 April (in the levels shown in Figure 1), and zero otherwise. While two-thirds of no-season-ticket  
 13 customers did not report a change, around 50% of new season-ticket customers reported an increase  
 14 in public transport use, but only around 20% reported a decrease in automobile use; one-third of  
 15 existing season-ticket customers reported an increase in public transport use, but only around 7%  
 16 also reported a decrease in automobile use. We corroborate these findings using a bivariate Probit  
 17 model to see if other factors than the customer group affect the reported behavioral changes and  
 18 if there is a correlation among unobserved factors between the two outcomes. We find no other  
 19 significant effects than the customer group, no significant correlation in the unobserved factors,  
 20 and the model’s predictions are very close to the observed shares in Table 3.

21 Regarding savings from having the “Deutschlandticket” as a mobility tool, 75% of season-

**TABLE 3** : Travel behavior changes in automobile and public transport use for the three considered customer groups.

Behavioral change	Season-ticket customer		
	No	Existing	New
Not more public transport, not less automobile	68.81%	50.99%	34.48%
Not more public transport, less automobile	16.56%	20.16%	13.79%
More public transport, not less automobile	11.90%	21.74%	31.90%
More public transport, less automobile	2.73%	7.11%	19.83%

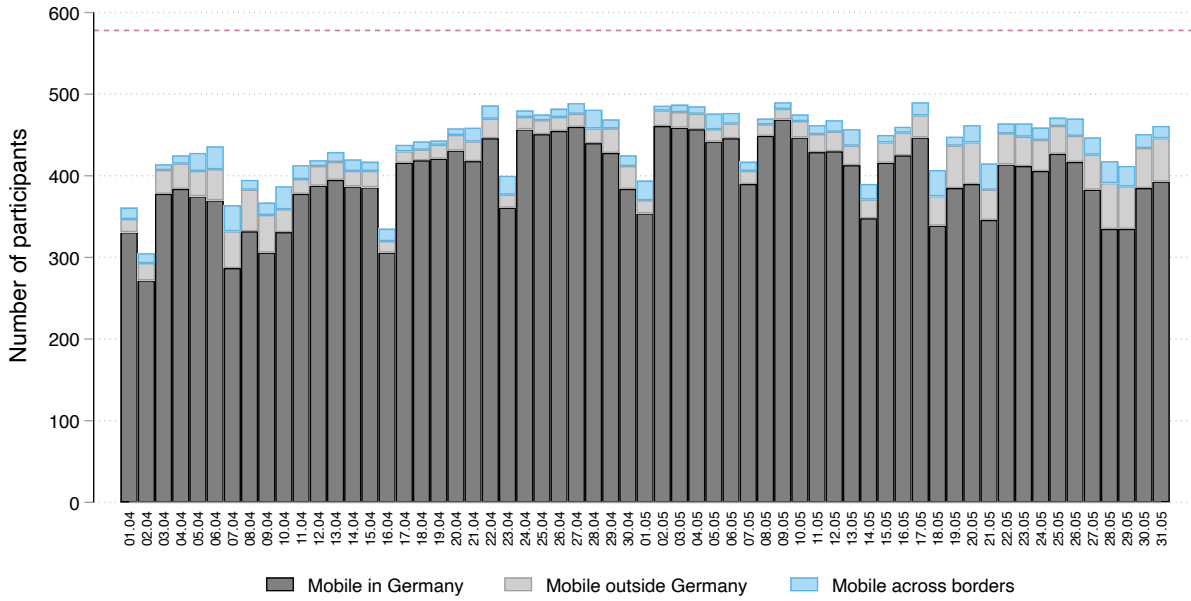
1 ticket owners reported that they save money with the “Deutschlandticket”, of which 50% saved  
 2 less than 40 Euro per month and only 7% save more than 100 Euro per month.

### 3 *Smartphone-based travel diary*

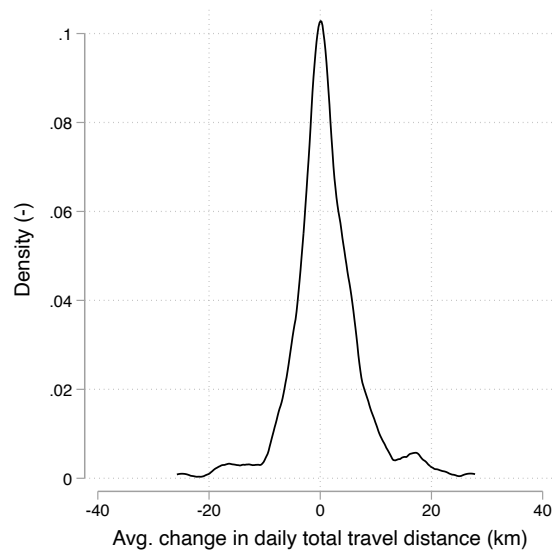
4 Figure 2 shows the smartphone usage pattern during April and May 2023, with the activities of  
 5 being mobile in Germany, being mobile outside of Germany, and moving across borders. The red  
 6 horizontal line marks the 578 study participants who completed the questionnaire after introducing  
 7 the “Deutschlandticket” and reported at least one day of data. It can be seen that not all participants  
 8 were providing data all the time and that for around 32.5% of person-days, no measurements are  
 9 available as respondents were either immobile or did not turn on their smartphones for tracking.  
 10 A person-day here is one person providing one day of travel behavior measurements. Out of the  
 11 available 23,799 person-days, we exclude 5,577 person-days for several reasons: all person-days  
 12 without any travel, all respondents who have not at least five person-days in April and in May in  
 13 Germany (i.e. ten person-days in total), all person-days with daily travel distances greater than  
 14 three times the median distance of that respondent and all respondents who reported a change in  
 15 daily travel distance more/less/of than 30 kilometers from one month to the other. In the end, this  
 16 leads to 18,222 person-days of 506 distinct users considered for this analysis (8,860 in April, 9,362  
 17 in May), where, on average, one respondent reports 17 person-days in April and 18 person-days in  
 18 May.

19 For each respondent, we compute the average total daily travel distance, the average daily  
 20 automobile travel distance, and the average daily public transport distance for April and May 2023,  
 21 i.e., before and after the introduction of the “Deutschlandticket”. Figure 3 shows the changes in  
 22 average total travel distance between April and May 2023. A positive value means that travel  
 23 increased in May compared to April, and a negative value means that travel decreased in May  
 24 compared to April (note that there are Easter holidays as well as several bank holidays in Germany  
 25 in that period). Generally, travel increased on average by 0.98 km (median 0.47 km) in our sample  
 26 (by mode: 0.63 km increase in public transport travel, 0.52 km decrease in automobile travel).  
 27 Nevertheless, the figure also shows substantial variability in travel behavior within persons, which  
 28 could be a confounding factor in determining changes in mode choice, e.g., April could be charac-  
 29 terized by holiday travel, while May was a typical working month.

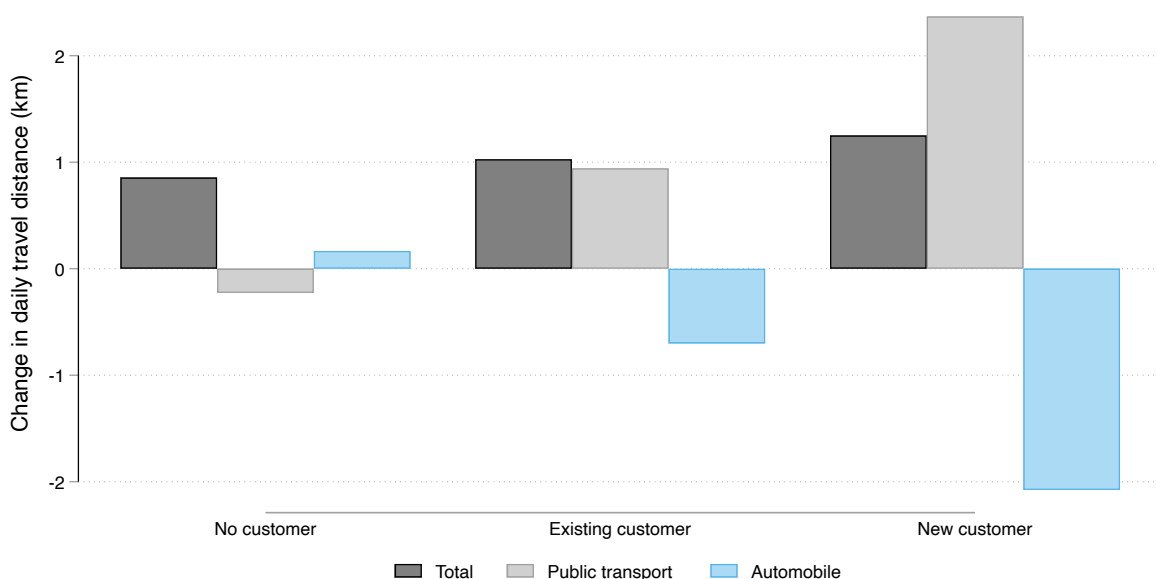
30 Figure 4 shows the changes in average daily travel distances (total, automobile, public  
 31 transport) from April to May 2023 for the three previously used customer groups (no season-  
 32 ticket customer, existing season-ticket customer, new season-ticket customer). A positive value



**FIGURE 2 :** Smartphone use and travel behavior in April and May.



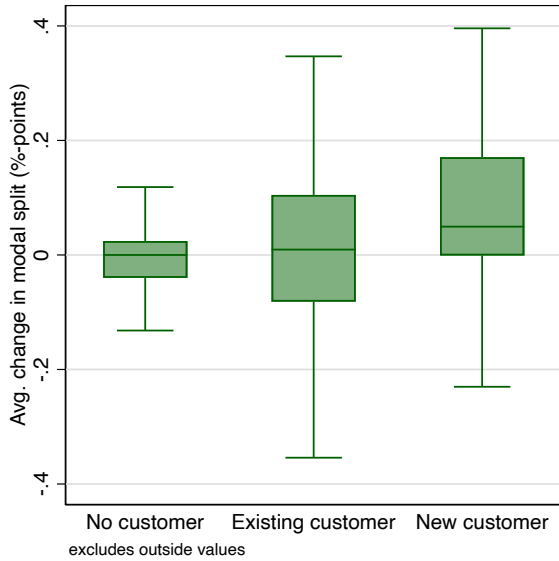
**FIGURE 3 :** Changes in average total travel distance between May and April 2023.



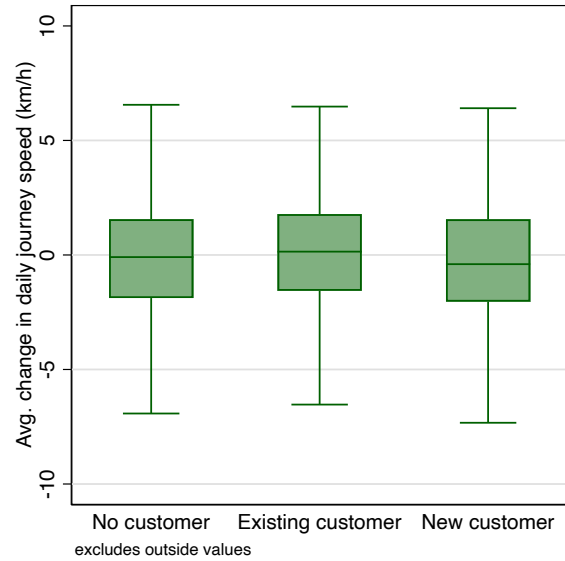
**FIGURE 4** : Changes in average daily travel distances by customer group.

1 in Figure 4 indicates that the travel distance increased from April to May, and a negative value  
 2 indicates a decrease. It can be seen that total daily travel distances increased in all three groups,  
 3 while public transport travel increased substantially stronger for existing and new season-ticket  
 4 customers. However, automobile travel did not decrease at the same level as public transport travel  
 5 increased: the gap is 0.25 km for existing customers and 0.3 km for new customers. Nevertheless,  
 6 the findings from Figure 4 align well with the hypothesis that the “Deutschlandticket” increases  
 7 public transport use.

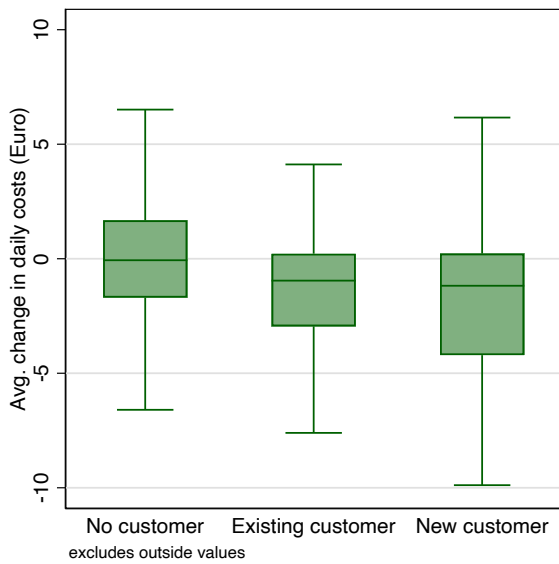
8 For every respondent, we calculate the average changes from April to May in public trans-  
 9 port modal share, journey speed, travel costs, and carbon emissions, where all values refer to daily  
 10 averages. Figure 5 shows the results, where a positive value on the vertical axis means an increase  
 11 from April to May. For reference, Figure 5 shows the median, while we report the mean of each  
 12 measure in the following. We separate the results by the customer groups used before: no season-  
 13 ticket customers, existing season-ticket customers, and new season-ticket customers. Figure 5a  
 14 shows for non-customers no change in the public transport modal share, the modal share of exist-  
 15 ing customers increased on average by one percent point, while it increased for new customers on  
 16 average by 7%. Figure 5b shows the speed changes, which decrease for every customer group less  
 17 than 1 km/h. It can be concluded that existing and new customers are not traveling faster by using  
 18 the “Deutschlandticket”, but slightly slower, but not much as it could be expected when thinking  
 19 of public transport as a “slower mode” compared to the automobile. The savings in travel costs  
 20 as shown in Figure 5c, which comprise the time costs (for public transport 3.83 Euro/h, for auto-  
 21 mobile transport 4.66 Euro/h, both taken from (34), 0.5 Euro/km automobile costs as well as the  
 22 savings indicated by respondents as a consequence of the introduction of the “Deutschlandticket”.  
 23 While non-customers report on average no changes in travel costs, existing customers save around  
 24 1.46 Euro per day and new customers around 2.11 Euro per day. When considering cost savings  
 25 by Germany’s regional statistical spatial typology, we find that new customers in more rural areas



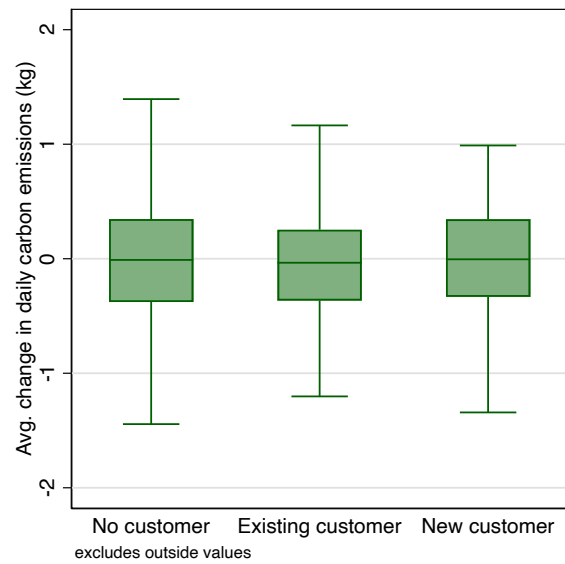
(a) Changes in public transport modal share



(b) Changes in journey speed



(c) Changes in travel costs



(d) Changes in carbon emissions

**FIGURE 5** : Changes in modal share, journey speeds, travel costs, and carbon emissions for the three customer groups.

1 save around 4.5 Euros per day, new customers living in urban areas around 2 Euros per day, and  
 2 new customers in metropolitan centers around 1.36 Euros per day. Ultimately, the observed be-  
 3 havior so far did not result in substantial changes in daily carbon emissions, as seen in Figure 5d.  
 4 Note here, however, that emissions are calculated based on German averages (35), which do not  
 5 consider local factors, e.g., whether electric services run on green power, as in the case of Munich.

6 To corroborate and quantify the observations from Figure 5a, we regress the change in pub-  
 7 lic transport modal share on a series of explanatory variables. Here, we find that a marginal effect



1 of being a new customer compared to customers on public transport mode share of 7 percentage  
2 points and a marginal effect of existing customers of 5 percentage points. If new customers used  
3 public transport 1-3 days per week before the introduction of the “Deutschlandticket”, their change  
4 in public transport modal share increases to around 11 percentage points; if they used public trans-  
5 port less than once per week before, their change in public transport modal share increases to  
6 around 15 percentage points.

## 7 **DISCUSSION**

8 The first insights on ridership, funding impact, and travel behavior suggest a positive trend toward  
9 the expected - and politically desired - outcomes. However, we must observe the introduction  
10 of the “Deutschlandticket” for an extended period of time to see at which level this trend settles.  
11 The introduction of the “Deutschlandticket” in May coincides with the summer holidays and the  
12 cycling season, where the period from September to November can be expected to provide more re-  
13 liable estimates. In addition, many federal states and transit districts are still working on providing  
14 a “Deutschlandticket” for low-income people, pupils, and students. Consequently, only when this  
15 transition period is over, and further organizational questions are clarified, a reliable assessment of  
16 this policy instrument can be made; here, dimensions of interest are modal shift, carbon abatement  
17 costs, revenue loss, and consumer surplus. As the “Deutschlandticket” is also promoted as a sus-  
18 tainability policy instrument, especially the carbon abatement costs will be of interest compared to  
19 other measures such as subsidizing renewable energy generation.

20 The variability in travel behavior underlying Figure 4 also emphasizes the complexity of  
21 travel behavior in the 21st century, calling for future research that addresses the understanding,  
22 modeling, and integration of this complexity in the planning of future transportation systems, long-  
23 term policymaking, and for transit companies in the revenue distribution process. This involves  
24 developing methodologies to identify and generate representative entries for travel diaries based  
25 on mobility tracking and how to reliably identify modal shifts and induced demand. The six-week  
26 period used in the “MobiDrive” study provides a starting point (36), but given the growth in long-  
27 distance travel and the demographic change in the past 25 years, this parameter must be revisited.

## 28 **CONCLUSIONS**

29 In this paper, we presented the genesis of the fare policy innovation “Deutschlandticket”, initial  
30 insights on the overall impact on ridership and funding, and findings on travel behavior outcomes  
31 using data from our “Mobilität.Leben” study. The “Deutschlandticket” is a flat-fare season-ticket  
32 subscription for all local and regional public transport services, which not only reduces the aver-  
33 age cost, but also simplifies the entire fare policy system in Germany. The political and public  
34 expectation is that the “Deutschlandticket” boosts ridership and promotes public transport.

35 We found in our study and official figures that season-ticket ownership increased by about  
36 10%, and especially new season-ticket customers, i.e., those who had no season ticket before,  
37 increased public transport use. Nevertheless, only 20% of new season-ticket customers and 7% of  
38 existing season-ticket customers indicated increased public transport use and decreased automobile  
39 use. Using the mobility tracking data from our study, we find that existing and new season-ticket  
40 customers increased public transport use more than they reduced automobile use.

41 In closing, the fare policy “Deutschlandticket” can be considered a success. First and fore-  
42 most, it is a marketing success that boosted the image of the public transport system. Second, early  
43 findings suggest that the “Deutschlandticket” is partially successful in moving Germany towards

1 a more sustainable transportation system, which immediately means calling for supply-side mea-  
2 sures to maximize the realizable benefits. Nevertheless, ultimately an assessment will show how  
3 the costs and benefits of this fare innovation are distributed and whether it should be continued  
4 after the year 2025.

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## 16 **AUTHOR CONTRIBUTIONS**

17 The authors confirm their contribution to the paper as follows: study conception and design: Allis-  
18 ter Loder, Klaus Bogenberger; data collection: Allister Loder, Fabienne Cantner, Victoria Dahmen;  
19 analysis and interpretation of results: Allister Loder, Fabienne Cantner, Victoria Dahmen, Klaus  
20 Bogenberger; draft manuscript preparation: Allister Loder. All authors reviewed the results and  
21 approved the final version of the manuscript.

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