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Small Payments Can Help Take Cars Off the Road Cost-Effectively

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Abstract

This study investigates the effectiveness of monetary incentives to encourage individuals to give up car ownership. In a survey experiment among 1,143 car owners from a representative sample in Germany, participants received hypothetical offers for an annual payment scheme requiring them to give up all privately owned cars, with the option to reassess each year. Depending on the payment amount of € 300, € 1,500, or € 3,000, 6 % to 19 % expressed a willingness to forgo their car, while about half would retain it regardless of the amount offered. A cost-benefit analysis suggests that the lowest payment would be cost-effective due to reductions in externalities arising from car usage, even if low-mileage vehicles were given up. Considering the added value of freeing parking space, cost-effectiveness could extend to higher payments. The study also presents a real-world case from Marburg, Germany, where a large pilot has been implemented, offering practical insight into implementation.

Key words: willingness to accept, survey experiment, car ownership, mobility

1 Introduction

Private car use engenders large and largely externalized costs, ranging from carbon emissions to increased air and noise pollution to accidents and congestion. To address these externalities, economists typically propose various price-based policy instruments, including taxes on gasoline, distance driven, weight and size of vehicle, and car ownership itself (e.g. Fullerton and West, 2002; Parry and Small, 2005; Parry et al., 2007; Santos et al., 2010). Yet efficiency remains elusive. However comprehensive a set of price-based interventions may be, many end up as second-best instruments, failing to internalize other externalities associated with both car use and car ownership. Moreover, the efficiency of price-based instruments hinges on the feasibility of redistributing revenues, which is not always feasible with the precision that would be required to ensure that those who have losses are adequately compensated (Sallee, 2019). In addition, the social acceptability of price-based instruments tends to be lower than for 'pull' measures, which do not directly restrict car use but encourage the use of more environmentally friendly modes of transport (see Andor et al., 2024; Eriksson et al., 2010; Hrelja and Rye, 2022).

In the past, car scrappage schemes, commonly known as 'Cash for Clunkers' initiatives, were implemented widely in the US and parts of Europe to encourage individuals to replace their old cars with more efficient ones (Knittel, 2009; Mian and Sufi, 2012). More recently, some policies, including in Barcelona, Spain, and Marburg, Germany, have focused on payments for giving up cars altogether (Dieckmann, 2024; European Commission Urban Mobility Observatory, 2021). Additionally, incentive payments to give up cars have been tested or implemented in pilot projects across Belgium, France, Germany, Lithuania, and the UK (European Commission Urban Mobility Observatory, 2020; Joeres, 2021; Moering, 2025; Tatum, 2021; Tooze, 2021). A number of initiatives in Germany are proposing annual payments to those without cars, paid from carbon price revenues (Reidl, 2021). In the transport sector, financial incentives have been tested in other contexts, such as encouraging flexible travel behavior instead of imposing congestion charges, and it has been found that rewards can be an effective policy instrument (Knockaert et al., 2012).

This measure aims at altering the extensive margin, i.e., the decision of whether to own a car in the first place. Many existing measures primarily target the intensive margin—that is, they seek to reduce car use rather than car ownership. Taxes on fuel, road pricing, and congestion charges make driving more expensive, thereby discouraging excessive use while allowing individuals to retain their vehicles. However, such policies do not primarily target the extensive margin. This distinction is crucial, as private car ownership often creates structural dependencies that reinforce car-centric mobility patterns, regardless of how much a vehicle is used. While less common, policies targeting the extensive margin could complement traditional price-based interventions.

In this study, we evaluate the conditions for such payment schemes to be cost-effective. Paying to give up car ownership altogether goes well beyond pricing specific negative externalities, where they could indeed lead to significant overpayment (Knittel, 2009). Meanwhile, such payments allow policymakers to address externalities associated both with driving and with car ownership per se (Inci et al., 2017). We assess the acceptance rates for different payment amounts and identify factors that influence acceptance of a payment in exchange for giving up driving the private car. To this end, we conducted a large-scale survey experiment in 2022 among German respondents (n=1,143) who owned at least one car at that time. In particular, we assess participants' willingness to accept annual payments of € 300, € 1,500, and € 3,000 to give up all their cars in their household. If participants refused to give up their car for any of these amounts, they were asked to indicate the level at which they would be willing to accept the payment or they could indicate that they are not willing to give up driving a car under any circumstances. Additionally, we designed an alternative scenario assessing the acceptance of a one-time payment of € 900, € 4,500, and € 9,000. Notably, the one-time payment focuses on giving up only a single car, introducing another dimension, as households might still have access to a vehicle despite giving up one. In any case, participation in the scheme and the decision to give up driving was presented as entirely voluntary. To assess acceptance rates for both the yearly and one-time payment schemes, we randomly assigned half of our sample to the yearly scheme and the other half to the one-time scheme. We randomly varied the offered payment levels across participants so that each participant was presented with only one amount.

We find that acceptance rates for giving up car ownership in exchange for a yearly payment vary from 6 % to 19 %, depending on the amount offered. Acceptance rates for one-time payment vary from 14 % to 26 %, respectively. Notably, around one half of the participants say they would refuse to give up their car under any circumstances. We further examine whether acceptance for a yearly payment scheme which requires to give up all cars varies across different subgroups. Our findings indicate significantly higher acceptance among low income groups compared to high income groups, with a difference exceeding 18 percentage points for the highest payment of € 3,000 (where acceptance reaches 28 %). Individuals in urban areas show nearly double the acceptance rate (17 %) compared to those in rural areas (9 %). Additionally, individuals with lower overall mileage across all their cars are more likely to accept a payment and give up driving, whereas those with older vehicles (purchased before 2015) are more inclined to accept compared to those who purchased their primarily used car more recently.

In addition, we estimate the potential savings in externalities that would result from implementing such a yearly payment scheme which requires to give up all cars. Based on a study by the European Commission et al. (2019), we quantify external costs of accidents, air pollution, climate change, noise, and congestion at around € 2,000 for a representative car per year. As the payments paid are expected to be from public expenditures, we argue that a payment scheme would be considered cost-effective as long as it does not exceed the potential external cost savings. External costs can vary widely and depend mainly on the mileage of the car that would be relinquished. Therefore, we identify the level of payment that remains cost-effective even if the annual mileage falls below our assumed central parameter. For this purpose, we compute quantile values for a households' annual kilometers driven based on our sample. By adjusting the amount by the marginal cost of public funds (MCF), we find that the low payment level (€ 300) would remain cost-effective even if only cars in the bottom 10 % of mileage were given up. In addition to the externalities associated with car usage, the public space occupied by parked cars incurs significant costs, typically borne by the municipalities. Reducing car ownership not only helps mitigate external costs but also generates direct savings for local governments. For example, the cost of maintaining open public parking spaces was estimated at € 840 per year in rural areas and € 1,800 per year in urban areas (Klimaschutz- und Energieagentur Baden-Württemberg, 2020). To ensure cost-effectiveness, the payment offered should be balanced to these savings as well. Considering that the annual payment scheme requires participants to give up all cars they own, the cost-effectiveness of the program could extend to even higher payments.

Evaluating the potential of such a scheme is particularly relevant, as it could serve as an innovative transportation policy capable of removing large numbers of cars from roads and parking spaces in a short period of time. But apart from a few pilot projects, it has not yet been implemented on a large scale. The probably largest pilot has started in 2024 in Marburg, Germany, where car owners can receive up to € 1,250. In this study, we present the Marburg pilot as a case study to demonstrate the implementation process of such a scheme and the potential challenges involved.

With this study, we aim to contribute by conducting an ex-ante evaluation based on stated-choice preferences to assess the feasibility of implementation on a nationwide scale in Germany, with results that can be transferred to other European countries. Finally, our paper contributes to the relatively young literature on the passive use value of cars. This non-use value in car ownership, arising from factors such as social status, flexibility, and convenience, significantly contributes to the overall car use value (Moody et al., 2021). We extend this line of research by investigating the potential of paying households to give up their cars.

2 Sample Characteristics and Experimental Design

Our experiment was embedded in a survey that was conducted between March 28 and April 15 2022 in cooperation with the survey institute *forsa* as one element of a larger survey on mobility behavior. This survey is part of the 'RWI Climate-Mobility Panel' which among others has been monitoring public support for selected transportation policies in Germany since 2018. The survey was conducted on the individual level by interviewing randomly selected individuals aged 18 and older from the *forsa* household panel. The panel is representative of the population in Germany aged 14 and above with access to the internet.[1] Panel members are recruited via telephone, and cannot actively apply for participation in the panel. This minimizes the risk that the sample primarily consists of individuals particularly interested in the topic or survey bots. The sample used for the present survey was randomly drawn from the representative household panel.

A total of 1,419 individuals participated in the survey, of which 1,266 completed it, resulting in a participation rate of 89.2 %. A comparison of the full sample (n=1,266) with the German population, based on data from the *Mikrozensus* (microcensus) which is the largest annual household survey in official statistics in Germany, reveals that older age groups (between 65 and 74), individuals with an intermediate secondary school degree, and those with rather higher monthly household net incomes (between € 3,200 and € 5,200)

[1] According to Statistisches Bundesamt (2023a), the share of individuals between 16 and 74 years who use the internet in Germany in 2022 is about 94 %.

are overrepresented. Conversely, younger age groups (up to 34), as well as individuals in the lower half of the income distribution (below € 3,200), are underrepresented. The gender distribution is slightly imbalanced, with 6 percentage points more males compared to the *Mikrozensus* (microcensus) (Supplementary Table A1). Although some population groups are over- or underrepresented in our sample and the acceptance rates we measure can therefore not be generalized directly to the population as a whole, we assume that due to the elaborate recruitment process of the *forsa* panel and the random draw of our sample from the panel, our results can provide a good impression of the potential of a payment scheme to give up cars and of promising target groups.

For the experiment, only participants who own at least one car (n=1,143) were included, which is 90.3 % of the full sample. Descriptive statistics for this subsample are presented in Table 1. This includes data on income, place of residence, employment status, the participants' age as well as details about the households' cars, such as the annual mileage and the year of purchase. Additionally, we incorporate a variable indicating the distance to the nearest public transport station from the participant's home. We present the variables not as continuous, but as categorical variables, mostly divided into three categories or presented as binary variables.

In the survey, participants were randomly assigned to different experimental groups, creating variation across multiple dimensions. Half of the participants received a scenario including an annual payment, requiring them to give up all cars in their household, even with multiple vehicles. The other half received an alternative scheme with a one-time payment, not requiring full relinquishment for those with more than one car. The time span for which a person who accepts the one-time payment would not be allowed to buy a car again was set at three years. The yearly payment, on the other hand, would theoretically continue indefinitely, but would cease in the year the person decides to buy a car again. Additionally, it was explicitly stated that participants would receive the full value of their car upon selling it.

Furthermore, we introduced variations in the payment amounts offered for both the annual and the alternative one-time scheme. Payment amounts varied between low, medium and high, ranging from €300, €1,500 and €3,000 for the annual scheme and €900, €4,500 and €9,000 for the alternative scheme. The payments are chosen in a way that the sum of the yearly payments equals the amount of the one-time payment after three years. Within each of the two groups, participants were evenly allocated to one of three levels of incentive payment amounts. This results in 6 different groups in total. Each group includes between 187 and 192 participants (Supplementary Table A2). If participants refused to give up driving a car for the proposed amount, they were additionally asked to specify the amount for which they would be willing to do so. They could also state that they would not be willing to give up driving under any circumstances. The survey questions are illustrated in the Supplementary Materials.

Table 1: Descriptive statistics for socioeconomic and mobility-related variables among participants

	Explanation	No. observations	Share (in %)
Monthly net household income (adjusted by household size)		990	
Low	Dummy: 1 if income is lower than € 1,950		32.42
Mid	Dummy: 1 if income is between € 1,950 and € 2,632		33.03
High	Dummy: 1 if income is € 2,633 and higher		34.55
Place of residence		1,137	
Rural area	Dummy: 1 if respondent lives in a rural area (smaller than 20,000 citizens)		32.81
Town area	Dummy: 1 if respondent lives in a town area (between 20,000 and 100,000 citizens)		40.19
Urban area	Dummy: 1 if respondent lives in an urban area (larger than 100,000 citizens)		27.00
Employment status		1,139	
Working	Dummy: 1 if respondent is working (not working includes unemployed and retired individuals, students, homemakers)		56.80
Age		1,143	
18 - 39	Dummy: 1 if respondent is between 18 and 39 years old		14.70
40 - 59	Dummy: 1 if respondent is between 40 and 59 years old		39.28
60+	Dummy: 1 if respondent is 60 years and older		46.02
Cumulative annual mileage of all cars available in the household[1]		1,045	
Low	Dummy: 1 if mileage is lower than 10,000 kilometers		29.67
Mid	Dummy: 1 if mileage is between 10,000 and 19,999 kilometers		36.65
High	Dummy: 1 if mileage is 20,000 kilometers and higher		33.68
Purchase year of the primarily used car		1,038	
Early purchase	Dummy: 1 if purchase year was 2014 and before		27.75
Recent purchase	Dummy: 1 if purchase year was between 2015 and 2018		33.72
Latest purchase	Dummy: 1 if purchase year was between 2019 and 2022		38.53
Distance to next public transport station (bus, tram, train etc.) from home		1,124	
Low	Dummy: 1 if distance is lower than 500 meters		31.67
Mid	Dummy: 1 if distance is between 500 and 1,000 meters		30.87
High	Dummy: 1 if distance is higher than 1,000 meters		37.46

[1] Participants self-reported the annual kilometers driven for up to three household cars. We identified and removed outliers separated for each car (first, second, and third) if the reported kilometers exceeded the 99th percentile. We then calculated the sum of kilometers driven per household.

3 Acceptance Rates for a Yearly Incentive Payment Design

Between 6 % to 19 % of respondents are willing to forgo their car(s) in their household for an annual payment, depending on our offered payment amounts (Table 2). Specifically, 6 % would give up driving for € 300 per year, 14 % for € 1,500, and 19 % for € 3,000. Acceptance rates rise with higher payment amounts although this rise is not directly proportional to the amount offered. Participants were also given the option to self-report the amount they would accept if they chose to reject the offered payment. Quantile values for the self-reported amounts accepting an annual payment and giving up all cars are provided in Supplementary Table A3. The proportion of participants who self-reported an amount ranges from 12 % to 16 %, with 16 % in the group offered the lowest payment (€ 300). A threshold effect is observed, as around 50 % to 60 % of participants are unwilling to part with their vehicles under any circumstances, with slight variation across the three groups.

Table 2: Acceptance rates for giving up all privately owned cars in exchange for a yearly payment, separated by payment level and car ownership status (one vs. several cars)

	No. observations	**Share willing to accept (in %)**	**Share willing to accept for higher amount (in %)**	**Share refusing to give up car for any amount (in %)**
		Differences in percentage points		
Full sample				
Reference: € 300	190	6.32	15.79	59.47
€ 1,500	191	+7.82**	-2.70	-7.64
€ 3,000	187	+12.40***	-4.02	-7.07
Participants from households with one car				
Reference: € 300	95	7.37	15.79	55.79
€ 1,500	103	+10.11**	-2.20	-10.16
€ 3,000	92	+16.54***	-8.18*	-4.70
Participants from households with several cars				
Reference: € 300	95	5.26	15.79	63.16
€ 1,500	88	+4.96	-3.29	-4.07
€ 3,000	95	+8.42**	0.00	-9.47

The category 'No answer/don't know' is not listed in this table, which is why the percentage shares within each payment group do not sum to 100 %.
The differences between the reference payment group (€ 300) and the other groups are calculated and tested for statistical significance using chi-squared tests (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Differences are presented in percentage points.

Furthermore, in Table 2 we distinguish between participants having one car in their household and those with multiple cars to explore potential variations in willingness to give up driving. This distinction is particularly relevant, as the scheme requires individuals with multiple cars to give up all vehicles. Acceptance rates indeed differ between these groups. For instance, 24 % of participants with one car accept a € 3,000 payment, whereas only 13 % of participants with several cars in their household accept the same amount.

Next, we are interested in assessing how acceptance rates vary between various subgroups. To this end, Table 3 presents acceptance rates based on different characteristics (see Table 1). In Table 3, we do not differentiate acceptance rates based on the three offered payment amounts (€ 300, € 1500, and € 3000). Instead, we aggregate acceptance into a single measure, meaning that acceptance here refers to whether a person accepted the payment amount offered compared to all others (including those who answered 'No answer/don't know'). The acceptance rates based on these characteristics separated for the different payment levels is illustrated in Supplementary Table A6.

We assess the willingness to accept across different subgroups to understand the heterogeneity of acceptance. This enables us to identify groups that are more likely to participate in the program, as well as those who are less inclined to do so. This information is valuable in two directions. First, by targeting the groups more likely to accept giving up driving, policymakers can allocate resources more effectively. Second, understanding heterogeneity is essential to determine if certain groups might be unaddressed by the policy, which could have distributional implications, especially if some groups benefit disproportionately. Identifying these groups helps in assessing the potential impacts and effectiveness of the measure. For example, encouraging individuals in urban areas to give up their cars could be more effective than in rural areas where more public space is available.

In Supplementary Table A4, we estimate linear probability models (LPM) that include all covariates simultaneously. The results differ from the subgroup analyses in the sense that we find a small negative effect for the variable indicating whether someone is employed. Additionally, the estimated coefficients are generally smaller in magnitude compared to the descriptive subgroup comparisons. The separate subgroup analysis, however, is particularly valuable for considerations related to targeting and distributional fairness. Subgroup analyses can reveal important patterns and practical insights that are critical for effective policy design.

Acceptance for giving up driving all cars in exchange for receiving a yearly payment decreases with higher monthly household net income. On average, the acceptance rate across the various payment amounts is 17 % for the lowest income group, which includes households with a net income of up to € 1,950 (adjusted for household size). In contrast, acceptance drops by nearly 7 percentage points in the highest income group (more than € 2,633 monthly net income). The difference is statistically significant. Supplementary Table A6 shows that for the highest payment of € 3,000, acceptance in the lowest income group reaches 28 %, which is 18 percentage points higher than in the highest income group. Lower income groups are more responsive to this policy measure. In terms of distributional effects, this suggests that the policy would not primarily benefit high-income groups, which is a common problem with subsidies aimed at encouraging climate-friendly behavior, such as the purchase of electric vehicles (Guo and Kontou, 2021; Lekavičius et al., 2020; Rubin and St-Louis, 2016).

Table 3: Acceptance rates for a yearly payment within several subgroups based on socioeconomic and mobility-related characteristics

Variable	**No. observations**	**Share willing to accept (in %) Differences in %-points**	**95 % confidence interval**
Monthly net household income (adjusted by household size)			
Reference: low (< € 1,950)	156	17.31	
Mid (€ 1,950 - € 2,632)	172	-5.10	[-12.79, 2.59]
High (≥ € 2,633)	168	-6.59*	[-14.15, 0.96]
Place of residence			
Reference: rural area	186	8.60	
Town area	228	+5.87*	[-0.22, 11.96]
Urban area	151	+7.95**	[0.79, 15.12]
Employment status			
Reference: working	323	10.53	
Not working	243	+5.52*	[-0.18, 11.22]
Age			
Reference: 18 - 39	89	16.85	
40 - 59	213	-7.93**	[-16.60, 0.73]
60+	266	-1.82	[-10.70, 7.07]
Cumulative annual mileage of all cars available in the household			
Reference: low (< 10,000 km)	143	23.78	
Mid (10,000 - 19,999 km)	180	-14.33***	[-22.51, -6.15]
High (≥ 20,000 km)	190	-17.99***	[-25.71, -10.26]
Purchase year of the primarily used car			
Reference: early purchase (before 2015)	130	16.15	
Recent purchase (2015 - 2018)	171	-3.87	[-11.89, 4.14]
Latest purchase (2019 - 2022)	207	-6.49*	[-13.99, 1.01]
Distance to next public transport station (bus, tram, train etc.) from home			
Reference: low (< 500 m)	188	15.43	
Mid (500 - 1,000 m)	160	-3.55	[-10.76, 3.65]
High (≥ 1,000 m)	212	-3.16	[-9.96, 3.62]

Differences between the reference group and the other categories are calculated and tested for statistical significance using chi-squared tests (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Differences are presented in percentage points.

Additionally, we observe differences in acceptance across places of residence. Individuals in urban areas are almost twice as likely to accept the offer compared to those in rural areas where average acceptance across the three payment levels is lower than 9 %. Employment status also plays a role, with non-working individuals (including unemployed and retired individuals, students, and homemakers) showing an acceptance rate nearly 6 percentage points higher than those who are working. This suggests that individuals without a job find it easier to forgo car ownership. Acceptance is also higher among the youngest (between 18 and 39) and oldest (60+) age groups while those between 40 and 59 are less willing to accept.

Acceptance rates vary significantly based on household driving mileage: Those who drive less than 10,000 kilometers per year have the highest acceptance rates, while those with moderate (10,000 – 19,999 km) or high ($\geq$ 20,000 km) annual mileage show significantly lower acceptance. Furthermore, individuals with cars purchased before 2015 are more likely to accept a payment, with an average acceptance rate of 16 %, while those with newer vehicles (purchased between 2019 and 2022) are less inclined to give up driving.

Finally, acceptance rates do not vary significantly based on public transport accessibility. While individuals living within 500 meters of a public transport station show slightly higher acceptance rates, the differences compared to those living 500 to 1,000 meters or more than 1,000 meters away are not statistically significant and remain relatively small, at no more than four percentage points. This suggests that proximity to public transport alone may not be a decisive factor in the decision to give up driving.

4 Acceptance Rates for an Alternative Incentive Payment Design

There is currently no specific design of an incentive payment program which has been established. For example, unlike the program we have presented so far-which requires individuals to give up car ownership altogether-some existing pilots only require individuals to give up a single vehicle, allowing them to keep additional vehicles if they have more than one (e.g. Dieckmann, 2024; European Commission Urban Mobility Observatory, 2021). We therefore assess whether the acceptance of a different incentive payment design differs from the proposed annual payment scheme. There are two main differences to the program discussed so far. First, it is a one-time payment rather than an annual payment. Second, participants receive this payment for giving up a car, without the condition that there must be no car in the household. This means that for households with one car, it is similar to the program discussed earlier (with the difference of a one-time payment vs. an annual payment). For households with more than one car, however, it is very different, as one or even more cars can continue to be used. It can be assumed that acceptance rates will increase here. While the costs of the car, such as parking space, will continue to be reduced, it is less certain whether car use will actually be reduced or whether individuals just undertake their car journeys with another car of the household.

In this scenario, we presented payment amounts randomized of € 900, € 4,500 and € 9,000.

The time span for which a person who accepts the one-time payment would not be allowed to buy a car again was set at three years. Thus, the payments were set to ensure the total of the yearly payments equals the one-time payment amount over three years (e.g. € 900/3 = € 300). The overall acceptance rate for giving up one car, regardless of whether the respondent owns one or multiple, is 14 % for € 900, 16 % for € 4,500 and rises up to 26 % for € 9,000. Notably, this rate is higher than the acceptance rate for the yearly payment condition, regardless of the offered payment amount (Supplementary Table A5).

For individuals with only one car, acceptance rates in the one-time payment condition are similar to those in the yearly payment scenario from Table 2. It ranges from 10 % to 20 % for the one-time scheme and from 7 % to 24 % for the yearly scheme. In contrast, among respondents with multiple cars, the one-time payment scheme leads to acceptance rates up to three times higher than in the yearly payment condition. At the highest payment level (€ 9,000), the acceptance rate reaches 33 %.

Based on this analysis, we come to two conclusions. First, the pure distinction between annual and one-time payments does not appear to have a major impact on acceptance rates, as the comparison of the two schemes for households with one car shows. Second, as expected, the acceptance rates for households with several cars increase substantially if they are not required to give up all their cars. This raises the question of what the main objective of the measure is. If the main objective is to reduce the number of cars on the road and the associated negative externalities, then a one-time payment might even be preferable. If the aim is to minimize externalities from car usage and potential substitution effects, the design of the annual payment, in which all the cars in the household have to be given up, may be more favorable.

5 Evaluating the Savings and Costs of Implementing an Annual Payment Scheme to Give up Cars

The implementation of a payment scheme to encourage individuals to give up their cars could generate welfare gains, as the use and ownership of cars causes significant societal costs that can be avoided if vehicles are no longer used. Therefore, we evaluate the annual payment scheme, which would require individuals to give up all cars they own if they choose to participate in the program. An ex-ante cost-benefit analysis of the program allows for a systematic comparison of the anticipated societal benefits with the associated costs of the policy. In the transportation sector, cost-benefit analyses are widely applied to evaluate various policy measures, such as congestion pricing and speed limit regulations (Eliasson, 2009; Gössling et al., 2023; Prud'homme and Bocarejo, 2005).

For evaluating the effectiveness of the payment scheme to give up cars, the primary costs include the payments given to car owners who accept to give up their vehicles. Additional costs, e.g. in connection with the program design, administration and advertising, may also be incurred. We abstract from these costs, though, as they are likely to be very variable, making them difficult to quantify accurately. Some of these costs would probably only be incurred in the start-up phase of such a policy, but would be greatly reduced in the long term once the processes are in place. Assuming the program's costs are borne by the government, we adjust the payment amounts by the marginal cost of public funds (MCF), which reflects the distortionary effects of raising additional income taxes (Kleven and Kreiner, 2006). Adjusting by the MCF implies that the implementation of new public expenditure programs, like the incentive scheme in our case, requires raising additional taxes. Following Kleven and Kreiner (2006)[2], we adopt an MCF factor of 1.85. Multiplying this factor by the respective payment levels (€ 300, € 1,500 and € 3,000) results in estimated policy costs of € 555, € 2,775 and € 5,500, respectively, per participant.

Taking cars off the road could generate societal benefits at multiple levels. First, private vehicle use generates external costs, i.e. negative impacts on society that are not reflected in the direct costs of owning or operating a car and are not carried by the individual car owner. The sources of these costs include accidents, air pollution, climate change, noise, and congestion. If individuals were incentivized to give up their cars, the external costs would be reduced as these vehicles would no longer be driven. The societal benefit arising from a car no longer being driven can therefore be quantified by estimating the average external costs for these different sources of societal harm.[3] Using estimates of average external costs provided by the European Commission et al. (2019), we quantify the external costs ranging between 13.43 and 14.80 €-cent, depending on the fuel type (gasoline or diesel engine). Using a weighted average to account for the different fuel types results in external costs of 13.85 €-cent per vehicle-kilometer (vkm) traveled (Table 4).

Table 4: Average external costs per car, categorized by fuel type and aggregated using a weighted average (price level 2022)

Cost type	**Costs gasoline engine (€-cent/vkm)**	**Costs diesel engine (€-cent/vkm)**	**Costs weighted average (€-cent/vkm)**
Accidents	8.19	8.19	8.19
Air pollution	0.60	2.16	1.07
Climate change	2.24	2.05	2.19
Noise	1.02	1.02	1.02
Congestion	1.38	1.38	1.38
External costs	13.43	14.80	13.85

Average costs (in €-cent/vkm) are based on the European Commission et al. (2019) at 2016 price levels. We adjusted them by considering a 13.8 % inflation rate, to reflect price levels at the time of the survey in March/April 2022 (Statistisches Bundesamt, 2025c). To summarize average costs differentiated by fuel type, we assign diesel cars a weight of 0.3 and cars with a gasoline engine a weight of 0.7, based on Kraftfahrt-Bundesamt (2022).

Our main finding from conducting the ex-ante cost-benefit analysis is that a € 300 payment can be considered cost-effective. Through a series of sensitivity analyses, we conclude that even for households with lower annual mileage, offering € 300 for giving up all privately owned cars results in a net societal benefit. This means the avoided external costs of car

[2]Kleven and Kreiner (2006) estimate the MCF using various labor supply elasticity scenarios. We use the result of Scenario 6, which they denote as the 'natural baseline scenario'.

[3]A detailed explanation of the various categories of external costs is provided in the Supplementary Materials.

use outweigh the payment amount.

Potential Annual Savings for a Representative Household To arrive at this conclusion, we first estimate the potential annual savings using our data, which includes information on self-reported kilometers driven by car for each respondent.[4] Focusing on privately owned cars (excluding company cars, which make up 10 % of the sample), we calculate that the median annual mileage for a household's primary car is 12,000 kilometers[5], leading to external costs of about € 1,700 per year. When accounting for all cars in a household, this value increases to 15,000 kilometers, or € 2,000 in external costs annually.

After adjusting for the marginal cost of public funds (MCF), we find that a payment of up to € 1,100 remains cost-effective if all cars in the household would be given up. Therefore, a € 300 payment would result in a net benefit. With an estimated acceptance rate of 6 % and assuming similar behavior at a national level, this policy could generate a societal benefit of approximately € 4 billion, based on 31 million car-owning households in Germany.[6]

Potential Annual Savings by Quantiles of Distance Driven So far, calculations base on median kilometers driven and it is reasonable to assume that individuals who are willing to give up driving their car might drive less than the median value. Therefore, we provide quantile values of kilometers driven, again in a first step for the primarily used car. The lower 10th percentile is at 5,000 kilometers and the lower 25th at 8,000 kilometers (Table 5). These quantile values allow us to identify the level of payment that remains cost-effective even if the annual mileage falls below the median value. If only one car per household would be given up, a payment up to around € 575, after adjusted by the MCF, would be cost-effective if only cars in the bottom 25 % of driven kilometers would be given up.

Considering all kilometers driven within a household does not change this finding. The 25th percentile of total household kilometers driven is approximately 8,000 kilometers, which does not differ from the 25th percentile for the primarily used car. Even if households gave up cars that are driven up to 5,000 kilometers per year (in the bottom 10 % of mileage), the low payment level of € 300 would still remain cost-effective.

Among the participants who accepted one of the offered amounts (n=62), the median of annual driven kilometers per household is 9,000 kilometers, the lower 25th percentile is 5,000 kilometers, with the 10th percentile at 4,000 kilometers. For those who either accepted one of the offered payments or expressed willingness to accept a higher amount (n=135), the median annual mileage across all household vehicles is 12,000 kilometers. The 25th percentile is at 7,000 kilometers, and the 10th percentile at 5,000 kilometers.

[4] In this section, we leverage information of our full sample and not only considering participants who accepted one of the offered amounts. Supplementary Table A7 presents car information for the full sample, as well as separately for those who accepted and those who refused to give up driving.

[5] Outliers were identified and removed for each car (first, second, and third) separately, based on whether the reported kilometers driven exceed the 99th percentile. After excluding these outliers, we identify the car with the highest mileage, i.e., the one driven the most kilometers within the household (n=1,045).

[6] We multiply the acceptance rate with the number of households in Germany who own at least one car, which totals 31 million households (Statistisches Bundesamt, 2023b; Zensus, 2022).

Table 5: Annual externality savings for each vehicle kilometer not driven, across various percentiles

Percentile	10 %	25 %	50 %
Savings primarily used car			
Annual driven kilometers per car (in km)	5,000	8,000	12,000
Externalities savings (in €)	693	1,108	1,662
Savings all cars per household			
Annual driven kilometers per household (in km)	5,000	8,000	15,000
Externalities savings (in €)	693	1,108	2,078

A low payment of € 300 would still be cost-effective if potential savings are calculated with these mileage information, given that cars in the bottom 25 % in terms of kilometers driven were given up.

The True Value of Parking Space Independent of the externalities associated with car usage, the public space occupied by a parked car carries significant, often overlooked, costs. These costs arise mainly from the value of the space itself and from the need to maintain the parking space. These are in most cases not strictly external costs because these are often costs borne by the municipality or city. Therefore, reducing cars not only alleviates external costs but also generates savings for local governments, mainly through the freeing up of valuable public space, rather than through a reduction of car usage itself.

One approach to quantify the true value of parking space is to assess the prices of residential parking permits, which are mandatory in many cities. However, these permits are typically offered at prices well below the true economic value of the land they occupy, as they are heavily subsidised. In addition, both the construction and maintenance costs of parking spaces and the associated opportunity costs can be considered. Opportunity costs, in particular, are challenging to evaluate as they depend on the potential alternative uses of the space. For example, instead of being used for parking, urban spaces could be repurposed as cafés, restaurants, retail areas, green spaces, or even for shared parking solutions. Regarding the construction and maintenance costs, the type of parking arrangement also significantly influences the value of the space. For instance, the costs associated with an open parking lot differ substantially from those of a multistory parking garage.

A case study by Klimaschutz- und Energieagentur Baden-Württemberg (2020) estimates that cost-recovering parking fees[7] for open parking spaces in rural areas of Baden-Württemberg, the third most populous federal state in Germany, would amount to approximately € 70 per month. In urban areas, these fees rise to € 150 per month, corresponding to annual costs of € 840 and € 1,800, respectively. Gössling et al. (2022) assume social cost of curbside parking fees at € 1,005 annually, which falls within the range of the estimates

[7]These include the running costs for the administration and maintenance of the parking spaces, i.e., expenses such as cleaning, winter maintenance, repairs, insurance, landscaping, energy, and personnel.

provided by Klimaschutz- und Energieagentur Baden-Württemberg (2020).[8] Given that the annual payment scheme requires to give up all cars, the potential savings would be even higher if individuals would give up more than one car. Based on our full sample, participants own on average 1.5 cars. Among those, who accepted one of the offered payments or self-reported an amount (n=151), the average is 1.5 as well. Given these numbers, potential savings could amount to approximately € 1,260 annually in rural areas and around € 2,700 annually in urban areas.

In addition to the savings from reduced externalities, these costs should also be included in a cost-benefit analysis. If cars no longer occupy public space, local governments could save these costs. Balancing these potential savings against the costs of the scheme shows that even higher payments than the low option of € 300 would be cost-effective. This is a rather conservative estimation as the figures only cover the maintenance costs of existing parking spaces. To put the results into perspective, participation in the program could lead to societal savings per individual ranging from around € 3,300 in rural areas to around € 4,700 in urban areas, based on our central parameters. These savings result from both the reduction in externalities and the value of parking space freed up, representing the combined total of these benefits.

Considering Potential Substitution Effects To better understand these potential shifts, we elicited the stated preferences of participants regarding their primary mode of transport in the absence of access to a private vehicle in a consecutive wave of the 'RWI Climate-Mobility Panel' in 2024. The results indicate that 40 % of participants would primarily switch to local public transportation, while 18 % would primarily use an electric bicycle. Additionally, 17 % would choose a regular bicycle, and nearly 8 % would prefer car-sharing services as their main mode of transport instead of a private car. The remaining respondents indicated they would primarily switch to walking, using long-distance trains or buses, or rely on other modes of transport (Supplementary Table A8). These findings provide insights into potential substitution patterns, offering a useful starting point for understanding how individuals might adjust their mobility choices in the absence of a private vehicle. However, a reliable quantification of possible substitution effects is beyond the scope of this paper and requires data from a natural experiment or a field trial.

6 A Case Study from Germany on the Feasibility of a Payment Scheme to Give up Cars

The implementation of payment schemes to give up cars has been tested or implemented in several European cities, including Barcelona in Spain, Lille in France, and Frankfurt in

[8] Market-based indicators, such as rental prices, serve as proxies for evaluating parking space value. While residential rents reflect living space costs, private parking garage fees more directly represent the market rate for dedicated parking. These costs align closely with those from Klimaschutz- und Energieagentur Baden-Württemberg (2020) and Gössling et al. (2022), as shown in Supplementary Table A9.

Germany (European Commission Urban Mobility Observatory, 2021; Joeres, 2021; Moering, 2025). In June 2024, a notable pilot started in Marburg, Germany. This scheme offers a payment for residents of Marburg who deregister a privately owned vehicle, that is registered in Marburg, for at least a year. The payment is given to those who give up one car and if someone owns multiple cars, it is allowed to keep the other cars. Participants can receive a payment for giving up driving their car of up to € 1,250 per year. The pilot project allows for up to 50 payments to be paid out—i.e. 50 cars to be taken off the road. 50 cars were deregistered within just one month, indicating a strong interest in the program in Marburg. After an evaluation of the one-year pilot phase, the aim is to transfer it into a permanent funding program.

To take part in the pilot, applicants need to meet some requirements. Participants must live in Marburg (have their primary residence there) and hold a driver's license. The deregistered car cannot be a leased or a company vehicle. A concern is that it comes to fraud, which could reduce the program's effectiveness. To minimize this risk, the payment is split into two parts. The first payment will be made after the first proof of deregistration of the vehicle in the form of a copy of the stamped vehicle registration document and the receipt. The second half of the payment is paid six months after the vehicle is given up. After 12 months, a proof must be provided that the participant still has the primary residence in Marburg.

Further, participants give permission for the vehicle registration office to check all household members' vehicle registrations. This allows to check that the participant has not reregistered a car in the meantime. During the year, the participants' household is not allowed to increase the total number of registered vehicles. Furthermore, the participant has to ensure that the deregistered vehicle is not available to members of the household or otherwise. In addition, each household can only receive a payment once, so it is not possible for several household members to receive a payment for not driving.

The scheme is designed in such a way that rather than receiving € 1,250 in cash, participants can divide their budget between several categories: € 50 as a 'climate bonus'—the climate bonuses can be spent on sustainable products in Marburg—up to € 800 in credits for using car-sharing services, up to € 400 in local vouchers specifically redeemable in Marburg's shops, and up to € 600 to cover public transport costs through the city's services. The latter amount is sufficient to purchase the *Deutschlandticket* for one year which provides unlimited access to local and regional public transportation across Germany. By allowing participants to choose specific amounts for each category in increments of € 100, it is ensured that the scheme can be tailored to individual transport needs. For example, a participant could choose to forgo the public transport allocation altogether and instead use the maximum € 800 for car sharing.

A difference compared to the assessed policy in our study is that only one car needs to be given up per participant, rather than all vehicles. Additionally, participants can only use these funds towards alternative transportation options or vouchers that ensure the entire payment remains in Marburg, rather than receiving the payment in cash. Despite these differences, there are also similarities. For example, participants can re-evaluate their decision on an annual basis.

7 Discussion

In this study, we assessed the willingness to give up private cars in exchange for receiving a payment based on a survey experiment conducted in 2022 with 1,143 participants in Germany. To date, this type of transport policy has been tested in several European pilot projects and implemented in several cities, such as in Barcelona, Spain, and Marburg, Germany. However, to our knowledge, no comprehensive assessment has been conducted on potential impacts if such a program were rolled out. To fill this gap, we took a first step to provide an ex-ante evaluation of the policy's potential beyond cities where such programs have already been implemented.

Using a stated-choice framework, we asked survey participants whether they would forgo private car ownership in exchange for a specific payment. By varying the offered payment amount between € 300, € 1,500, and € 3,000, we find acceptance rates for an annual payment and giving up all cars within a household of 6 % (€ 300), 15 %, (€ 1,500) and 19 % (€ 3,000). Crucially, acceptance is not uniform across demographic groups. Participants with lower incomes exhibit significantly higher acceptance rates, on average, more than 7 percentage points higher than high income participants, regardless of the payment level.

We further evaluated the conditions for such an annual payment scheme to be cost-effective. Quantifying the external costs associated with using a car at around 14 €-cent per vehicle kilometer traveled for a representative car, offering a payment of € 300 would even be cost effective if only cars in the lower quartile of mileage were given up. The true value of parking spaces also impacts the program's cost-effectiveness. It is estimated that the actual costs of maintaining public parking spaces amount to at least € 840 per year and car in rural areas and € 1,800 in urban areas. Considering that the annual payment scheme requires participants to give up all cars they own, the cost-effectiveness of the program can extend to higher payments. In urban areas, payments of up to approximately € 2,700 could still be considered cost-effective when considering the value of parking space. Our cost-benefit analysis, however, does not account for all factors. For example, we see that older vehicles are more likely to be given up within the proposed programs. As older cars tend to have higher emissions and lower fuel efficiency the reduction in negative externalities could be even larger. Given that our sensitivity analyses primarily focuses on kilometers driven and not other variables such as the age of the car, our estimates are rather conservative.

As a potential limitation, the hypothetical nature of our survey experiment leaves some uncertainty about whether individuals would actually follow through on giving up their cars if such a policy was implemented. While stated preferences provide valuable insights, revealed preferences could be observed in real-world trials. Nevertheless, ex-ante evaluations such as ours play a crucial role in guiding policy discussions before committing significant public funds. They allow for an initial assessment of potential impacts while acknowledging existing uncertainties. Survey-based approaches, particularly those using stated-choice frameworks, are a useful first step in understanding public acceptance and identifying key target groups for such programs.

Before the introduction of new transportation policies, it is essential to not only consider cost-effectiveness but also public acceptance. In another survey conducted two years later in 2024 as part of the 'RWI Climate-Mobility Panel', we asked respondents to assess their support for the idea of introducing nationwide monetary incentive schemes for giving up cars—rather than being confronted with the direct, hypothetical question on their willingness to participate. Even though participation in such programs would be entirely voluntary, we find that only 20 % of participants support the implementation, which is a relatively low rate of support in comparison to other transportation-related policy measures asked within the same survey (Andor et al., 2024). The low level of support may be due to citizens' concerns on the measure's (cost-)effectiveness, potentially questioning the use of public funds for this type of policy. It could also be due to citizens being unfamiliar with the measure, as it has so far barely been subject to public discussions. If the measure were brought into more public discourse and tested in pilot projects, concerns about feasibility and implementation could be addressed, potentially leading to a shift in public acceptance. Evidence suggests that public support for policies may change after their actual implementation (Carattini et al., 2024).

Further concerns that not only citizens but also policymakers should consider relate to issues of fairness and practical feasibility. For example, individuals who do not own a car in the first place can obviously not benefit from the incentive programs. In addition to deciding on the amount and the timing of the payments as tested with this study, many details on the implementation have to be considered, especially on their conditionality and on monitoring of compliance. Further, substitution effects in the medium and long term must be investigated if such payments schemes were to be rolled out at a large, nationwide scale. For example, the availability of affordable used, and likely older, cars may increase, counteracting the policy's intended objectives to a certain degree. Also, a subsequent rise in demand for alternative modes of transport—such as (electric) bicycles and public transport—will necessitate corresponding public infrastructure investments, causing additional costs while simultaneously increasing the attractiveness of these alternatives. Overall, it therefore seems difficult to estimate the complex dynamics and equilibrium effects of such incentive programs. Pilot studies and local programs provide valuable insights into their feasibility and potential challenges in implementation.

Incentive programs aimed at reducing car ownership seem particularly promising in urban areas, where external costs are high and the implementation may be limited in scope and associated expenditures. We therefore recommend to focus in particular on urban centers where car ownership alone generates substantial social costs, to consider pilot programs testing the effects of modest payments to decrease the presence and usage of cars.

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Appendix

Table A1: Comparison of the distribution of participants' socioeconomic characteristics in the full sample (n=1,266) with the German population based on the 2022 *Mikrozensus* (microcensus)

Variable	**Category**	**Proportion in Sample (in %)**	**Proportion in *Mikrozensus* (in %)**
Gender	Male	55.0	49.0
	Female	45.0	51.0
Age	<20	0.4	2.3
	20-24	1.8	6.5
	25-34	8.4	15.3
	35-44	13.0	15.5
	45-54	18.5	15.9
	55-64	23.5	18.7
	65-74	21.6	13.3
	75+	12.9	12.5
Highest level of education[1]	No school-leaving qualification	0.5	3.6
	No school-leaving qualification yet	0.1	5.0
	Secondary general school	22.0	24.3
	Intermediate secondary school	38.8	30.6
	Upper secondary school (higher education entrance qualification)	38.7	36.5
Household net income (monthly in €)[2]	<1,200	4.3	14.2
	1,200-3,200	43.5	51.5
	3,200-5,200	37.2	18.2
	≥ 5,200	15.0	16.1

[1]In the *Mikrozensus*, the population aged 15 and above is considered for the highest school-leaving qualification, whereas the sample includes respondents aged 18 and over.
[2]Income categories in the table deviate slightly from those used in the *Mikrozensus*. In the *Mikrozensus*, income groups were categorized as follows (in €): up to 1,250; 1,250-3,500; 3,500-5,000; and higher than 5,000.
Sources: gender (Statistisches Bundesamt, 2024); age (Statistisches Bundesamt, 2024); household size (Statistisches Bundesamt, 2025b); highest education level (Statistisches Bundesamt, 2024); household net income (Statistisches Bundesamt, 2025a)

Table A2: Overview of participant allocation across different payment groups and amounts

	One-time payment (n=575)	**Yearly payment** (n=568)
Low amount (€ 900 or € 300)	n=192	n=190
Medium amount (€ 4,500 or € 1,500)	n=191	n=191
High amount (€ 9,000 or € 3,000)	n=192	n=187

Table A3: Quantile values of self-reported yearly payment participants are willing to give up all privately owned cars

Quantiles	1 %	5 %	10 %	25 %	50 %	75 %	90 %	99 %
Amount willing to give up car	600	1,000	1,000	3,000	6,000	20,000	50,000	1,000,000

No. observations: 77

Table A4: Associations between willingness to give up all privately owned cars for a yearly payment and socioeconomic, regional, and mobility-related factors (linear probability models)

	(1) **Acceptance to give up car**	(2) **Acceptance to give up car**	(3) **Never give up car**
Medium payment (€ 1,500)	0.0782** (0.0309)	0.0807** (0.0339)	-0.0540 (0.0564)
High payment (€ 3,000)	0.124*** (0.0336)	0.113*** (0.0374)	-0.0341 (0.0582)
Low monthly net household income (€ 1,950 - € 2,632)		-0.0551 (0.0405)	0.0230 (0.0578)
High monthly net household income ($\geq$ € 2,633)		-0.0620 (0.0396)	0.0776 (0.0591)
Live in town area		0.0420 (0.0338)	-0.164*** (0.0558)
Live in urban area		0.0386 (0.0421)	-0.177*** (0.0624)
Working		-0.00618 (0.0439)	0.0360 (0.0744)
Age 40 - 59		-0.0727 (0.0460)	0.0956 (0.0700)
Age 60+		-0.0404 (0.0562)	0.200** (0.0860)
Mid cumulative annual mileage of all cars in HH (10,00-19,999 km)		-0.133*** (0.0482)	-0.00532 (0.0604)
High cumulative annual mileage of all cars in HH ($\geq$ 20,000 km)		-0.167*** (0.0482)	0.128** (0.0641)
Recent purchase primarily used car (2015 - 2018)		-0.0346 (0.0434)	-0.0233 (0.0619)
Latest purchase primarily used car (2019 - 2022)		-0.0390 (0.0412)	0.0460 (0.0581)
Mid distance to next publ. transport station (500 - 1,000 m)		-0.0428 (0.0402)	0.0830 (0.0591)
Mid distance to next publ. transport station ($\geq$ 1,000 m)		-0.0537 (0.0365)	0.113** (0.0571)
Constant	0.0632*** (0.0177)	0.291*** (0.0842)	0.373*** (0.123)
Observations	568	443	443

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Acceptance rates for giving up one car in exchange for a one-time payment, separated by payment level and car ownership status (one vs. several cars)

	No. observations	**Share willing to accept (in %)**	**Share willing to accept for higher amount (in %)**	**Share refusing to give up car for any amount (in %)**
			Differences in %-points	
Full sample				
Reference: € 900	192	13.54	18.23	51.56
€ 4,500	191	+2.69	-0.95	+0.79
€ 9,000	192	+11.20**	-6.25*	-4.88
Participants from households with one car				
Reference: € 900	111	9.91	15.32	55.86
€ 4,500	108	+4.90	-1.43	+1.56
€ 9,000	107	+9.72**	-4.10	-5.39
Participants from households with several cars				
Reference: € 900	81	18.52	22.22	45.68
€ 4,500	83	-0.45	-0.54	+0.10
€ 9,000	85	+14.23**	-9.28	-3.33

The category 'No answer/don't know' is not listed in this table, which is why the percentage shares within each payment group do not sum to 100 %.
Differences between the reference payment group (€ 300) and the other groups are calculated and tested for statistical significance using chi-squared tests (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Differences are presented in percentage points.

Table A6: Acceptance rates for giving up all privately owned cars in exchange for a yearly payment based on socioeconomic and mobility-related characteristics, separated by payment level

Variable	**Share willing to accept (in %)**		
	€ 300	€ 1,500	€ 3,000
Monthly net household income (adjusted by household size)			
Reference: low (< € 1,950)	7.41	18.18	27.66
Mid (€ 1,950 - € 2,632)	-3.56	-8.01	-6.35
High (≥ € 2,632)	+2.76	-5.90	-18.04**
Place of residence			
Reference: rural area	1.64	11.11	12.90
Town area	+6.15	+2.78	+8.62
Urban area	+8.36	+6.75	+9.32
Employment status			
Reference: working	4.12	13.56	12.96
Not working	+3.48	+1.72	+13.62**
Age			
Reference: 18 - 39	5.26	20.00	20.00
40 - 59	-0.37	-7.32	-11.15
60+	+1.74	-7.50	+6.74
Cumulative annual mileage of all cars available in the household			
Reference: low (< 10,000 km)	12.73	28.21	32.65
Mid (10,000 - 19,999 km)	-6.37	-18.83**	-19.45**
High (≥ 20,000 km)	0.00	-18.97**	-24.84***
Purchase year of the primarily used car			
Reference: (early purchase: before 2015)	9.62	17.65	22.73
Recent purchase (2015 - 2018)	-4.06	-3.56	-5.34
Latest purchase (2019 - 2022)	-5.39	-6.54	-9.03
Distance to next public transport station (bus, tram, train etc.) from home			
Reference: low (< 500 m)	7.57	17.91	21.82
Mid (< 1,000 m)	+1.12	-8.82	-4.87
High (≥ 1,000 m)	-3.58	-2.99	-3.25
No. observations	190	191	187

Differences between the reference payment group (€ 300) and the other groups are calculated and tested for statistical significance using chi-squared tests (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Differences are presented in percentage points.

Table A7: Car information for full sample and different subsamples

Variable	Full sample	Accept offered payment	Refuse offered payment	Difference in %-points	Accept offered or higher payment	Refuse offered or higher payment	Difference in %-points
		(€ 300, € 1,500 or € 3,000)					
Yearly distance of driven kilometers (mean)							
Primarily used car	14,669	10,797	14,992	-4,195**	12,573	15,168	-2,595*
All cars within household	18,960	13,810	19,935	-6,125**	16,713	20,082	-3,369
Engine of primarily used car (share in %)							
Diesel	27.56	19.35	30.16	-10.81*	22.96	30.95	-7.99*
Gasoline	65.17	77.42	60.31	+17.11**	71.11	59.26	+11.85**
Electric vehicle	6.41	3.23	8.43	-5.20	8.89	7.41	+1.48
Size of primarily used car (share in %)							
Small car	49.66	54.84	45.23	+9.61	48.89	45.50	+3.39
Mid size car	30.49	35.48	29.49	+5.99	34.07	28.84	+5.23
Large size car	15.63	9.68	20.18	-10.50**	13.33	20.90	-7.57*
Other	4.22	0.00	5.10	-5.10*	3.70	4.76	-1.06
No. observations	1,043	62	451		135	378	

The differences are calculated and tested for statistical significance using chi-squared tests (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A8: Main alternative mode of transport to the car (stated-choice)

Mode of Transport	Frequency	Share (in %)
By foot	328	6.50
Carsharing or rental car	388	7.69
Public transport (bus, tram, regional trains, etc.)	1,985	39.35
Bicycle	854	16.93
Electric bicycle	923	18.30
E-scooter	24	0.48
Train (long-distance)	189	3.75
Bus (long-distance)	128	2.54
Other mode of transport	226	4.48
Total	5,045	100.00

The following question was asked in the consecutive wave of the ‘RWI Climate-Mobility Panel‘ in 2024 to participants who reported having at least one car: Assuming you did not have a car available, what mode of transport would you mainly use instead?

Table A9: Potential monthly and annual savings per car due to free space in Germany

Category	Urban/rural	Cost per m^2 (monthly)	Cost per car (monthly)	Cost per car (yearly)
Net rent prices for living	Rural	€ 6.4	€ 64–89.6	€ 768–1,075.2
	Urban	€ 8.3	€ 83–116.2	€ 996–1,394.2
Garage rental prices	Rural	-	€ 30	€ 360
	Urban	-	€ 150	€ 1,800

To quantify costs per car, a car size ranging from 10 to 14 m^2 is used.
Sources: net rent prices (Statistisches Bundesamt, 2022); garage rental price (Creutzig et al., 2020)

Survey Questions

One-time scheme (50 % of participants):

Amount: [€ 900 – € 4,500 – € 9,000]

1. Only for participants owning one car:

We would now like to return to the topic of driving. Currently, some countries are testing new measures to reduce car usage. One such measure involves paying a one-time payment for giving up private car ownership. Imagine you would receive a one-time payment of [AMOUNT] if you sell your car and do not purchase a new one for three years. Of course, you would also receive the selling price of your car at its current market value. Would you give up your car for a payment of [AMOUNT]?

2. Only for participants owning several cars:

We would now like to return to the topic of driving. Currently, some countries are testing new measures to reduce car usage. One such measure involves paying a one-time payment for giving up private car ownership. Imagine you would receive a one-time payment of [AMOUNT] if you sell one of your cars and do not purchase a new one for three years. Of course, you would also receive the selling price of your car at its current market value. Would you give up one of your cars for a payment of [AMOUNT]?

- Yes
- No
- Don't know
- No answer

If answer = No

What would the one-time payment need to be for you to sell your car and not purchase a new one for three years? Of course, you would also receive the selling price of your car at its current market value.

- Answer: [€ 0 - 1,000,000]
- I would not give up my car under any circumstances
- Don't know
- No answer

Annual scheme (50 % of participants):

Amount: [€ 300 – € 1,500 – € 3,000]

We would now like to return to the topic of driving. Currently, some countries are testing new measures to reduce car usage. One such measure involves paying an annual payment for giving up the use of a private car in your household. Imagine you and all German households would receive an annual payment of [AMOUNT] if you give up using a private car. It would not be allowed to permanently have a car available by other means, such as a company car or a car belonging to a relative or friend. However, rental cars, taxis, and car-sharing would be allowed. Of course, you could also receive the selling price of your car(s) at its current market value. Would you give up using a private car for a payment of [AMOUNT] per year?

- Yes

- No
- Don't know
- No answer

If answer = No
What would the annual payment need to be for you to give up the use of a private car? Of course, you could also receive the selling price of your car(s) at its current market value.

- Answer: [€ 0 - 1,000,000]
- I would not give up my car under any circumstances
- Don't know
- No answer

Explanation of External Costs based on the European Commission et al. (2019)

Accidents

Traffic accidents lead to significant costs, both material and immaterial. Material costs include expenses such as repairing vehicle damages, medical treatments, and administrative procedures. In contrast, immaterial costs account for the emotional toll, including pain, suffering, and reduced quality of life. While material costs can be calculated using market prices, immaterial costs lack a clear market value, making them more difficult to estimate. Some accident-related costs are already internalized, such as those covered by insurance premiums or anticipated risks. External accident costs refer specifically to the societal costs of accidents that are not covered by insurance or borne directly by individuals, including the broader impact on the well-being of others.

Air pollution

European Commission et al. (2019) address four main types of impacts caused by the emission of transport-related air pollutants. First, health effects result from the inhalation of pollutants such as particles (PM_{10}, $PM_{2.5}$) and nitrogen oxides (NO_X), increasing the risk of respiratory and cardiovascular diseases, leading to medical costs, lost productivity, and even death. Second, crop losses occur when pollutants such as ozone (formed from NO_X and VOC) and acidic substances (e.g., SO_2, NO_X) damage agricultural crops, reducing yields. Third, air pollutants cause material and building damage, including surface pollution from particles and dust, and corrosion of building facades from acidic compounds like NO_X and SO_2. Finally, pollutants contribute to biodiversity loss by damaging ecosystems through soil acidification, water pollution, and eutrophication, resulting in reduced biodiversity in flora and fauna.

Climate change

Transportation contributes to climate change through emissions of greenhouse gases (GHG) like CO_2, N_2O, and CH_4. These emissions result in global warming, leading to rising sea levels, extreme weather events, biodiversity loss, and other long-term impacts. Climate costs encompass all the effects of global warming, such as damage to agriculture, ecosystems, and human health. Calculating these costs is complex due to the global and long-term nature of climate change. While road and rail emissions mainly involve direct greenhouse gases, aviation also emits other harmful substances at high altitudes, complicating cost assessments for this sector. Three inputs are used to quantify the external costs of climate change: GHG emission factors for each vehicle type, vehicle performance data, and climate change costs per tonne of CO_2 equivalent. The GHG emissions for each vehicle type are calculated by multiplying the vehicle kilometers driven in each country by the vehicle emission factors (in g/km) for each GHG (CO_2, N_2O, CH_4, and other aviation emissions). By applying Global Warming Potentials (GWP), the emissions of these three GHGs are combined to obtain the total CO_2 equivalent emissions. These emissions are then multiplied by the climate change costs per tonne of CO_2 equivalent to calculate the total climate change costs for each mode of transportation. Finally, to determine the average climate change costs, the total costs are divided by the number of passenger kilometers (pkms) or tonne kilometers (tkms) driven by the vehicle type.

Noise pollution

Traffic noise, particularly from road, rail, and aviation, negatively affects human well-being. It disrupts daily life, causes sleep disturbances, and can lead to health problems like stress and cardiovascular issues. Urbanization and increasing traffic volumes exacerbate noise-related problems by exposing more people to higher noise levels. The cost of noise is measured in decibels (dB), with nighttime noise being particularly harmful.

Congestion

Congestion occurs when traffic flow approaches or exceeds the capacity of roads, slowing down vehicles and increasing travel times. The main cost arises when additional vehicles delay others, resulting in lost time and productivity. Unlike other transport modes like rail and aviation, which follow fixed schedules, road congestion directly affects drivers and passengers. Congestion can also worsen other externalities, such as higher emissions and increased accident risks. Estimating congestion costs involves understanding traffic patterns and their interactions with road capacity, but accurate assessments often require local studies.