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Not just self-interest: How car dependence shapes the acceptability of street interventions in Barcelona

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ABSTRACT

Urban street-space interventions such as pedestrianizations, bike lanes, superblocks, and school streets are increasingly used to reduce car dependence and improve public space, but they often face political resistance. A central question is whether opposition among drivers and car-dependent households reflects a direct attachment to automobility or whether it operates through more specific concerns about personal costs, freedom, and everyday routines. This paper examines this question using the ATRAPA-BCN survey, a cross-sectional survey of 2,000 adults living in Barcelona and its metropolitan area. We estimate nested ordinary least squares models for four street-space interventions, progressively introducing car use and perceived household car need, expected personal impact and freedom loss, public-good beliefs and fairness, and trust in the City Council. Descriptively, car use and perceived household car need are associated with lower acceptability across interventions. However, once perceived personal impact and freedom loss are introduced, car use is no longer independently associated with acceptability for any of the four interventions, while perceived household car need remains more persistent in some cases. Perceived personal impact is the strongest and most consistent predictor of acceptability, and freedom loss retains an additional negative association. Public-good beliefs and social fairness also remain positively associated with support, indicating that acceptability is not reducible to expected personal consequences. Overall, frequent car use alone does not explain opposition. Support is more closely associated with whether people feel their household needs a car, how they expect the intervention to affect their daily life and freedom of movement, and whether they see it as beneficial and fair.

1. Introduction

Urban built-environment interventions that reallocate street space have become increasingly prominent in cities seeking to reduce transport externalities, improve public health, and curb car dependence (Furlong et al., 2025). Measures such as pedestrianizations, protected bike lanes, superblocks, and school streets are attractive to local governments because they reshape everyday mobility through the design of streets and public space, often without relying primarily on taxes, pricing, or other explicitly punitive instruments (Marquet, Fernández-Núñez, et al., 2024). At the same time, recent experience shows that even interventions with a strong technical rationale and documented social and environmental benefits can become politically fragile once they encounter organized public resistance (Cornet & Hook, 2025).

This tension is especially visible in the case of street-space interventions. By altering street design, these interventions alter the material organization of movement, access and priority on the streets (Hrelja et al., 2025). For this reason, opposition is often triggered less by abstract disagreement with sustainability goals than by the perception that familiar routines are being disrupted (Herdt & Jonkman, 2023; Pritchett et al., 2024) and that previously taken-for-granted forms of (auto)mobility are being questioned (Lange, 2025). The loss of a driving lane or a parking space may therefore become more salient than intangible gains such as cleaner air, safer streets, or lower emissions.

Research on climate and transport policy acceptability has already identified a relatively stable set of determinants of support, including perceived effectiveness (Bergquist et al., 2022; Dreyer et al., 2015;

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Morton et al., 2021; Sun et al., 2016), fairness (Huber et al., 2020; Isaacson et al., 2024; Maestre-Andrés et al., 2019; Mullen, 2021), institutional trust (Huber & Wicki, 2021; Jagers et al., 2017; Kitt et al., 2021), ideology (Boggio & Beria, 2019; Chan & Lin, 2022; Ejelöv & Nilsson, 2020), and anticipated personal costs (Kallbekken et al., 2013; Kallbekken & Sælen, 2011; Lindgren et al., 2026; Palm & Handy, 2018; Schade & Schlag, 2003). Among these, self-interest becomes especially salient when policies impose visible material consequences or affect everyday routines such as driving (Marquet, Mojica, et al., 2024). In the transport domain, work on congestion pricing and other restrictive instruments has repeatedly shown that travel behavior, anticipated private costs, and direct exposure to the policy are central to support and opposition (Baumgartner et al., 2025; Drozda, 2025; Helferich & Tröger, 2026), and are behind the prominent protests associated with bike lanes (Kinman et al., 2025; Lambert et al., 2026), parking reforms (Goran & Yu Faxer, 2026; Schreibmüller et al., 2025; Zellmann et al., 2026) or more targeted interventions such as superblocks (Marquet, Fernández-Núñez, et al., 2024) or low traffic neighborhoods (Verlinghieri et al., 2025). Yet in the case of street-space interventions, it remains unclear whether car dependence operates as a direct source of opposition or whether it matters mainly by shaping how people expect the intervention to affect them.

In debates around pedestrianization, bike lanes, or superblocks, car dependence is often treated as a shorthand explanation for opposition, assuming that drivers or car-dependent households will tend to oppose interventions because they are "pro-car," because they identify with automobility (Helferich & Tröger, 2026; Schreibmüller et al., 2025), or because they stand more to lose (Haarstad & Yazar, 2025; Pritchett et al., 2024). However, such a direct backlash account remains incomplete. Studies such as Lanzendorf et al. (2023) or Schreibmüller et al. (2025) have failed to find a direct link between car use, car need, and policy acceptability, suggesting the existence of a more complex relationship that operates through other nodes or factors such as intention to reduce car use, or parking availability.

This paper addresses that gap through the case of Barcelona, a city where the politics of street-space transformation have become especially visible (Anguelovski et al., 2023; Fernández Núñez et al., 2025). Drawing on the ATRAPA-BCN survey, we examine acceptability across four major interventions—pedestrianizations, bike lanes, superblocks, and school streets—using the same sample and set of models. We distinguish between how often people use a car, whether they feel their household needs one, and how they expect each intervention to affect their daily life and freedom of movement. We then examine whether support is also related to whether the intervention is seen as beneficial for the city, fairly distributed, and implemented by a trustworthy City Council. By comparing these relationships across four types of intervention, we move beyond a simple opposition between "motorists" and "supporters of sustainable mobility", offering a more detailed account of why people support or oppose changes to street space.

2. Theoretical background

Across climate and transport policy, public support is rarely explained by a single factor. Instead, it tends to emerge from the combination of policy-specific beliefs and broader normative or political orientations. Perceived effectiveness, fairness, and trust are among the most consistent correlates of support (Ejelöv & Nilsson, 2020; Huber & Wicki, 2021; Morton et al., 2021), while ideology and value orientations shape how citizens interpret both the problem and the proposed solution (Kitt et al., 2021; Montoya-Villalobos & Cambo, 2026). For street-space interventions, these considerations are especially intertwined because the policies are experienced locally and their distributive consequences are visible rather than abstract (Schreibmüller et al., 2025). Car dependence therefore needs to be understood not in isolation, but in relation to the burdens people expect to bear, the freedom they believe they may lose, and their judgments about public benefits, fairness, and institutional trust.

Street-space redesign introduces a distinctive acceptability problem. Built-environment sustainable travel interventions (BESTI) differ from classic market-based policies because they are spatially concentrated, highly visible, and directly redistribute scarce urban space. The resulting trade-offs are often experienced as zero-sum, particularly by those who feel that car movement or parking is being displaced to accommodate walking, cycling, or public life (Timmons et al., 2023). However, this zero-sum perception is highly sensitive to what the reclaimed space is converted into, as the acceptability of losing a driving lane or a parking spot depends heavily on the perceived value of the newly provided public good (Baumgartner et al., 2025; Mouratidis et al., 2026). Studies of parking reallocation show that support differs depending on whether space is converted into cycling infrastructure, greenery, public squares, or other neighborhood improvements (Goetting et al., 2025). A car-dependent resident may therefore react differently to the same loss of road space depending on whether the replacement is understood as serving a competing transport mode or providing a widely valued public good, such as child safety (Fernández Núñez et al., 2025; Zellmann et al., 2026).

Because street-space interventions are spatially concentrated, fairness is also judged territorially. Whereas opposition to road pricing, fuel taxes, and other financial measures often focuses on regressivity (Axsen & Long, 2025), street-space reallocation raises questions about which neighborhoods receive the benefits, where traffic or parking pressures are displaced, and whether residents in peripheral or poorly connected areas bear disproportionate burdens (Haarstad & Yazar, 2025; Rye et al., 2025). Opposition may therefore reflect a sense of spatial exclusion as much as an ideological defense of automobility (Marquet, Mojica, et al., 2024).

Within that setting, car dependence has been treated as a central source of opposition because it aligns policy consequences with individual self-interest. Research on transport policy has long suggested that support for restrictive measures depends on whether a policy's expected costs and benefits correspond to an individual's everyday travel practices. In this sense, car dependence is not only a matter of individual convenience but also shapes perceptions of distributive fairness: those who rely on cars may interpret street-space reallocation as placing disproportionate burdens on their everyday mobility while benefits accrue to other groups. Boggio and Beria (2019), for example, show that the value citizens attach to car use, together with frequency of use, lies at the root of many road-pricing acceptability problems and that car dependence remains a negative predictor of support once policy exposure is considered. In many quantitative models, this relationship is modeled as a direct effect: car ownership, frequent car use, or a strong preference for driving are associated with lower acceptability of restrictive "push" measures (Baumgartner et al., 2025; Lichtin et al., 2024).

However, deeper psychological and structural analyses suggest that car dependence may also be operating through indirect pathways. Based on these findings, car dependence would act as a lens through which individuals evaluate a policy's consequences, specifically triggering fears regarding burdens, freedom, and routine disruption. According to Jagers et al. (2017), car dependence affects personal outcome expectancy, that is, the extent to which the implementation of a policy instrument is expected to imply negative personal consequences. Because dependence leaves individuals feeling they have low behavioral control, or few viable alternatives, they may expect the intervention to impose particularly heavy burdens, which in turn indirectly drives opposition (Player et al., 2023). These perceived burdens may be further amplified when institutional trust is low. If residents do not trust local authorities to deliver promised benefits, provide viable alternatives, or distribute costs fairly, street-space interventions are more likely to be interpreted as imposed losses rather than as collective improvements. Only a small number of studies using more advanced statistical approaches have been able to confirm that the trait of car ownership often exerts its influence

through indirect psychological expectations. Oltra et al. (2021) demonstrated this in the case of the Barcelona low emission zone, and Zhang et al. (2023) found a similar pattern for congestion pricing in Beijing. In that sense, Schreibmüller et al. (2025) distinguish between a car-dependent demographic that opposes interventions because they feel their daily mobility needs cannot be met without a car and a "status-quo satisfied" group that opposes car-reduction measures more categorically because they view car ownership, driving, and free parking as self-evident rights. This second group may resist policies aimed at reducing cars even when they are not strictly dependent on them for everyday mobility. Similarly, Lanzendorf et al. (2023) find that an individual's intention to reduce car use is a much stronger predictor of policy acceptance than their actual current frequency of driving.

Beyond these practical and psychological pathways, car-dependent lifestyles may also be deeply intertwined with cultural values of individualism and autonomy (Marquet et al., 2025; Schwanen & Hopkins, 2026). In that sense, car-dependent individuals have been found to be more likely to interpret interventions that reallocate street space or impose tolls as an authoritarian infringement on their personal freedom of movement (Lange, 2025). Policies targeting cars may therefore be perceived as an attack on an individual's right to choose how they live and move (Boso et al., 2023). Schwanen and Hopkins (2026) further elaborate that this contestation is rooted in a clash between competing conceptions of mobility freedom, with car-dependent individuals tending to defend "negative freedom," that is, the right to move through public space without state interference or restriction. By contrast, street-space interventions attempt to establish collective freedoms, such as the freedom to breathe clean air, walk safely, or allow children to play on the street.

Increasingly, this ideological defense has merged with wider organized political identities. Recent scholarship points to the rise of "motorist populism" (Drozda, 2025), a phenomenon in which the defense of automobility is weaponized by right-wing and anti-establishment political movements. In these cases, street-space interventions are stripped of their environmental rationale and instead recoded as elite conspiracies designed to restrict civic movement, control populations, and attack traditional ways of life (Lange, 2025; Marquet et al., 2025).

Overall, however, neither personal self-interest nor political identity fully explains support for transport policies. Citizens also judge whether interventions are likely to produce public benefits, whether their costs and benefits are fairly distributed, and whether the institutions responsible for implementation can be trusted (Dechezleprêtre et al., 2025; Montoya-Villalobos & Cambo, 2026). This matters especially for street-space interventions, which are justified not only as constraints on car use but as ways of producing public goods such as safer streets, cleaner air, more walking and cycling, and stronger neighborhood life. Finally, the loss of road or parking space is unlikely to be evaluated in isolation, but in relation to what replaces it and to the public goods the intervention is perceived to provide. As a result, the role of car dependence and self-interest assessments may vary across street-intervention types, depending on whether a measure is interpreted as a loss for drivers, as a broader improvement to the urban environment, or as the provision of a widely valued public good. According to that logic, car dependence should predict opposition less strongly for interventions framed around universally protected public goods, such as child safety and health in school streets, compared to interventions more easily perceived as direct, zero-sum spatial redistributions to competing transport modes, such as dedicated bike lanes.

Accordingly, this paper examines the extent to which car dependence is associated with lower support for pedestrianizations, bike lanes, superblocks, and school streets in Barcelona. It further assesses whether this association operates primarily as a direct positional effect or, instead, through an indirect process running via self-interest evaluations, particularly anticipated personal impacts and perceived losses of freedom of movement. The analysis also examines whether civic evaluations, such as beliefs about public benefits, fairness, and trust in the City Council, continue to shape acceptability independently. Finally, by comparing four types of street-space intervention, the paper assesses whether the relationship between car dependence and support varies according to the type of space reallocated and the public good associated with each intervention.

3. Methods

3.1. Study design and data source

The analysis uses the ATRAPA-BCN survey, a cross-sectional CAWI survey of adults aged 18 years and older living in the city of Barcelona and the metropolitan area (AMB). The questionnaire was designed to capture support for four major street-space interventions in Barcelona: pedestrianizations, bike lanes, superblocks, and school streets, together with a larger set of attitudes and covariates related to urban mobility and policy acceptability. The questionnaire did not rely on a single pre-existing instrument, but most items were taken or adapted from questions and scales previously used in research on transport-policy acceptability, institutional trust, environmental attitudes and values, travel behavior, and neighborhood change. These were complemented by questions developed specifically for the ATRAPA project and adapted to the four street interventions examined. Questionnaire development involved several rounds of review within the research team, followed by pilot testing with respondents outside the team. The pilot was used to assess the clarity of the wording and intervention definitions, the adequacy of the response options, questionnaire length, routing, and the technical functioning of the online instrument. The questionnaire was revised on the basis of this process before fieldwork began.

The target sample was 2,000 respondents, with 1,500 interviews in Barcelona and 500 in the AMB, drawn using quota sampling. Quotas covered gender, education, and territorial distribution by district or municipality, while age was allowed to follow its natural distribution within each area. Fieldwork was conducted in spring 2025 by IPSOS, which applied a multilayer quality-control protocol including duplication checks, bot and script detection, respondent authentication, and response-pattern diagnostics. Fieldwork took place during the municipal term that began after the 2023 local election, rather than under the administration responsible for the main expansion of the superblock program. IPSOS reported completion rates of 53% in the Barcelona subsample and 37% in the AMB subsample, with an average interview length of 20 minutes; after quality screening, the final delivered dataset contained 2,000 validated interviews.

Participants completed a questionnaire structured around repeated intervention-specific modules. At the beginning of the questionnaire, respondents were provided with a brief definition of each intervention. Superblocks, for example, were described as areas in which several urban blocks prioritize pedestrians and cyclists while motorized traffic is redirected to surrounding streets. The definition referred to the general intervention model and did not identify a particular implementation, such as Poblenou, Sant Antoni, or the Green Axes. Respondents were subsequently asked whether they were aware of each type of intervention on their street, in their neighborhood, elsewhere in their city, or elsewhere in Barcelona. Respondents then completed parallel batteries on acceptability, perceived personal impacts, perceived effects on freedom of movement, expected public benefits, fairness, and trust in the City Council. The questionnaire also collected residential location information, together with items on participation, media exposure, emotional reactions, travel behavior, and intentions to reduce car use. Trust items followed a planned-missing design in which each respondent rated two of the four interventions.

3.2. Outcome variable

The dependent variables are the acceptability ratings for each

intervention. Respondents were asked to indicate the extent to which they agreed with the introduction of pedestrianizations, bike lanes, superblocks, and school streets in Barcelona, using a five-point response scale ranging from complete disagreement to complete agreement. Each intervention-specific item was analyzed separately as a 1–5 outcome, with higher values indicating greater support. The analysis therefore includes four parallel outcomes: acceptability of pedestrianizations, bike lanes, superblocks, and school streets.

3.3. Main explanatory variables

Car dependence is operationalized through two complementary measures. The first is car use frequency, captured as the number of days per week respondents use a car or motorcycle, ranging from 0 to 7 days. In the regression models this variable is treated as continuous. For the descriptive figures, car use frequency was grouped into four categories: no car use (0 days per week), low car use (1–2 days), medium car use (3–5 days), and high car use (6–7 days). The second measure is perceived household car need, captured through agreement with the statement that the household needs a car to carry out the basic activities of daily life. This item is reverse coded so that higher values indicate greater perceived need. In the regression models it is treated as an ordered measure, while in the descriptive figures it is grouped into low, medium, and high perceived household car need.

To examine the pathways through which car dependence may shape acceptability, two sets of intervention-specific evaluative variables were incorporated. The first captures self-interest evaluations and includes two measures: perceived personal impact and perceived freedom of movement. Perceived personal impact is based on the main five-category item asking respondents whether expanding each intervention in Barcelona would affect them "very negatively," "negatively," "positively," "very positively," or "not affect me." For the analysis, this item was recoded into a signed scale ranging from negative to positive expected impact, with "not affect me" coded as the neutral midpoint. The subsequent conditional follow-up items, which asked respondents to identify specific reasons for negative or positive expected impacts, were not used to construct the variable; they are used only to clarify the substantive meaning of the measure. These follow-up options covered issues such as parking difficulty, congestion affecting daily trips, deliveries, traffic displacement, noise, safety, quality of life, and local accessibility. Perceived freedom of movement was measured separately by asking respondents to indicate how much each intervention affects their freedom of movement, using a five-point scale ranging from "greatly reduces my freedom of movement" to "greatly increases my freedom of movement." This item was recoded so that higher values indicate greater perceived freedom loss.

The second set captures collective and distributive evaluations. Perceived public-good beliefs were derived from five intervention-specific items asking whether each transformation contributes to (1) safer public spaces, (2) more walking and cycling, (3) better air quality, (4) reduced car use, and (5) stronger social interaction and neighborhood ties. Fairness was captured through two repeated items: whether the transformations have been concentrated in certain neighborhoods and whether their impacts are distributed equitably across social groups. We refer to public-good beliefs, fairness, and trust as civic evaluations, because they capture whether respondents see the interventions as collectively beneficial, fairly distributed, and institutionally credible.

Trust in the City Council was measured with repeated intervention-specific items on whether the council acts in the public interest, is transparent and honest with citizens, distributes impacts and benefits equitably, and has the technical competence required to implement the interventions. In the analytical models, the trust measure is based on the three items capturing public interest, transparency, and technical competence, leaving aside the council fairness statement because it overlaps conceptually with the fairness block. The trust battery followed a planned-missing design in which each respondent rated only two of the four interventions. The questions referred to the City Council as an institution and did not name a particular mayor, governing coalition, or implementation period. They should therefore be interpreted as respondents' contemporaneous assessments of the Council's capacity, transparency, and public-interest orientation in relation to each intervention, rather than as evaluations of one specific municipal administration.

For modeling purposes, variables were coded so that higher values reflected more of the construct named by each variable. Perceived household car need was coded so that higher scores indicate greater need for a car in daily household activities. The personal-impact item was recoded as a signed measure of expected personal impact, with negative values indicating expected negative effects, the neutral category indicating no expected personal effect, and positive values indicating expected positive effects. This means that a positive coefficient for personal impact should be interpreted as higher acceptability among respondents who expect the intervention to affect them more positively. By contrast, the freedom-of-movement item was recoded so that higher values indicate greater perceived loss of freedom, and therefore a negative coefficient indicates lower acceptability among respondents who perceive stronger freedom loss. The public-good index was computed as the mean of the five collective-benefit items for each intervention. Geographic fairness, measured through respondents' agreement that the interventions had been concentrated in particular neighborhoods, such as more central or peripheral areas, was reverse coded so that higher values indicate a greater perception of a more even—and therefore fairer— geographic distribution. The item captures the perceived territorial distribution of the interventions rather than an explicit normative judgment by respondents about whether that distribution is fair. Social fairness, measured through agreement that the positive and negative impacts of the interventions were equitably distributed across different social groups, was coded so that higher values indicate greater perceived social fairness. The trust index was constructed as the mean of the three trust items for each intervention. The wording, construction, and coding of the main analytical variables are summarized in Supplementary Table S1.

3.4. Control variables

All models include a common set of controls: gender, age, education, income, homeownership, political ideology, and municipality of residence. Residence was coded as a binary distinction between respondents living in Barcelona and those living in the wider metropolitan area. Homeownership was derived from the tenure variable, and ideology was treated as an ordered indicator of left-right political positioning.

3.5. Analytical strategy

The analytical objective is to examine how car dependence relates to the acceptability of four street-space interventions and how this relationship changes as other relevant evaluations are introduced. We estimate a sequence of nested ordinary least squares models separately for pedestrianizations, bike lanes, superblocks, and school streets. Ordinary least squares is used because the five-point acceptability measure is treated as approximately continuous, allowing coefficients to be interpreted directly on the original response scale. Estimating separate models for each intervention allows the associations to vary across policy types and makes it possible to assess the consistency of the overall pattern.

Our first block of models focuses on self-interest pathways. Model A includes car use, perceived car need, and the full control set, and therefore establishes the baseline association between car dependence and acceptability. Model B adds perceived personal impact in order to assess whether car dependence is linked to lower support because car-dependent respondents expect the intervention to affect them negatively in practical terms. Model C instead adds perceived freedom loss,

testing whether the association is bound up with anticipated constraints on mobility and autonomy. Model D includes both self-interest variables simultaneously and provides the fullest assessment of whether the car-dependence gradient remains once these more proximate evaluative mechanisms are taken into account.

The second block introduces civic evaluations in order to determine whether support is shaped only by self-interest or also by more collective and legitimacy-related considerations. Model E adds public-good beliefs to the full self-interest specification, testing whether respondents' views about public benefits such as safety, air quality, active travel, and social interaction contribute independently to acceptability. Model F instead adds geographic and social fairness, allowing us to examine whether judgments about the territorial and social distribution of impacts matter over and above car dependence and self-interest concerns. Model G includes both public-good beliefs and fairness simultaneously, thereby assessing whether these evaluative dimensions retain explanatory power when entered together and whether they further attenuate the apparent role of car dependence.

The final stage examines the role of institutional trust. Because the trust items followed a planned-missing design, Model H adds the intervention-specific trust index and is estimated on reduced complete-case samples. This tests whether trust in the City Council remains associated with acceptability after accounting for car dependence, personal impact, freedom loss, public-good beliefs, and fairness.

All models are estimated separately for the four interventions using unstandardized coefficients and robust standard errors. The nested design allows us to assess whether car dependence operates mainly as a direct predictor of opposition, whether its effect is absorbed by perceived personal impacts and freedom loss, and whether judgments about collective benefits, fairness, and institutional trust continue to shape support independently. As a sensitivity analysis, Model G was also estimated separately for respondents living in Barcelona and those living in the wider metropolitan area. These subgroup models use the same specification as the main analysis, except that municipality of residence is omitted from the control variables. Full estimates are reported in Supplementary Table S2.

4. Results

An initial descriptive view of how car dependence relates to the acceptability of the four street-space interventions is provided in Fig. 1. Acceptability declines as respondents report more frequent car or motorcycle use. This pattern is visible across all four interventions, suggesting that car use is negatively associated with support from the outset. At the same time, the gradient is not equally strong across intervention types. School streets remain the most positively evaluated intervention across all categories of car use, and their decline is comparatively modest even among frequent car users. Pedestrianizations also retain relatively high levels of support, although acceptability decreases as car use intensifies. By contrast, bike lanes and especially superblocks display steeper gradients, with support falling more sharply among frequent car users. The relative ordering of interventions is stable across groups: school streets are consistently the most accepted, followed by pedestrianizations, then bike lanes, while superblocks receive the lowest ratings throughout.

Table 1 examines whether the negative association between car dependence and intervention acceptability remains once self-interest evaluations are introduced. In the baseline specification (Model A), more frequent car or motorcycle use is associated with significantly lower acceptability for pedestrianizations, bike lanes, and superblocks, while the coefficient for school streets is negative but not statistically significant. Perceived household car need is negatively associated with acceptability across all four interventions, with the largest coefficient observed for superblocks. The baseline models therefore confirm that both behavioral car use and perceived household car need are linked to lower support, although the strength of the relationship varies across intervention types.

Once perceived personal impact is introduced (Model B), the coefficient for car or motorcycle use becomes small and statistically insignificant in all four cases, while the coefficient for household car need is reduced substantially and loses significance for bike lanes. Personal impact is strongly and positively associated with acceptability across all interventions, with particularly large coefficients for bike lanes and superblocks. This suggests that expectations about how the intervention will affect respondents personally account for a substantial share of the initial car-dependence gradient. The increase in model fit is also marked, with R^2 rising from around 0.10 in Model A to between 0.25 and 0.48 in Model B once we incorporate the personal impact.

A similar pattern emerges when freedom loss is introduced in place of personal impact (Model C). Freedom loss is negatively and

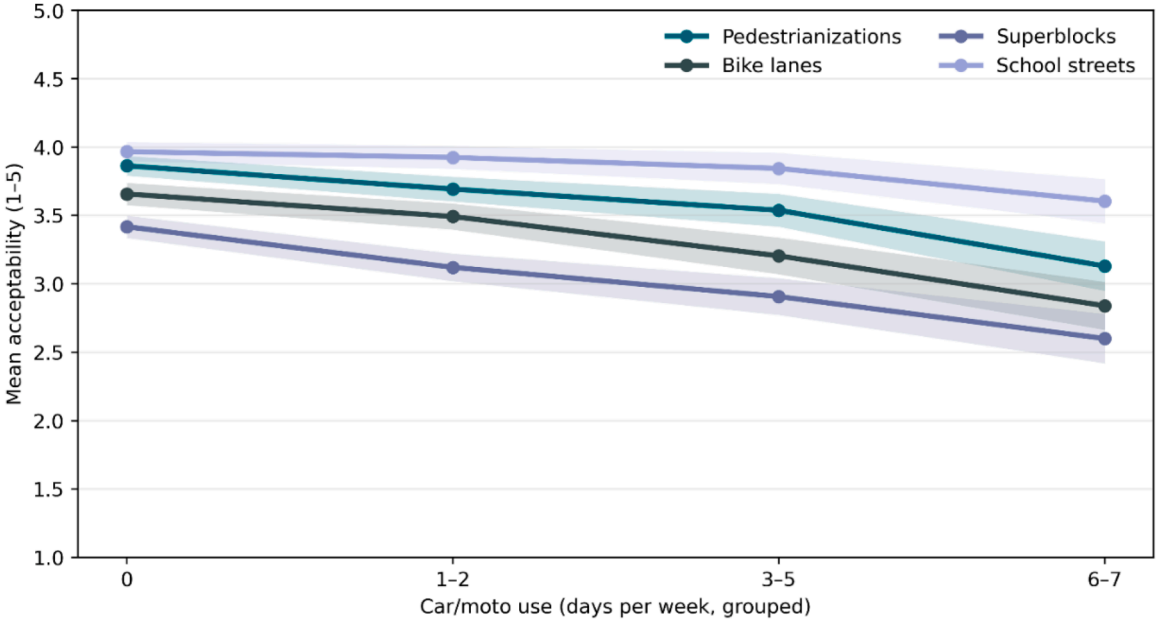

Fig. 1. Intervention self-reported acceptability by car use.

Table 1
Car dependence, self-interest evaluations, and acceptability of street interventions.

	Pedestrianizations	Bike lanes	Superblocks	School streets
Model A				
Car/moto use days/week	-0.074*** (0.016)	-0.078*** (0.016)	-0.083*** (0.017)	-0.022 (0.015)
Perceived household car need	-0.126*** (0.025)	-0.120*** (0.027)	-0.146*** (0.027)	-0.109*** (0.023)
R^2	**0.097**	**0.101**	**0.098**	**0.061**
Model B				
Car/moto use days/week	-0.013 (0.014)	-0.024 (0.013)	-0.019 (0.014)	-0.002 (0.013)
Perceived household car need	-0.061** (0.021)	-0.037 (0.021)	-0.042* (0.021)	-0.093*** (0.021)
Personal impact (signed)	0.543*** (0.023)	0.625*** (0.019)	0.653*** (0.020)	0.452*** (0.026)
R^2	**0.372**	**0.465**	**0.478**	**0.252**
Model C				
Car/moto use days/week	-0.041** (0.016)	-0.058*** (0.016)	-0.053*** (0.016)	-0.005 (0.014)
Perceived household car need	-0.088*** (0.023)	-0.086*** (0.025)	-0.099*** (0.025)	-0.107*** (0.023)
Freedom loss	-0.351*** (0.027)	-0.389*** (0.025)	-0.441*** (0.024)	-0.282*** (0.028)
R^2	**0.214**	**0.249**	**0.278**	**0.137**
Model D				
Car/moto use days/week	-0.006 (0.014)	-0.024 (0.013)	-0.016 (0.013)	0.003 (0.013)
Perceived household car need	-0.053* (0.021)	-0.035 (0.021)	-0.038 (0.020)	-0.094*** (0.021)
Personal impact (signed)	0.479*** (0.027)	0.568*** (0.023)	0.571*** (0.025)	0.401*** (0.028)
Freedom loss	-0.150*** (0.026)	-0.111*** (0.023)	-0.161*** (0.024)	-0.135*** (0.026)
R^2	**0.390**	**0.473**	**0.496**	**0.267**

Unstandardized coefficients with robust standard errors in parentheses. All models include controls for gender, age, education, ideology, income, home-ownership, and municipality of residence. All models are estimated on the same complete-case sample (N = 1,616). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

significantly associated with acceptability in all four intervention models, and its coefficient is largest for superblocks. Compared with Model A, the coefficients for both car use and household car need are attenuated, although they remain statistically significant in most cases. This indicates that perceived restrictions on freedom of movement account for part of the association between car dependence and support, but less completely than perceived personal impact alone.

Model D includes both self-interest variables simultaneously (personal impact + freedom loss). In this full specification, car or motorcycle use is no longer significantly associated with acceptability for any intervention. Household car need remains significant only for pedestrianizations and school streets, and in both cases its coefficient is notably smaller than in the baseline model. At the same time, both personal impact and freedom loss remain significant across all four interventions. Personal impact retains a strong positive association with acceptability, while freedom loss retains an independent negative association, although its coefficient is substantially reduced relative to Model C. Model fit is highest in this final specification, particularly for bike lanes and superblocks, where R^2 reaches 0.473 and 0.496, respectively.

Overall, the results indicate that the initial negative relationship between car dependence and acceptability is strongly reduced once self-interest evaluations are taken into account. As shown in Fig. 2, this attenuation is stronger when perceived personal impact is introduced than when perceived freedom loss is introduced alone: the coefficients for car dependence move closer to zero in the "impact only" specification than in the "freedom only" specification. This suggests that perceived personal impact constitutes the primary evaluative mechanism linking car dependence to opposition, while freedom-loss perceptions provide an additional but smaller explanatory contribution (Fig. 2). The attenuation is especially clear for car use frequency, whose association disappears entirely in the fully specified models. By contrast, perceived household car need shows somewhat greater persistence, particularly for school streets. Across all intervention types, perceived personal impact emerges as the strongest correlate of acceptability, while perceived freedom loss contributes additional explanatory power beyond personal impact alone.

To examine whether the attenuation of car dependence persists once civic evaluations are introduced, Table 2 presents the successive extensions of the model from the full self-interest specification to the final model including trust. The main pattern is one of progressive displacement. Once personal impact and freedom loss are accounted for (Model D), car use no longer shows an independent association with acceptability for any of the four interventions. Perceived household car need proves more persistent, but its association is limited and remains statistically significant only in some cases. By contrast, personal impact remains strongly and positively associated with acceptability throughout, while freedom loss remains negatively associated with support, although its coefficient becomes smaller as civic evaluations are added.

The introduction of public-good beliefs (Model E) substantially improves model fit across all four interventions and reveals a strong independent association with support. Social fairness is positively associated with acceptability across all four interventions, whereas geographic fairness (Model F) is generally negative and more uneven in its significance. Because higher values indicate a more even territorial distribution, the negative coefficient means that respondents who perceived interventions as less concentrated in particular neighborhoods tended to report slightly lower acceptability. This result should be interpreted cautiously, as the item captures perceptions of geographic distribution rather than respondents' explicit evaluation of whether that distribution is desirable. Finally, the full specification (Model H) reveals that acceptability is not well described as a simple matter of car dependence but is instead organized by an evaluative process in which self-interest considerations, collective-benefit beliefs, fairness judgments, and, in some cases, trust in the City Council all contribute independently. The final model reaches its highest explanatory power for superblocks, where R^2 rises to 0.600, while remaining substantial for pedestrianizations (0.485), bike lanes (0.542), and school streets (0.388).

When focusing on the full model results (Model H) in Fig. 3, we can see that across all four panels, perceived personal impact emerges as the strongest positive correlate of acceptability, while freedom loss remains negative, particularly for superblocks. Public-good beliefs and social fairness also display consistently positive associations across interventions, indicating that support depends not only on expected personal consequences but also on whether the intervention is seen as beneficial and socially just. By contrast, direct car-dependence effects are comparatively weak in the final model. Car use is effectively null throughout, while perceived household car need retains a modest negative association for pedestrianizations, bike lanes, and school streets, but not for superblocks. For its part, trust in the City Council adds a further positive association for pedestrianizations and, more clearly, for superblocks.

Finally, Fig. 4 presents the same final-model standardized beta coefficients by predictor, making it possible to compare how each explanatory dimension varies across interventions. This perspective shows, first, that the null role of car use is highly consistent, whereas perceived household car need retains a negative association for pedestrianizations, bike lanes, and school streets, but not for superblocks.

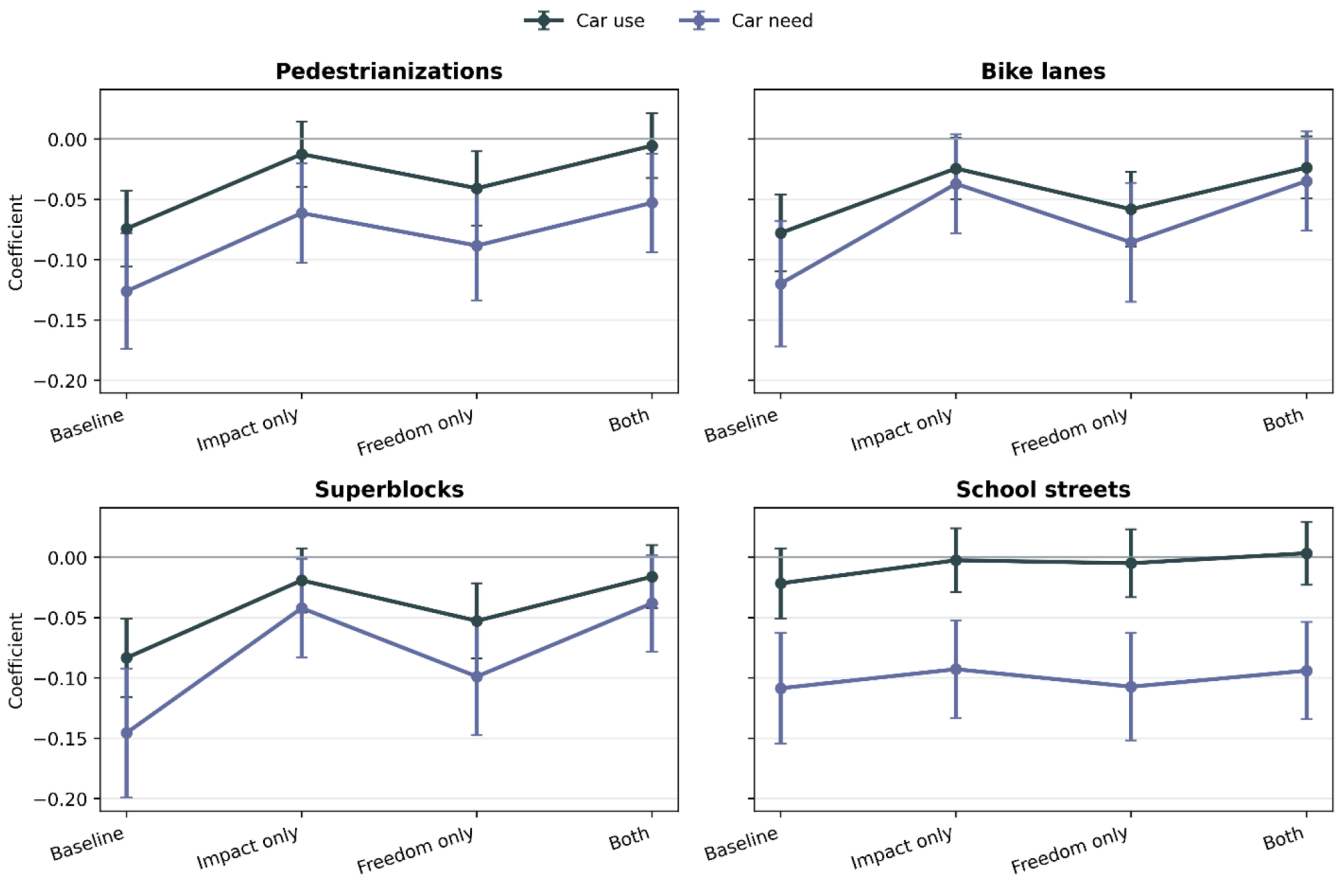

Fig. 2. Attenuation of car dependence factors.

Second, the coefficients for personal impact, public-good beliefs, and social fairness are comparatively homogeneous across interventions, confirming that these dimensions are robust correlates of support regardless of policy type. Third, freedom loss is most strongly associated with superblock acceptability, while public-good beliefs are somewhat weaker for school streets than for the other interventions. Geographic fairness is only clearly negative for school streets in the final model, and trust in the City Council is most strongly associated with support for superblocks.

5. Discussion

A central question in debates over street-space interventions has been whether opposition among drivers and car-dependent households reflects a deeper ideological attachment to automobility, or a more practical concern about how these policies will affect everyday life (Naseri et al., 2025; Schreibmüller et al., 2025). This distinction matters because different sources of opposition call for different policy responses. If resistance is rooted mainly in identity, values, or group belonging, it is unlikely to be softened by technical evidence or small design adjustments. If opposition is rooted instead in anticipated personal costs and practical burdens, then it may be more responsive to changes in implementation such as clearer communication, better access arrangements, mitigation of local disruptions, and the provision of workable alternatives.

In the case of four street interventions in Barcelona, our results point more strongly toward the latter explanation. Car users and households that report needing a car are initially less supportive of pedestrianizations, bike lanes, superblocks, and school streets. However, the association with car use frequency disappears once anticipated personal impacts and perceived losses of freedom of movement are taken into account, while perceived household car need remains more persistent in some cases. This suggests that frequent driving alone is insufficient to explain opposition. What matters more is whether people feel dependent on the car and how they expect the intervention to affect their daily life and freedom of movement. At the same time, public-good beliefs and social fairness remain strongly associated with acceptability, showing that support is not reducible to expected personal consequences. Our results therefore point more strongly to concerns about disruption, inconvenience, and limited alternatives than to a simple identity-based defense of automobility, although the cross-sectional design does not allow us to separate practical dependence fully from political identity or attachment to the car.

This pattern is consistent with a growing literature showing that car use and car ownership often lose explanatory power once policy-specific evaluations are introduced. Studies of parking policy, low-emission zones, and congestion pricing have found that the initial role of car use or ownership weakens substantially once fairness, effectiveness, expected impacts, or problem perceptions are included in the model (Baumgartner et al., 2025; Oltra et al., 2021; Zhang et al., 2023). Our results extend this pattern to four types of street-space interventions examined within the same survey design. Across all four cases, car use frequency is largely absorbed once self-interest evaluations are controlled for. Perceived household car need, however, is more persistent. This distinction is important, as a person may use a car frequently without seeing it as indispensable; by contrast, respondents who feel that the household needs a car for the basic activities of daily life appear harder to move through personal impact, freedom, fairness, or trust alone. The acceptability-relevant divide is therefore between those who feel locked into car dependence and those who perceive more room to adapt.

According to our results, self-interest evaluations are the central

Table 2
Civic evaluations, trust, and acceptability of street interventions.

	Pedestrianizations	Bike lanes	Superblocks	School streets
Full self-interest (Model D)				
Car/moto use days/week	-0.006 (0.014)	-0.024 (0.013)	-0.016 (0.013)	0.003 (0.013)
Perceived household car need	-0.053* (0.021)	-0.035 (0.021)	-0.038 (0.020)	-0.094*** (0.021)
Personal impact (signed)	0.479*** (0.027)	0.568*** (0.023)	0.571*** (0.025)	0.401*** (0.028)
Freedom loss	-0.150*** (0.026)	-0.111*** (0.023)	-0.161*** (0.024)	-0.135*** (0.026)
R^2	0.390	0.473	0.496	0.267
Public good (Model E)				
Car/moto use days/week	-0.003 (0.013)	-0.011 (0.012)	-0.009 (0.012)	0.014 (0.012)
Perceived household car need	-0.039* (0.020)	-0.027 (0.020)	-0.032 (0.018)	-0.077*** (0.020)
Personal impact (signed)	0.319*** (0.029)	0.409*** (0.027)	0.382*** (0.028)	0.268*** (0.028)
Freedom loss	-0.076** (0.024)	-0.053* (0.022)	-0.070** (0.022)	-0.043 (0.025)
Public-good beliefs	0.405*** (0.034)	0.388*** (0.033)	0.472*** (0.032)	0.410*** (0.034)
R^2	0.459	0.529	0.571	0.354
Fairness only (Model F)				
Car/moto use days/week	-0.007 (0.013)	-0.019 (0.013)	-0.020 (0.013)	0.009 (0.013)
Perceived household car need	-0.049* (0.020)	-0.033 (0.020)	-0.031 (0.020)	-0.088*** (0.020)
Personal impact (signed)	0.417*** (0.027)	0.503*** (0.024)	0.512*** (0.026)	0.343*** (0.027)
Freedom loss	-0.128*** (0.025)	-0.086*** (0.022)	-0.148*** (0.023)	-0.110*** (0.024)
Geographic fairness	-0.080*** (0.023)	-0.045* (0.021)	-0.098*** (0.023)	-0.068** (0.021)
Social fairness	0.201*** (0.023)	0.208*** (0.023)	0.162*** (0.025)	0.220*** (0.023)
R^2	0.440	0.512	0.526	0.331
Public good + Fairness (Model G)				
Car/moto use days/week	-0.004 (0.012)	-0.010 (0.012)	-0.012 (0.012)	0.016 (0.012)
Perceived household car need	-0.039* (0.019)	-0.026 (0.020)	-0.028 (0.018)	-0.076*** (0.020)
Personal impact (signed)	0.303*** (0.029)	0.392*** (0.027)	0.366*** (0.028)	0.251*** (0.027)
Freedom loss	-0.074** (0.024)	-0.046* (0.021)	-0.071*** (0.022)	-0.042 (0.024)
Public-good beliefs	0.334*** (0.035)	0.321*** (0.034)	0.422*** (0.033)	0.336*** (0.035)
Geographic fairness	-0.059** (0.022)	-0.017 (0.021)	-0.063** (0.021)	-0.049* (0.020)
Social fairness	0.143*** (0.023)	0.151*** (0.023)	0.098*** (0.024)	0.157*** (0.022)
R^2	0.483	0.546	0.581	0.384
Full model + Trust (Model H)				
Car/moto use days/week	0.011 (0.017)	-0.004 (0.017)	-0.022 (0.017)	0.027 (0.016)
Perceived household car need	-0.067* (0.028)	-0.054* (0.027)	-0.005 (0.024)	-0.064* (0.026)
Personal impact (signed)	0.314*** (0.040)	0.326*** (0.037)	0.282*** (0.041)	0.253*** (0.038)
Freedom loss	-0.052 (0.034)	-0.059* (0.029)	-0.110*** (0.030)	-0.082* (0.032)
Public-good beliefs	0.332*** (0.048)	0.345*** (0.054)	0.389*** (0.047)	0.208*** (0.048)
Geographic fairness	-0.039 (0.030)	0.010 (0.029)	-0.025 (0.028)	-0.083** (0.028)
Social fairness	0.083** (0.032)	0.141*** (0.034)	0.113*** (0.033)	0.164*** (0.030)
Trust in City Council	0.090* (0.035)	0.047 (0.042)	0.153*** (0.036)	0.063 (0.035)
R^2	0.485	0.542	0.600	0.388

Nested OLS models of acceptability across four street-space interventions. Controls for gender, age, education, ideology, income, homeownership, and municipality of residence are included in all models.
Model D includes the full self-interest specification (car use, perceived household car need, personal impact, and freedom loss). Model E adds perceived public-good beliefs.
Model F adds fairness evaluations (geographic and social).
Model G includes both public-good beliefs and fairness.
Model H is estimated on reduced intervention-specific samples because of the planned-missing trust design.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

mechanism through which car dependence is translated into acceptability. Perceived personal impact is the strongest and most consistent predictor of acceptability across the models, while perceived freedom loss retains an additional negative role in most specifications. Respondents oppose street interventions when they expect them to make daily life harder, less flexible, or less manageable. This interpretation also links opposition to household-level constraints. This aligns with work distinguishing general car users from those whose daily mobility is more strictly dependent on the car, and suggests that perceived necessity may be more politically durable than travel frequency alone (Roukouni & Cats, 2025; Schreibmüller et al., 2025).

At the same time, our results clearly show that acceptability is not reducible to individual self-interest. Even among respondents for whom car dependence and expected personal burdens matter, support remains strongly associated with civic evaluations. Public-good beliefs remain positive across all four interventions, and social fairness is consistently associated with higher acceptability. This indicates that respondents do not evaluate street interventions only through the question of whether they personally gain or lose. They also assess whether these interventions produce collective benefits and whether those benefits or burdens are distributed fairly. In this respect, our findings extend the broader acceptability literature, which has repeatedly identified fairness and effectiveness as sources of support for other kinds of transport policy (Bergquist et al., 2022; Drews & Ahrend, 2025; Helferich & Tröger, 2026), by showing that these considerations remain relevant even after accounting for car dependence, anticipated personal impacts, and perceived freedom loss.

Interestingly, our results point to a more uneven role for geographic fairness. The negative association should not be interpreted as evidence that respondents prefer geographically unfair implementation. Perceived concentration may also reflect greater familiarity with interventions, recognition that they have been targeted toward particular areas, or support for concentrating changes where they are considered most necessary. Unlike carbon taxes, fuel prices, or other non-spatial policy instruments, street interventions materialize in specific places. They can therefore be interpreted as favoring some neighborhoods over

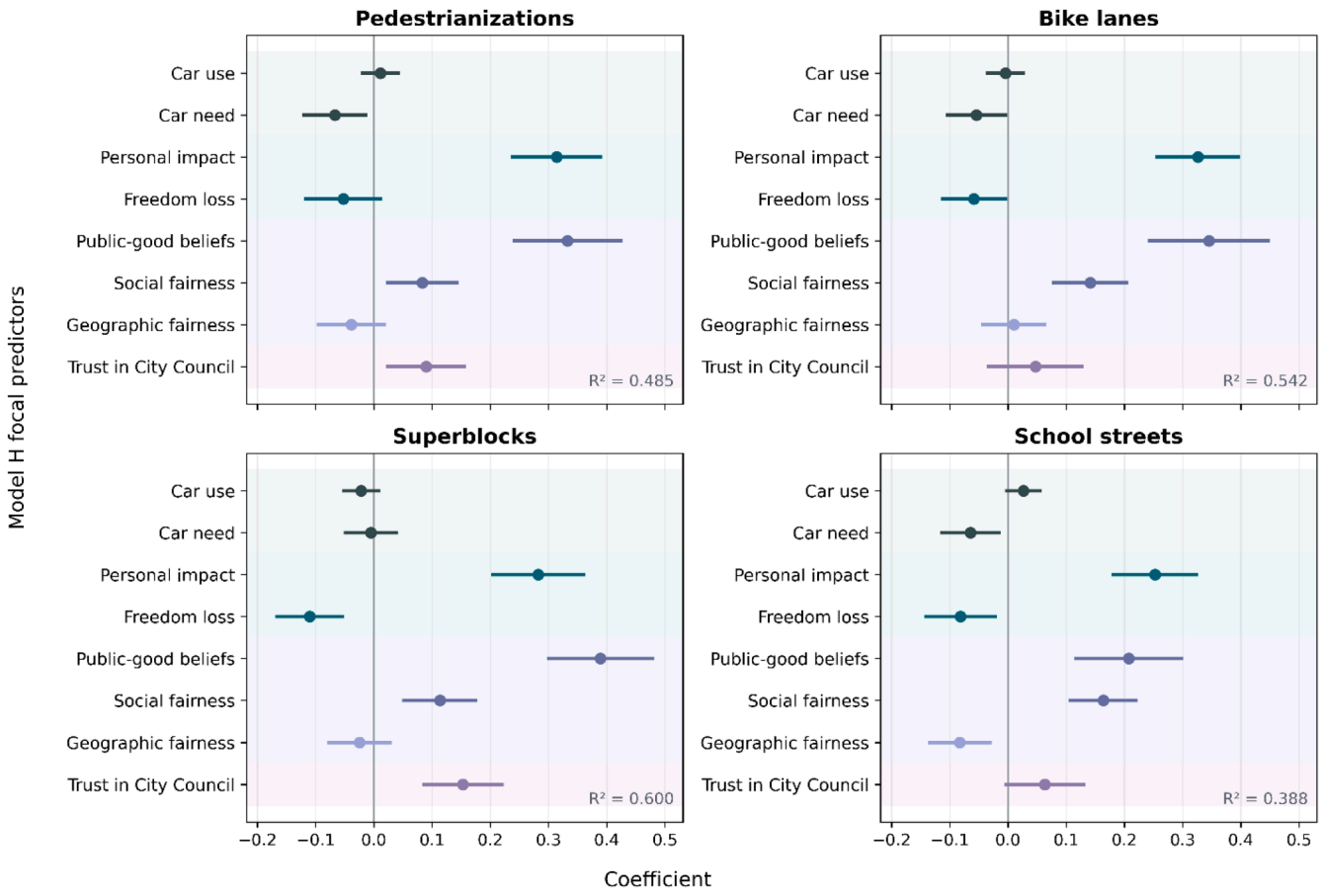

Fig. 3. Model H coefficients by intervention.

others, concentrating burdens in particular areas, or reinforcing core-periphery tensions (Haarstad & Yazar, 2025; Schultheiss et al., 2024; Verlinghieri et al., 2025). The territorial politics of street-space reallocation should therefore receive more attention in future acceptability research, particularly in cities where urban transformations are unevenly distributed or symbolically associated with specific districts (Anguelovski et al., 2023; Nello-Deakin, 2024).

The comparison across types of interventions reinforces this interpretation. Across pedestrianizations, bike lanes, superblocks, and school streets, the overall structure of support is stable: acceptability is consistently organized around personal impact, freedom loss, public-good beliefs, and social fairness. Yet the strength of each determinant varies by policy type. Acceptability of superblocks is most strongly associated with freedom loss and institutional trust, suggesting that this intervention is especially vulnerable to concerns about constrained mobility and particularly tied to municipal credibility. This is consistent with research linking superblocks to governance disputes, political trust, and electoral conflict in Barcelona (Fernández Núñez et al., 2025; Marken et al., 2026; Marquet, Fernández-Núñez, et al., 2024). School streets, by contrast, show the weakest direct role for car use but a more persistent role for perceived household car need. This pattern points to a household dimension of acceptability that is not fully captured by individual travel behavior. As suggested by Pritchett et al. (2024) and Timmons et al. (2023), opposition to street interventions can be linked to the resilience of household travel routines, mobility-of-care responsibilities, and unequal access to travel resources within households. This may help explain why some studies find greater resistance among groups with care responsibilities, children, or more constrained travel capabilities (Mouratidis, 2026; Naseri et al., 2026). In the case of protected school streets, this interpretation is particularly relevant because the intervention is normatively framed around child safety and play, while its perceived burdens are often expressed through escorting, parking, congestion, and access concerns. These differences also point to distinct implementation challenges. For superblocks, the comparatively strong associations with perceived freedom loss and trust in the City Council suggest that access arrangements, traffic circulation, and confidence in the implementing authority are particularly important to how the intervention is received. School streets, by contrast, remain relatively well supported even among frequent car users, perhaps because child safety is a widely shared objective. Yet the persistent association with perceived household car need indicates that access, school escorting, and other care-related trips still need to be considered in their design.

Pedestrianizations, bike lanes, superblocks, and school streets all reallocate urban space, but they do not carry the same symbolic meaning or trigger the same practical concerns. Nor does each category necessarily refer to a single uniform design. In Barcelona, the superblock program has evolved through successive versions that have differed in their physical form and scale, but also in their participatory processes, political framing, institutional support, and implementation strategy. Recent work has described this trajectory as both a process of conceptual iteration and an "unfinished policy paradigm shift" (De Boeck, Acker, et al., 2026; De Boeck, Honey-Rosés, et al., 2026). Future acceptability research should therefore pay closer attention to policy morphology: what kind of space is being reallocated, what public good is being created, whose routines are disrupted, and which institution is visibly responsible for implementation. This is especially important for superblocks in Barcelona. Public justification for superblocks has often relied on climate emergency, public health, and social justice arguments (Amorim-Maia et al., 2024; Zografos et al., 2020), yet our findings suggest that residents often evaluate street interventions through anticipated burdens and effects on everyday routines. Part of the

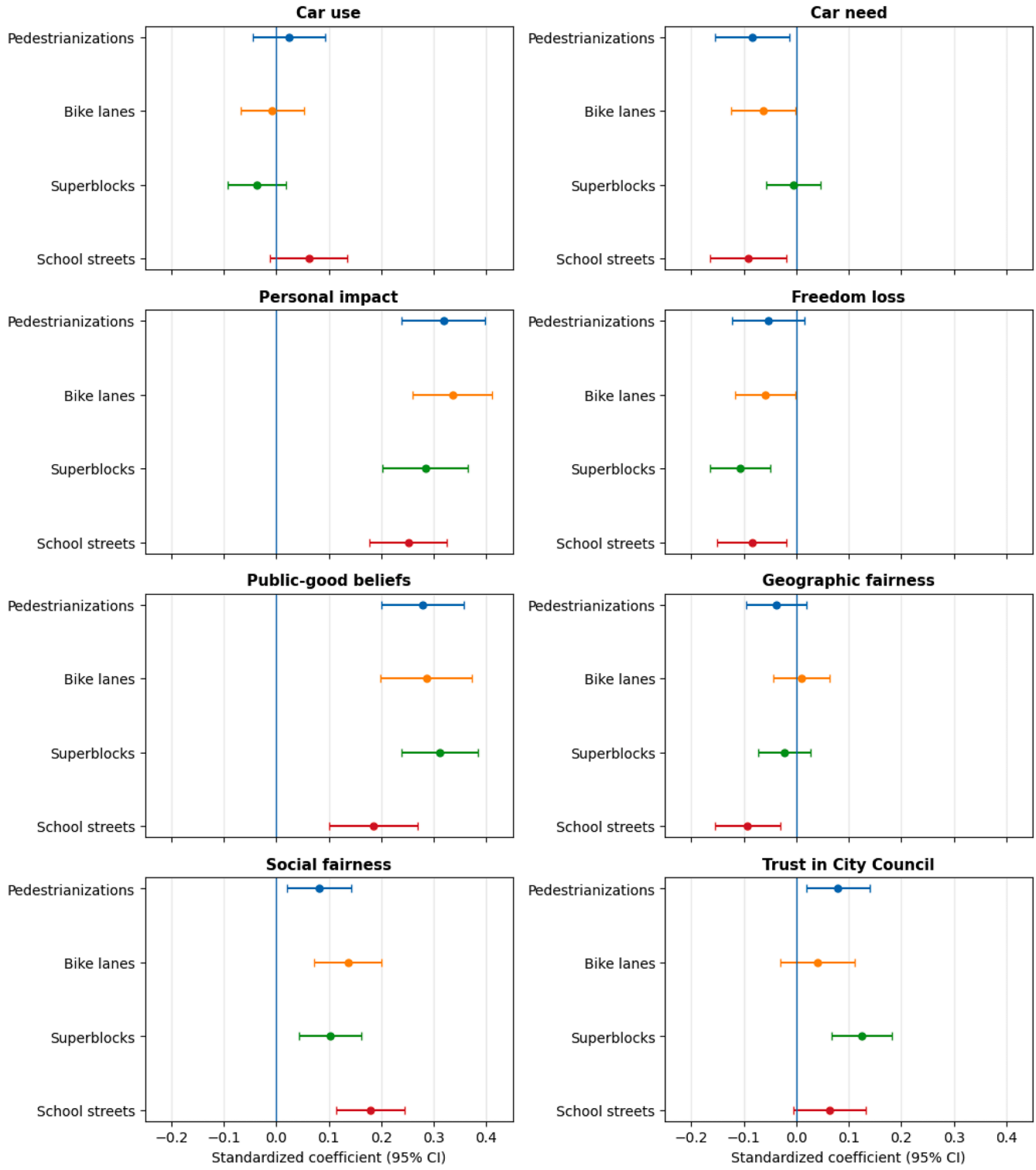

Fig. 4. Model H coefficients by predictor.

backlash may therefore reflect a mismatch between the justificatory frame of the policy and the practical lens through which many affected residents understand its consequences. This interpretation is consistent with qualitative accounts showing that climate, health, and social-justice frames often encountered resident concerns about commuting, access, deliveries, parking, and the organization of daily life (Morales-López & Floyd, 2025).

The policy implication is that we should not treat opposition as a monolithic anti-environmental bloc, but neither should it be dismissed as mere misunderstanding. If car dependence operates mainly through anticipated burdens and perceived loss of convenience, then communication and implementation strategies need to engage directly with practical concerns: access, deliveries, parking, escorting, traffic displacement, and the organization of daily trips. The relatively strong model fit for bike lanes and superblocks also suggests that acceptability is structured around a compact set of judgments about the interventions, which are potentially more actionable than broad ideological orientations. At the same time, the persistence of public-good beliefs and social

fairness shows that support is not driven only by individual self-interest. Making collective benefits visible, early, and credible remains essential when interventions are contested. The selective role of trust also suggests that legitimacy-building should be tailored to the political profile of each intervention. Where projects become emblematic of a municipal agenda, as with superblocks, institutional credibility may matter even more (De Boeck, Acker, et al., 2026).

Our findings should also be interpreted in light of Barcelona's mobility context. Barcelona is a dense and compact city with an extensive public transport network and a wide range of active travel options. Perceived freedom loss may therefore operate differently in more car-oriented settings, particularly in many North American cities, where everyday activities are often more difficult to carry out without a private vehicle and car use is more deeply embedded in daily life and mobility culture. We would expect the general association between perceived mobility constraints and lower acceptability to appear in other contexts, but its strength and meaning may differ. Where car dependence is more structural and alternatives are limited, perceived freedom loss may reflect practical necessity more strongly. In contexts with greater modal choice, it may be more closely linked to political identity, institutional trust, or broader views of public intervention. Comparative research is therefore needed to examine how these relationships vary across mobility systems and cultures of automobility.

Several limitations should also be acknowledged. First, the cross-sectional design prevents us from determining whether car-dependent lifestyles generate the evaluative patterns observed here, or whether deeper ideological orientations help produce both car dependence and lower support. Longitudinal or panel designs would be especially useful for examining whether practical dependence gradually hardens into ideological defense, or whether ideological commitments shape interpretations of burden from the beginning. Because the trust questions did not specify a particular municipal administration, respondents may have drawn on experiences associated with different governments and phases of implementation. The trust measure therefore captures a general assessment of the City Council at the time of the survey, informed potentially by both current and earlier experiences. Barcelona is a distinctive case: the superblock debate has been unusually visible, politically charged, and symbolically tied to a broader municipal agenda. In addition, although respondents were given a common definition of superblocks, they were not asked to evaluate a specific implementation. Their responses may therefore have been informed by different projects and phases of the program, including Poblenou, Sant Antoni, or the later Green Axes. The results should consequently be interpreted as attitudes toward the general idea of superblocks rather than toward one uniform design or implementation process. Even so, the consistency of the patterns across four interventions suggests that the argument travels beyond a single policy. Future work should examine whether similar mechanisms appear in other cities and should pay particular attention to school streets, where moral salience and practical household necessity appear to coexist in unusually complex ways.

6. Conclusions

Our analysis examined whether car dependence shapes the acceptability of street-space interventions directly, or whether its role is mediated through more specific evaluations of personal burden, freedom, public benefit, fairness, and trust. Using the ATRAPA-BCN survey, we compared support for pedestrianizations, bike lanes, superblocks, and school streets in Barcelona. The results show a consistent initial car-dependence gradient: respondents who use the car more often, and especially those who report greater household car need, are less supportive of these interventions. However, driving frequency alone does not explain this association. Once self-interest evaluations are introduced, car use no longer retains an independent association with acceptability, while perceived household car need remains more persistent, although only for some interventions. The results therefore suggest that the role of car dependence lies less in driving frequency itself than in perceived household need, expected personal impacts, and perceived losses of freedom. At the same time, we find that acceptability is not reducible to pure self-interest. Public-good beliefs and social fairness remain consistently associated with support, while trust in the City Council matters selectively, especially for superblocks.

These findings allow us to move beyond a binary distinction between "drivers" and "supporters of sustainable mobility." They show that support for street-space transformation is better understood as a layered evaluative process in which practical burdens, perceived freedom, collective benefits, fairness, and institutional credibility are weighed together. For policymakers, this means that opposition should not be treated simply as anti-environmentalism or identity-based resistance. Building support for street interventions requires addressing concrete concerns about everyday mobility while also making the public benefits and fairness of the transformation visible and credible.

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CRediT authorship contribution statement

Monika Maciejewska: Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Oriol Roig-Costa:** Writing – review & editing, Methodology, Investigation. **Filippo Tassinari:** Writing – review & editing, Methodology, Investigation. **Oriol Marquet:** Writing – review & editing, Validation, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.urbmob.2026.100270.

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