

Gendered Transport Inequalities and Adaptive Preferences in Rural Spain: Public Transport and Subjective Well-Being

Gloria Alarcón-García¹, Laura Lopez-Gomez², Jose Manuel Mayor Balsas³ and Patricia Reus⁴

Abstract

This article examines gender inequalities in public transport access and valuation in Spain, focusing on the compounded vulnerabilities of rural women in high-poverty contexts. Integrating transport geography, feminist economics, and the capabilities approach, we challenge traditional, market-driven planning paradigms based on revealed demand. Empirically, the study demonstrates a "dual disconnection" operating through distinct territorial and perceptual mechanisms. Econometric modeling reveals that rural residence is the dominant predictor of reduced objective transport access absorbing gender-specific variations due to the severity of baseline geographic deprivation. Conversely, subjective valuation is highly gendered: women attribute significantly higher importance to public transport than men. Crucially, this positive gender effect is systematically attenuated in regions with high rates of poverty or social exclusion (AROPE). This negative interaction provides robust empirical evidence of adaptive preferences, wherein prolonged underinvestment causes vulnerable rural women to lower their expectations and adjust their perceived needs to a restricted horizon of possibilities. We argue for a paradigm shift from demand-responsive metrics toward a capabilities-based framework that establishes minimum mobility standards, incorporates care-oriented mobility into transit design, and utilizes targeted affordability interventions to safeguard spatial justice and substantive citizenship.

Keywords: Spatial Justice; Transport Disadvantage; Adaptive Preferences; Gender-Responsive Planning; Rural Mobility; Care Economy.

JEL Classification:R41, B54, R58, I31.

1. Introduction

Public transport has ceased to be regarded in the specialist literature as a mere technical service designed to facilitate movement, and has come to be understood as an essential infrastructure for well-being and social inclusion. From this perspective, its importance lies not only in enabling the physical movement of people, but in making possible effective access to employment, education, healthcare, care work, social relationships, and community participation (Lucas, 2012; Martens, 2017; Pereira et al., 2017; Vecchio & Martens, 2021). Consequently, the absence or inadequacy of public transport constitutes a structural constraint that limits individuals' real opportunities and reduces their capacity to develop life projects under conditions of autonomy and dignity.

¹ Univesity of Murcia, Spain

² University of Murcia, Spain

³ University of Murcia, Spain

⁴ Technical University of Cartagena, Spain

This interpretation is particularly relevant in rural areas, where low population density, territorial dispersion, and the concentration of services in regional centres increase dependence on mobility infrastructure. In these contexts, the lack of public transport implies not merely greater difficulties in travelling, but may translate into territorial exclusion, social isolation, and severe limitations in accessing essential services (Church et al., 2000; Farrington & Farrington, 2005). The Spanish Ministry of Agriculture, Fisheries and Food (MAPA, 2021) explicitly notes that public transport is one of the areas most negatively assessed by rural women in Spain, owing to its impact on access to employment, healthcare, education, and social participation.

The descriptive findings of the present study confirm and deepen this diagnosis. Public transport emerges as the infrastructure most poorly rated by residents of rural Spanish municipalities, with a mean score of 5.10 out of 10, considerably below the national average of 6.44. The situation is even more critical among rural women with dependants in their care, who assign public transport a mean score of 4.64. At the same time, these same women attribute greater importance to public transport than their male rural counterparts, which demonstrates that mobility constitutes for them a particularly pressing everyday necessity.

Explaining this finding requires the incorporation of a gender perspective. A substantial body of research has demonstrated that women and men exhibit different mobility patterns as a result of the persistent sexual division of labour and the unequal distribution of domestic and care responsibilities. Whereas male travel patterns have traditionally been associated with paid employment and more direct, linear journeys, female mobility is characterised by trip-chaining, multiple stops, and a strong connection to accompanying activities, shopping, administrative tasks, and the care of children, older people, and dependants (Hanson, 2010; Sánchez de Madariaga, 2004). This "care mobility" requires more flexible, accessible, safe, and affordable transport systems, as well as adequate public spaces for walking, waiting, and travelling with others.

From the perspective of feminist economics, these differences are not interpreted as mere individual preferences, but as the outcome of the social organisation of care. Collective well-being depends on a vast amount of unpaid work that continues to be performed predominantly by women. When public infrastructure is insufficient, the temporal, physical, and emotional cost of sustaining everyday life is displaced onto households and, within them, onto women (Borderías & Carrasco, 1994; Himmelweit, 2005; Gornick & Meyers, 2009). In this sense, public transport must be understood as a genuine care infrastructure, in that it enables children to be taken to school, dependants to be accompanied to healthcare facilities, shopping to be carried out, and family and community networks to be maintained.

The report by the European Institute for Gender Equality, *Well-being and Gender Equality: The Role of Infrastructure* (2020), provides a particularly robust empirical basis for this interpretation. The study demonstrates that European women consistently attribute greater importance than men to public transport, childcare centres, facilities for older people, public lighting, and pedestrian spaces, and that these infrastructures are closely linked to fundamental capabilities such as employment, education, health, and social relationships. The report concludes that public investment in infrastructure is not gender-neutral, but directly influences the distribution of time, economic autonomy, and the well-being of both women and men.

2. Theoretical Framework: Mobility, Care, and Quality of Life Among Rural Women

The study of rural women's quality of life requires attention to a series of structural factors that transcend the traditional approach focused exclusively on economic or health indicators. Among these factors, mobility occupies a central place, particularly when analysed from a feminist perspective that integrates the economics of care. In this regard, data obtained from a survey conducted in April 2024 within the framework of the research project "Infrastructures for Everyday Life from the Feminist Economics of Well-being" clearly reveal the value that caregivers place on street quality, and that public transport is one of the aspects most poorly rated by women residing in rural municipalities with fewer than 5,000 inhabitants. Indeed, with a mean score of 5.23, this rating is notably lower than in urban contexts, where it reaches or even exceeds 8 points.

The situation is further aggravated when considering the views of women with dependants in their care, who rate public transport with a mean score of only 4.64. By contrast, other areas of everyday life receive considerably higher ratings: education received scores 8.77; personal relationships, 8.58; paid work, 7.58; and physical and mental health, 7.56. This marked contrast reveals that public transport not only constitutes a deficient service, but directly affects the autonomy and quality of life of rural women. This is not a new reality. The Diagnosis of Gender Equality in Rural Areas (MAPA, 2021) notes that public transport is one of the areas most negatively assessed by rural women, owing to its impact on everyday mobility, access to employment, education, healthcare, and sociopolitical participation. Low frequency, limited coverage, and the lack of connections between municipalities generate a structural dependence on private vehicles. Many women, however, do not hold a driving licence or have regular access to a vehicle, for economic reasons or due to inequalities in the intrafamilial distribution of mobility resources (MAPA, 2021, p. 103).

This context is further compounded by the burden of care work. It is predominantly women who assume responsibility for accompanying children, older people, and dependants (MAPA, 2021, p. 41), which entails constant and complex mobility demands. The absence of an adequate transport system therefore imposes an additional burden that reinforces traditional gender roles, limits employment opportunities, and restricts access to essential services.

Furthermore, the same MAPA report (2021) highlights that nearly two-thirds of the employed rural population do not need to travel to work, which suggests that the main mobility deficiencies are not necessarily linked to employment, but rather to the reproductive sphere: care, leisure, and community participation. Even so, women show higher rates of commuting to other rural municipalities (4.8 percentage points more than men) and to urban areas (1.6 percentage points more), and are overrepresented in public transport use, with a representation index of 2.3. This greater dependence is directly related to lower availability of private vehicles or driving licences, which translates into a structural inequality in access to mobility and, consequently, to employment and social opportunities.

Moreover, although some indicators point to a narrowing of gender gaps in transport use since 2011 (MARM, 2011), walking remains a predominantly female mode of mobility.

This form of travel persists even in contexts where women must cover greater distances to reach their workplaces, suggesting that female mobility continues to be shaped by precarity and a lack of autonomy.

All these data reflect the persistence of an unequal assignment of gender roles and stereotypes that condition the mobility patterns of rural women. It is particularly telling that the 2021 Diagnosis of Gender Equality in Rural Areas analyses mobility exclusively through the lens of employment, without addressing the specific characteristics of care mobility — an omission that limits the understanding of structural inequalities in everyday mobility.

Care mobility, as authors such as Sánchez de Madariaga (2004) and Gutiérrez Resa (2018, 2020) have noted, is distinguished from productive mobility by its multifunctional, fragmented, and unpredictable character. These are not linear, regular journeys, but trips that combine diverse tasks such as accompanying dependants, running errands, shopping, or attending health centres. This form of mobility is deeply connected to reproductive work and has consequently been historically rendered invisible in transport and urban planning policies — and, as evidenced in these very pages, continues to be so even in studies on gender equality.

One of the central features of care mobility is its irregular temporality. Journeys must adapt to unforeseen circumstances and the needs of others, which demands great flexibility and time availability, typically assumed by women (Gutiérrez Resa, 2018). Moreover, care mobility tends to take place in the immediate surroundings or in nearby municipalities, reinforcing dependence on public transport or non-motorised modes such as walking — particularly in rural contexts where, as noted above, access to private vehicles is already unequal for women and men.

Care mobility also carries an additional physical and emotional dimension. Travelling with children, older people, or dependants transforms the journey into an extension of care work itself, increasing its demands and amplifying the negative effects of its invisibility within traditional technical frameworks of mobility analysis (Gutiérrez Resa, 2018).

Accordingly, the precariousness of public transport in rural areas — or deficiencies in the public realm (maintenance, lighting, rest furniture, shade, etc.) — must be understood not merely as an infrastructural shortcoming, but as a structural element of gender inequality. Incorporating the analysis of care mobility from a feminist and territorial perspective makes it possible not only to identify the obstacles faced by rural women, but also to propose comprehensive solutions that improve their quality of life, their autonomy, and their full participation in all spheres of society.

3. Literature Review

Public transport has ceased to be regarded in the specialist literature as a mere technical service designed to facilitate movement, and has come to be understood as an essential infrastructure for well-being and social inclusion. From this perspective, its importance lies not only in enabling the physical movement of people, but in making possible effective access to employment, education, healthcare, care work, social relationships, and community participation. Consequently, the absence or inadequacy of public

transport constitutes a structural constraint that limits individuals' real opportunities and reduces their capacity to develop life projects under conditions of autonomy and dignity (Lucas, 2012; Martens, 2017; Pereira et al., 2017; Vecchio & Martens, 2021). This perspective is particularly relevant in rural areas, where low population density, territorial dispersion, and the concentration of services in regional centres increase dependence on mobility infrastructure. In these contexts, the lack of public transport implies not merely greater difficulties in travelling, but may translate into territorial exclusion, social isolation, and severe limitations in accessing essential services. The literature on transport disadvantage has demonstrated that these deficiencies disproportionately affect people with fewer economic resources, older people, immigrant populations, and women, by restricting their access to educational, employment, and social opportunities (Church et al., 2000; Farrington & Farrington, 2005; Lucas, 2012).

The descriptive findings of this study are fully situated within this interpretive framework. Public transport emerges as the infrastructure most poorly rated by residents of rural Spanish municipalities, with a mean score of 5.10 out of 10, well below the national average of 6.44. Among rural women with dependants in their care, the rating falls to 4.64, highlighting the intensity of mobility restrictions in households where care needs are greatest. At the same time, these same women attribute greater importance to public transport than their male rural counterparts, demonstrating that mobility constitutes for them a particularly critical everyday necessity.

Explaining this finding requires the incorporation of a gender perspective. A substantial body of research has demonstrated that women and men exhibit different mobility patterns as a result of the persistent sexual division of labour and the unequal distribution of domestic and care responsibilities. Whereas male travel patterns have traditionally been associated with paid employment and more direct, linear journeys, female mobility is characterised by trip-chaining, multiple stops, and a strong connection to accompanying activities, shopping, administrative tasks, and the care of children, older people, and dependants (Hanson, 2010; Sánchez de Madariaga, 2004). This so-called "care mobility" requires more flexible, accessible, safe, and affordable transport systems, as well as adequate public spaces for walking, waiting, and travelling with others.

From the perspective of feminist economics, these differences are not interpreted as individual preferences, but as the outcome of the social organisation of care. Collective well-being depends on a vast amount of unpaid work that continues to be performed predominantly by women. When public infrastructure is insufficient, the temporal, physical, and emotional cost of sustaining everyday life is displaced onto households and, within them, onto women (Borderías & Carrasco, 1994; Himmelweit, 2005; Gornick & Meyers, 2009). In this sense, public transport must be understood as a genuine care infrastructure, in that it enables children to be taken to school, dependants to be accompanied to healthcare facilities, shopping to be carried out, and family and community networks to be maintained.

The European Institute for Gender Equality report on well-being and infrastructure (2020a) provides decisive empirical evidence in this direction. The study demonstrates that European women consistently attribute greater importance than men to public transport, childcare centres, facilities for older people, public lighting, and pedestrian spaces, and that these infrastructures are closely linked to fundamental capabilities such as employment, education, health, and social relationships. The report concludes that

public investment in infrastructure is not gender-neutral, but directly influences the distribution of time, economic autonomy, and the well-being of both women and men. The capabilities approach provides the normative foundation for integrating these contributions. According to Amartya Sen (1999) and Martha Nussbaum (2000), well-being must be evaluated in terms of people's real freedoms to be and do what they value. Material resources alone do not guarantee such freedoms; their conversion into effective opportunities depends on personal, social, and institutional factors. Public infrastructures constitute precisely such essential conversion factors, since they determine whether people can access services, maintain social relationships, pursue paid employment, or exercise the right to give and receive care. In the case of rural women, the lack of public transport simultaneously constrains capabilities related to paid work, health, education, social participation, and personal autonomy.

The literature on transport justice broadens this perspective by challenging planning based exclusively on observed demand. Karel Martens (2017) argues that transport systems should be designed in accordance with principles of distributive justice, prioritising those who face the greatest restrictions in accessing essential opportunities. Similarly, Pereira et al. (2017) contend that the evaluation of transport policies must explicitly incorporate equity criteria and not be limited to indicators of economic efficiency. This perspective is particularly pertinent in rural areas, where low levels of public transport use may reflect not an absence of need, but rather an insufficient or inadequate supply.

This question leads directly to the concept of adaptive preferences. According to Sen (1999) and Nussbaum (2000), individuals who have been subjected to deprivation over extended periods may adjust their expectations to what they consider attainable, thereby reducing the importance they attribute to goods and services they objectively need. Applied to public transport, this framework suggests that prolonged exposure to scarce, infrequent, or non-existent services may lead people to stop expecting effective solutions and to moderate their subjective valuations accordingly.

The econometric findings of the present study provide evidence consistent with this mechanism. The second model shows that women attribute, on average, greater importance to public transport than men. However, this positive effect decreases significantly as the regional AROPE rate — an indicator of risk of poverty and social exclusion — increases. In other words, women continue to regard public transport as more important than men do, but this difference attenuates in the most socioeconomically disadvantaged contexts. This evidence suggests that simultaneous exposure to poverty, exclusion, and service scarcity may generate a process of expectation adaptation that weakens the expressed valuation of an infrastructure that remains essential to everyday life.

This finding makes it possible to formulate the principal conceptual contribution of the article: the existence of a double disconnection that affects rural women in particular. The first is a territorial disconnection, stemming from the objectively insufficient provision of public transport in rural areas. The second is a perceptual disconnection, resulting from the adaptation of expectations in contexts of poverty and social exclusion. Both dimensions are mutually reinforcing. The structural scarcity of services reduces real mobility opportunities; subjective adaptation to that scarcity diminishes the intensity of

expressed demand; and this reduced demand may be interpreted by planners as an absence of need, thereby justifying further cuts or a lack of investment.

Consequently, public transport must be conceived as a strategic infrastructure for the sustainability of life and for gender equality. Its analysis requires moving beyond sectoral approaches and adopting an interdisciplinary perspective that integrates feminist economics, the capabilities approach, transport justice, and the theory of adaptive preferences. Within this framework, ensuring adequate levels of mobility in rural areas is not merely a matter of efficiency or territorial cohesion, but an indispensable condition for women to access employment, exercise the right to give and receive care, participate fully in society, and develop their life projects under conditions of freedom and well-being.

4. Data and methodology

4.1. Data

The primary empirical dataset for this analysis is original survey data produced by the research project "Infraestructuras para la Vida Cotidiana desde la Economía Feminista del Bienestar", funded by the Spanish Ministry of Science and Innovation. The project is coordinated from the University of Murcia and constitutes, to the authors' knowledge, the first nationally representative survey in Spain designed explicitly to measure access to and valuation of public infrastructure and services through a feminist political economy lens, with capability-based indicators as its normative architecture.

The survey was administered in February 2024 and combines an objective well-being module (access and importance of eight categories of public infrastructure), a subjective well-being and life satisfaction module, a capability-based impact battery, and a detailed individual sociodemographic background section. It is explicitly oriented toward the measurement of infrastructure-specific capabilities rather than household income and consumption. As far as public transport is concerned, it disaggregates transport access and importance from a broader battery of eight infrastructure categories, enabling simultaneous comparison across infrastructure types and identification of the relative salience of each for different population groups; and also incorporates a comprehensive care-economy module—including hours devoted to unpaid work, number and type of dependents, and time use by activity category—that is absent from general-purpose socioeconomic surveys.

The target population of the survey is the general population of both sexes aged 18 and above residing in Spain, including all territorial typologies from large metropolitan areas to small rural municipalities. The unit of observation is the individual respondent (rather than the household), a design choice that is consistent with the feminist political economy tradition's insistence on the intra-household disaggregation of welfare analysis (Folbre, 2001; Daly, 2011). Income, time-use, care responsibilities, and infrastructure valuations are collected at the individual level, enabling the disaggregation of outcomes that household-level surveys systematically obscure.

The questionnaire is structured into five substantive modules, each contributing specific variables to our analytical strategy. Modul A assesses access and importance of public infrastructures. Respondents rated each of eight categories of public infrastructure on two

separate eleven-point scales (1–10 plus an explicit "don't know/no answer" option). The first scale measures self-reported level of access: "Using a scale from 1 to 10, where 1 means access is completely non-existent and 10 means excellent availability, please rate your level of access to each of the following infrastructures and public services." The second scale measures importance: "Using a scale from 1 to 10, where 1 means the infrastructure is not at all important and 10 means it is very important for attending to your needs, please rate the importance of each infrastructure." The eight infrastructure categories are: nursery schools for children under 3; health centers and hospitals; centers for dependent persons; pavements, pedestrian streets, parks, public lighting, and green spaces; markets and shopping centers; public transport for local journeys and daily commuting; leisure and cultural/sports facilities; and industrial parks.

For the present analysis, two of the three key outcome variables are derived directly from Module A: access to public transport APT_{ij} , the respondent's self-reported access level on the 1–10 scale; and importance of public transport IPT_{ij} , the respondent's self-reported importance rating on the 1–10 scale. The distinction between these two outcome variables is theoretically central to the adaptive preferences analysis: APT measures what the respondent perceives to be available, while IPT measures how much they value it. The divergence between these two measures, and its systematic patterning by gender and socioeconomic vulnerability, constitutes the empirical operationalisation of the adaptive preferences mechanism. Access and importance of pavements, pedestrian streets, parks, public lighting, and green zones—is used as the access to basic urban infrastructure AUI_{ij} control variable in both models, following the theoretical argument that complementary public space infrastructure is a structural determinant of the usability of public transport.

Module B is focus on capability-based well-being. This module presents respondents with each of the eight infrastructure categories in turn and asks them to rate, on a 1–10 scale, how important each infrastructure has been (or is) for each of eight capability dimensions: physical and mental health; social relationships; education; domestic and care work; labour market participation; mobility; leisure and free time; and emotions.

Subjective well-being is covered in module C. This module collects three standard subjective well-being measures: satisfaction with nine life domains including transport (rated 1–10); agreement with four Satisfaction with Life Scale (SWLS) items (Diener et al., 1985), each rated 1–10; and global life satisfaction (1–10). These measures are used in the present analysis as contextual controls and as supplementary evidence on the relationship between transport provision and life satisfaction.

The last module, module D, is devoted to sociodemographic background. This comprehensive individual background module collects the following variables relevant to the present analysis: number of children and their ages; number of non-child dependents cared for; hours devoted daily to paid work, education, self-care and leisure, social life, commuting, and unpaid household and care work on a typical workday; province of employment; educational attainment, six categories from no schooling to university; civil status; residential location type, six categories from "city center" to "rural village" used to construct the $rural_{ij}$ binary indicator; individual net monthly income; religious self-identification; country of birth, used to construct the immigrant binary indicator; sexual orientation and disability or serious illness status.

The self-reported residential location type, which distinguishes categories such as “rural village” (*pueblo en zona rural*) and “hamlet/parish” (*pedanía, parroquia o Diputación*). These variables are combined to construct the binary indicator $rural_{ij}$ defined as residence in municipalities with 5,000 inhabitants or fewer or self-identification with rural village/hamlet environments. This operationalization has important methodological advantages because rurality is measured directly within the survey design rather than appended ex post from external administrative classifications. It captures respondents’ own experience of their residential environment, including perceived deficits in infrastructure and mobility provision that may not be reflected in purely statistical territorial definitions. It also allows for within-stratum comparisons across socio-demographic groups, such as differences by age or income among women living in rural areas.

By contrast, the AROPE indicator is not derived from the survey itself but incorporated separately from official statistics published by the Spanish National Statistics Institute (INE). Regional AROPE rates are included in the regression models as an external contextual variable capturing the broader socio-economic conditions of each Autonomous Community. Their role is to assess whether women living in rural areas within regions characterized by higher levels of poverty and social exclusion tend to perceive public transport as poorer or more important in their daily lives. Thus, while the rurality indicator reflects individual residential context measured directly in the survey, AROPE captures territorial socio-economic vulnerability at the regional level.

4.2. Methodology

Both dependent variables—self-reported access to public transport APT_{ij} and self-reported importance of public transport IPT_{ij} —are continuous ratings on 1–10 scales collected from individuals whose outcomes are shaped by a combination of individual characteristics and the structural features of the territorial and socioeconomic environment in which they live. This hierarchical data structure—individuals nested within habitat strata, which are themselves embedded in broader territorial contexts—motivates the use of linear mixed-effects models (also known as multilevel or hierarchical linear models) as the fundamental analytical strategy.

The mixed-effects framework is appropriate here for three reasons. First, it properly accounts for the non-independence of observations within the same habitat stratum: individuals living in rural areas share unobserved structural characteristics—service absence, car dependency, geographic isolation—that make their outcomes more similar to each other than to urban residents, violating the independence assumption of ordinary least squares regression and producing deflated standard errors. Second, it enables simultaneous estimation of fixed effects at the individual level (gender, care responsibilities, income, education, immigration status) and the contextual effects of habitat type, whose proper estimation requires a modelling framework that explicitly represents the nested structure of the data (Gelman and Hill, 2007). Third, and most important for the adaptive preferences analysis, it enables the specification and testing of cross-level interaction terms that are theoretically motivated by the intersectional framework and statistically estimable only within a multilevel specification.

In our first model the dependent variable is the access to public transportation by the respondent (APT_{ij}). Independent variables include individual characteristics such as age,

sex, level of income, educational attainment (basic (BE_{ij}) or higher education (HE_{ij})), immigrant status, and residential environment (rural or not). Contextual variables were also incorporated such as access to basic urban infrastructure (AUI_{ij}), the number of dependents in the household ($dependents_{ij}$), and the regional rate of poverty risk or social exclusion (AROPE). Finally, two interaction terms were included to account for the possibility of differences between urban and rural women and to capture disparities among vulnerable women: ($female_{ij} \cdot rural_{ij}$) and ($female_{ij} \cdot AROPE_j$). The estimated equation is as follows:

$$\begin{aligned} APT_{ij} = & \beta_0 + \beta_1 age_{ij} + \beta_2 female_{ij} + \beta_3 income_{ij} + \beta_4 dependents_{ij} + \beta_5 AUI_{ij} + \beta_6 BE_{ij} \\ & + \beta_7 HE_{ij} + \beta_8 rural_{ij} + \beta_9 immigrant_{ij} + \beta_{10} AROPE_j + \beta_{11} (female_{ij} \cdot rural_{ij}) \\ & + \beta_{12} (female_{ij} \cdot AROPE_j) + u_{0j} + \varepsilon_{ij} \end{aligned}$$

The stochastic structure of the model specifies that $u_{0j} \sim N(0, \sigma^2_u)$ represents the region-specific random intercept, capturing unobserved between-region heterogeneity in transport provision and planning quality that is not accounted for by the included predictors; and that $\varepsilon_{ij} \sim N(0, \sigma^2)$ represents the individual-level residual, assumed to be independent across individuals within regions after conditioning on the random intercept.

We know that access to public transport in Spain is positively influenced by other contextual infrastructures, but rural areas and communities with higher rates of poverty and social exclusion lack access to it. Now we want to know if the lack of public access is related to the importance that individuals give to public transport in their lives and if that importance is determined by the individuals themselves. To do this, two linear mixed-effects model with random intercepts at the regional level (autonomous community) were estimated, using survey data from the year 2024. This methodological approach adequately addresses the hierarchical structure of the data, in which individuals are nested within territorial units, allowing for the decomposition of variance at both the individual and regional levels. Consequently, the model captures both the fixed effects of explanatory variables and the random variability between regions.

The dependent variable is the importance attributed to public transportation by the respondent (IPT_{ij}). We include other individual covariates such as age, sex, number of children and dependents, educational attainment (basic (BE_{ij}) or higher education (HE_{ij})), immigrant status, and residential environment (rural or not). Contextual variables were also incorporated, including effective access to public transportation (APT_{ij}), access to basic urban infrastructure (AUI_{ij}), and the regional rate of poverty risk or social exclusion (AROPE). Finally, two interaction terms were included to account for the possibility of differences between urban and rural women and to capture disparities among vulnerable women (just in the second model): ($female_{ij} \cdot rural_{ij}$) and ($female_{ij} \cdot AROPE_j$).

Formally, the estimated model is expressed as:

$$IPT_{ij} = \beta_0 + \beta_1 age_{ij} + \beta_2 childrens_{ij} + \beta_3 female_{ij} + \beta_4 APT_{ij} + \beta_5 dependents_{ij} + \beta_6 AUI_{ij} + \beta_7 BE_{ij} + \beta_8 HE_{ij} + \beta_9 rural_{ij} + \beta_{10} immigrant_{ij} + \beta_{11} AROPE_j + \beta_{12} (female_{ij} \cdot rural_{ij}) + \beta_{13} (female_{ij} \cdot AROPE_j) + u_{0j} + \varepsilon_{ij} \quad (2)$$

where i denotes the individual and j the autonomous community. The term u_{0j} represents the random variation across regions, while ε_{jt} corresponds to the individual-level residual error.

The comparison between Specifications 2a and 2b is analytically important: the change in the coefficient on female when the interaction is introduced (β_3 increases from 2a to 2b) and the corresponding coefficient on AROPE (which loses significance in 2b) together indicate the degree to which the aggregate poverty effect is gender-mediated. Formally, the marginal effect of female gender on IPT at a given regional AROPE level is $\delta IPT / \delta female = \beta_3 + \beta_{13} \times AROPE_j$, which is positive and large at low AROPE values (predominantly urban, low-poverty regions) but reduced at high AROPE values (predominantly rural, high-poverty regions), approaching zero in the most extreme cases. This marginal-effects calculus is the formal expression of the dual disconnection.

5. Results

5.1. Descriptive analysis

	Daycare centers for children's under 3 years old	Health centers and Hospitals	Care facilities	Sidewalks, pedestrian streets, parks, streetlights and green spaces	Markets and shopping centers	Public transport	Recreational areas	Industrial parks
Total for all geographic areas	6,91	7,56	5,45	7,66	7,08	6,44	6,85	5,68
Total rural areas	7,16	7,22	5,35	7,44	5,98	5,10	6,25	5,32
Rural Men	7,01	7,19	5,46	7,36	6,05	4,98	6,42	5,58
Rural Women	7,31	7,26	5,22	7,52	5,90	5,23	6,08	5,04
Rural man - Rural woman	-0.3	-0.07	0.24	-0.16	0.15	-0.25	0.34	0.54

Table 1 reports the average evaluation of access to different infrastructures and public services among rural respondents. Public transport emerges as one of the most poorly rated services by both rural women and men, together with services for dependent persons and industrial parks. Although both groups report low levels of accessibility, men assign slightly lower scores to public transport access than women.

Table 1. Average satisfaction with access to public infrastructure and services.

Source: own elaboration

Importantly, when rural areas are compared with the overall population across all territorial contexts, a substantial territorial gap becomes evident. Rural respondents evaluate access to public transport more than one point below the national average, highlighting the structural disadvantages associated with rural mobility provision. These findings suggest that limited transport accessibility constitutes a persistent feature of rural territorial inequality and reinforces the idea that mobility deprivation is a central component of rural well-being disadvantage.

Table 2. Average importance of infrastructure and public services in daily life.

	Daycare centers for children's under 3 years old	Health centers and Hospitals	Care facilities	Sidewalks, pedestrian streets, parks, streetlights and green spaces	Markets and shopping centers	Public transport	Recreational areas	Industrial parks
Total for all geographic areas	7,66	9,15	7,37	8,65	7,87	8,18	8,08	6,13
Total rural areas	7,83	9,00	7,45	8,48	7,63	7,69	7,93	6,35
Rural Men	7,97	9,02	7,35	8,23	7,41	7,47	7,91	6,69
Rural Women	7,69	9,00	7,56	8,75	7,85	7,92	7,95	6,00
Rural man - Rural woman	0,28	0,02	-0,21	-0,52	-0,44	-0,45	-0,04	0,69

Source: own elaboration

Regarding the perceived importance of infrastructures and public services in everyday life, both rural women and men identify healthcare facilities as the most important service, followed by local public infrastructures such as sidewalks, parks, and public lighting. However, important gender differences emerge in relation to mobility-related needs. Rural women assign greater importance than men to pedestrian infrastructure and public transport, reflecting a stronger dependence on accessible daily mobility systems.

While public transport is considered less important in rural areas than in other territorial contexts overall, rural women still rate it as more important than rural men for their daily lives. This finding suggests that women's everyday activities and care-related mobility patterns generate a greater reliance on accessible transport services, even within environments characterised by structurally limited transport provision.

Table 4. Subjective well-being. Average level of satisfaction for each of the aspects listed

	Rural		Other geographic areas	
	Women	Men	Women	Men
Your physical and mental health	7,56	7,72	7,55	7,68
Your relationships with those close to you	8,58	8,41	8,60	8,27

Education received	8,77	8,41	8,61	8,37
The time spent on household and caregiving activities	7,65	7,54	7,28	7,24
Paid work	7,58	7,66	7,57	7,82
Your household's financial situation	7,01	7,19	7,09	7,32
Public Transportation	4,90	4,87	6,69	6,52
The free time one has	7,33	7,32	7,43	7,21
Through the development and expression of their emotions	7,79	7,47	7,63	7,35

Source: own elaboration

The analysis of subjective well-being differentiates between women and men in rural areas while also comparing them with respondents living in other territorial contexts. The results show that rural women report higher levels of satisfaction than urban women in dimensions such as education, domestic and care activities, and emotional development. However, urban women report greater satisfaction with interpersonal relationships, leisure time, and, most notably, public transport services.

Within rural areas, gender differences are also evident. Rural women report greater satisfaction than rural men regarding social relationships, education, and emotional expression, whereas men report higher satisfaction with their economic situation and physical health. Nevertheless, the most striking result concerns public transport. Across both rural and non-rural contexts, transport services receive the lowest satisfaction scores among all dimensions of subjective well-being evaluated. This deficit is particularly severe in rural areas, where average satisfaction with public transport falls below 5 points for both women and men, highlighting the central role of transport deprivation in shaping rural well-being inequalities.

Table 5. Subjective well-being. Average level of satisfaction for each of the aspects listed.

	Rural		Other geographic areas	
	Women	Men	Women	Men
In most respects, my life is close to my ideal	6,88	6,89	6,83	6,92
My living conditions are excellent	7,04	6,96	6,84	7,11
So far, I've achieved the important things I want in life	7,36	7,31	7,46	7,29
If I could live my life over again, I wouldn't change a thing	6,76	6,82	6,59	6,68

Source: own elaboration

Table 5 examines overall life satisfaction among rural and non-rural women and men. Rural women report slightly higher satisfaction than urban women when evaluating the quality of their living conditions, and women in both territorial contexts are more likely than men to feel that they have achieved the important goals in their lives. At the same time, however, women—particularly rural women—are also more likely than men to state that they would change aspects of their lives if they could start over, suggesting a more ambivalent evaluation of their overall life trajectories.

Average life satisfaction scores reveal only small territorial differences among women, with rural women reporting a slightly lower overall evaluation of life than urban women. By contrast, rural men report the highest levels of overall life satisfaction among all groups analysed, while urban men report the lowest. These findings suggest that subjective well-being in rural contexts is strongly gendered and may reflect different processes of adaptation to territorial conditions and everyday constraints.

The descriptive analysis reveals a consistent pattern of gendered and territorial inequalities in mobility and well-being across rural Spain. Public transport emerges as one of the lowest-rated dimensions of everyday life, particularly in rural areas and especially among women with caregiving responsibilities. At the same time, women systematically assign greater importance than men to mobility-related infrastructures and services, reflecting the central role that transport plays in accessing employment, care activities, healthcare, and social participation. These findings suggest that mobility deprivation is closely connected to broader inequalities in autonomy, daily opportunities, and quality of life.

Nevertheless, descriptive statistics alone cannot determine the extent to which these differences are explained by individual characteristics, territorial conditions, or the interaction between both dimensions. To explore these mechanisms in greater depth, the following section develops several multilevel regression models that examine the determinants of perceived access to public transport, the subjective importance attributed to transport, and transport-related well-being across Spanish regions. In addition to individual-level characteristics, the models incorporate contextual indicators such as regional AROPE rates in order to assess whether broader socioeconomic environments contribute to shaping mobility perceptions and transport inequalities across territories.

5.2. Causal analysis.

Understanding disparities in access to public infrastructure and the perceived value of public transportation requires an analytical framework that accounts for both individual-level characteristics and contextual differences across regions. To address this, two linear mixed-effects models were estimated. The first model examines the predictors of access to public transportation, which captures individual self-reported access to public infrastructure, including transportation-related amenities. The second model shifts focus to the importance that individuals assign to public transportation, allowing for an exploration of how perceived relevance may or may not align with actual access conditions. Both models include random intercepts at the regional level (Autonomous Communities), reflecting the assumption that unobserved heterogeneity at the meso-level influences the outcomes of interest.

This modeling strategy responds to a key challenge in the study of spatial and social inequality: the need to disentangle individual-level disadvantages from contextual or structural constraints. While individual variables such as gender, age, and income-related vulnerability (e.g., being at risk of poverty) are known to shape access to services and mobility opportunities (Lucas, 2012; Martens, 2016), these effects are often mediated by territorial context—particularly the urban–rural divide (Farrington and Farrington, 2005). Mixed-effects models are therefore appropriate as they allow for the simultaneous

estimation of fixed effects (e.g., gender, immigrant status) and random effects (regional clustering), improving both inference and generalizability (Gelman and Hill, 2007).

Moreover, by modeling both access and importance as dependent variables, this approach addresses a gap in transport and infrastructure research. Most existing studies emphasize access as a measurable spatial variable (Geurs and van Wee, 2004), often neglecting the ways in which individuals perceive, value, or deprioritize certain forms of infrastructure based on lived experience. Including personal importance explicitly—as done in the second model—responds to recent calls for more user-centered mobility research (Sheller, 2018; Pereira, Schwanen and Banister, 2017).

This model design also allows for the investigation of potential adaptive preferences (Sen, 1999; Nussbaum, 2007), particularly among marginalized groups. For example, individuals with limited exposure to quality public transport might underreport its importance, not because of a lack of need, but due to chronic unavailability or low expectations. Exploring the predictors of perceived importance in tandem with actual access can therefore reveal whether low valuations are a reflection of real preferences or the result of infrastructural exclusion.

Taken together, the models offer a richer, multidimensional understanding of transport inequality, highlighting not only who has access, but also how that access is socially constructed and interpreted.

Table 6. Estimated linear Mixed-effects models for equation (1). Year: 2024.

	APT_{ij}
β_0	5.251*** (0.828)
age_{ij}	0.003 (0.004)
$female_{ij}$	-0.455 (0.528)
$income_{ij}$	0.011 (0.032)
$dependents_{ij}$	0.077* (0.042)
AUI_{ij}	0.437*** (0.030)
BE_{ij}	0.088 (0.204)
HE_{ij}	-0.069 (0.153)
$rural_{ij}$	-1.831*** (0.200)
$inmigrant_{ij}$	-0.704*** (0.220)
$AROPE_j$	-0.055** (0.026)
$female_{ij} \cdot rural_{ij}$	0.082 (0.273)
$(female_{ij} \cdot AROPE_j)$	0.016 (0.019)

***, **, * significance at 1%, 5% and 10% respectively

Source: own elaboration

Random effects reveal moderate between-group variance, with most of the variability residing at the individual level. The scaled residuals show a symmetric distribution, with no signs of problematic outliers, suggesting a reasonably well-behaved model.

Among the fixed effects, the most robust and statistically significant predictor is AUI_{ij} which refers to access to pedestrian streets, public lighting, and parks. Its high positive coefficient suggests that this form of urban infrastructure remains a key driver of broader access, even when controlling for other sociodemographic and contextual variables.

Living in rural areas continues to exert a strong and significant negative effect on access, reaffirming the territorial inequalities identified in the previous model. Similarly, being an immigrant or being at risk of poverty is associated with significantly lower levels of access. These findings point to persistent structural disadvantages linked to both geographic and socio-economic conditions.

In contrast, individual characteristics such as age, gender, and educational attainment do not show significant associations with access in this model. Additionally, interaction terms—such as being a woman in a rural area—do not produce meaningful moderating effects, suggesting that the main effects of rurality and poverty apply similarly across gender lines.

Table 7. Estimated linear Mixed-effects models for equation (2). Year: 2024.

	IPT_{ij} (1)	IPT_{ij} (2)
β_0	6.928 (0.496)	6.477 (0.542)
age_{ij}	-0.006 (0.004)	-0.006 (0.004)
$childrens_{ij}$	-0.031 (0.140)	-0.029 (0.140)
$female_{ij}$	0.659 (0.156)	1.624 (0.475)
APT_{ij}	0.236 (0.023)	0.237 (0.023)
$dependents_{ij}$	0.085 (0.037)	0.083 (0.037)
AUI_{ij}	0.003 (0.029)	-0.0002 (0.029)
BE_{ij}	0.144 (0.177)	0.153 (0.177)
HE_{ij}	-0.052 (0.135)	-0.051 (0.135)
$rural_{ij}$	-0.079 (0.189)	-0.104 (0.183)
$immigrant_{ij}$	-0.063 (0.199)	-0.062 (0.199)

$AROPE_j$	-0.021 (0.011)	-0.002 (0.014)
$(female_{ij} \cdot rural_{ij})$	-0.306 (0.244)	-0.249 (0.245)
$(female_{ij} \cdot AROPE_j)$	-	-0.036 (0.017)
***, **, * significance at 1%, 5% and 10% respectively		

Source: own elaboration

The model results reveal, among the fixed effects, that the variable female stands out with a positive and significant coefficient (1.62), indicating that, on average, women assign greater importance to public transportation than men. This result is consistent with the literature that points to a higher female dependence on collective transport for everyday mobility. Likewise, effective access to public transportation shows a very strong relationship with the valuation of its importance, reinforcing the hypothesis that availability decisively influences perceived utility. The number of dependents in the household also shows a positive and significant effect, which may reflect greater functional need among those with caregiving responsibilities.

The comparison between these two models—one including AROPE as a main effect only and the other incorporating the interaction between female and AROPE—reveals important differences that reinforce the intersectional nature of the findings. In the model without interaction, the coefficient for AROPE is negative and marginally significant (−0.021), while the effect of being female is positive but more moderate (0.66). However, when the interaction between female and AROPE is included, the direct effect of AROPE becomes non-significant, and the coefficient for female increases substantially to 1.62. Crucially, the negative and statistically significant interaction term (−0.036) indicates that the positive effect of being female on the importance attributed to public transport diminishes in contexts of poverty and social exclusion. This shift suggests that the impact of poverty is conditional on gender, highlighting that gender disparities in the valuation of public transportation are not uniform but shaped by socioeconomic vulnerability. These results underscore the need to analyze transport inequalities through an intersectional lens, as main effects alone obscure nuanced patterns of disadvantage.

This result aligns with a theoretical approach that combines gender and social exclusion as mutually constitutive dimensions. As Hanson (2010) and Church, Frost, and Sullivan (2000) point out, mobility inequalities cannot be explained solely from a gender perspective but must be understood in conjunction with other forms of structural disadvantage. In this case, the fact that the positive effect of being female is reduced in poverty contexts can be interpreted as a relative loss of agency: women in exclusionary situations have fewer resources, time, and options to exercise their mobility, which may reduce both their use and their valuation of public transport.

Moreover, these women may be forced to use less safe or more precarious means of transport or may not perceive public transport as a functional or dignified resource, even when they depend on it. As Lucas (2012) argues, transport loses its perceived value if it does not meet people's real needs, whether due to lack of connection, insecurity, or cost. Therefore, the observed negative effect does not necessarily imply a lower need for transport but rather a disconnect between supply and expectation.

The results from both models point out the role of geography as a structural determinant of access to public infrastructure. Living in rural areas is consistently associated with lower levels of access, confirming previous literature that emphasizes the persistent infrastructural deficits faced by non-urban populations. However, the models also suggest that individual perceptions and valuations of infrastructure, particularly public transport, are shaped not only by demographic factors such as gender, but also by the intersection with socioeconomic vulnerability.

Specifically, women tend to assign greater importance to public transportation, a finding consistent with gendered mobility patterns and caregiving roles that often increase reliance on collective modes of transport. However, women who are simultaneously at risk of poverty or social exclusion (AROE) appear to value public transport less, despite being among the groups most likely to benefit from it. This paradox points to a "perceptual disconnection": a misalignment between actual needs and expressed importance, likely driven by prolonged exposure to poor or absent services, which in turn lowers expectations and internalizes infrastructural marginality.

In parallel, the statistical insignificance of the interaction term may reflect a second layer of exclusion. Rather than indicating parity in access, the lack of differential effect suggests a "territorial disconnection", in which rural women are embedded in contexts so uniformly underserved that gender-specific dynamics are muted by the broader spatial deprivation. When both disconnections overlap—as in the case of rural women living in high-AROE regions—the compounded vulnerability becomes particularly severe.

In economically vulnerable contexts, the perception of public transport is predominantly instrumental: households prioritise economic accessibility (low cost in time and money) and spatial accessibility (service frequency, coverage, and distance), while symbolic attributes such as comfort become secondary. This phenomenon—commonly referred to as transport poverty—often forces low-income rural households to maintain a private vehicle as the only viable mobility option, thereby increasing their financial burden in a process known as “forced car ownership” (Curl, Clark, and Kearns, 2018). GPS-based studies in rural peripheries of Czechia and Germany demonstrate that the mobility of socially disadvantaged groups is strongly dependent on car access and social networks, illustrating how deficient public transport services exacerbate inequalities in access to opportunities and social participation (van Dülmen, Simon and Klärner, 2022).

In Sweden, rural households display a higher dependency on private cars, being less likely to reduce their car holdings and more likely to increase them compared to urban households (Pyddoke and Creutzer, 2014). At the European Union level, transport poverty is defined as the combined lack of availability, accessibility, affordability, and adequacy of transport, all of which constrain essential activities and intensify social exclusion in rural areas (Mejía Dorantes and Murauskaite-Bull, 2022). In Ireland, research has identified “hotspots” of mobility disadvantage and car dependency in rural territories, enabling the design of targeted interventions adapted to local contexts (Carroll, Benevenuto and Cauldfield, 2021). These findings suggest that the seemingly lower importance attributed to public transport among economically disadvantaged groups does not stem from disinterest, but from the complex interplay of economic, geographical, and structural constraints.

These findings emphasize the need to focus specifically on rural women in economically vulnerable regions, who may be doubly disconnected: perceptually, by not expecting or demanding infrastructure they do not believe will be provided; and territorially, by living in areas where structural underinvestment renders access universally low. Addressing transport inequality therefore requires policies that not only expand infrastructure, but also rebuild trust and perceived relevance among those who have long been excluded from planning priorities.

5. Discussion

Rural women in Spain are doubly disconnected from public transport: first, territorially, through the objective absence or inadequacy of services in rural areas and second, perceptually, through the attenuation of their expressed valuation of transport in high-poverty contexts. These two disconnections are not independent: the perceptual disconnection is causally downstream of the territorial one—it is precisely because rural women have experienced chronic service absence or inadequacy that their preferences adapt to deprivation, lowering their expressed demand and thereby undermining the demand-responsive logic of conventional transport planning. The two disconnections thus form a vicious circle: territorial deprivation produces perceptual adaptation, which reduces expressed demand, which is used to justify continued under-investment, which perpetuates territorial deprivation.

This vicious circle has a specific gendered structure that makes it particularly difficult to interrupt through conventional policy instruments. Because women's expressed demand for public transport is lower in high-poverty regions demand-responsive planning will systematically under-serve them relative to their objective needs. The conventional response to low demand (service reduction or elimination) deepens the territorial disconnection and accelerates the perceptual one. Escaping this vicious circle requires a fundamental shift in the normative basis of transport planning: from demand-responsiveness (allocating resources where expressed preferences are highest) to capabilities-based needs assessment (allocating resources where objective needs are greatest, irrespective of expressed preferences). This shift is not merely a technical adjustment but a political one, because it requires overriding the market logic embedded in most transport funding formulas and asserting instead a justice principle that prioritises the most excluded over the most vocal.

The most fundamental policy implication of this research is the need to reorient the normative basis of transport planning from demand-responsiveness to a capabilities-based framework that identifies and serves objective needs irrespective of expressed preferences. In practical terms, this implies the adoption of minimum mobility standards—guaranteed service levels, regardless of demand volumes—for rural areas, analogous to the universal service obligations that exist in telecommunications and postal services. Such standards would specify minimum service frequency (e.g., at least one daily connection to a service center, defined as a municipality with health, education, and administrative services), maximum waiting times, maximum walking distance to stops, and maximum fare as a proportion of local median income.

The formulation and enforcement of minimum mobility standards requires a governance actor with cross-jurisdictional authority and access to need-based (rather than demand-

based) data. In Spain's current intergovernmental structure, this points toward a strengthened role for Autonomous Communities in defining regional minimum standards and for the national government in funding their implementation through an equalization mechanism that compensates regions with larger rural populations and higher AROPE rates—regions that face higher costs of meeting minimum standards with lower fiscal capacity.

Service design must move beyond the radial-commuting paradigm to incorporate care-oriented mobility needs. This requires, at minimum: disaggregated mobility data collected and published at the municipal level, by sex and age, to make care-oriented flows visible to planners; gender impact assessments as a standard component of transport project appraisal; and participatory design processes that actively include rural women—particularly older women and those with intensive care responsibilities—as epistemic authorities on their own mobility needs. Peters (2013) has demonstrated that transport systems designed with active female participation are more efficient for the full population, not only for women, because women's complex trip chains surface planning problems that simpler commuting-oriented models miss.

Affordability is a precondition for access: transport that exists but is unaffordable provides a resource without enabling a capability. For the high-AROE regions identified in our analysis—including Murcia, Andalusia, Extremadura, and the Canary Islands—fare subsidies specifically targeted at low-income rural residents are warranted. The design of such subsidies matters: means-tested subsidies based on household income (rather than uniform fare reductions) are more distributionally effective; automatic enrolment based on AROPE indicators avoids the information and bureaucratic barriers that prevent the most excluded from accessing means-tested programmes.

Safety along the transport chain—from home to stop, at the stop, on the vehicle, and from the destination stop to the final destination—is a dimension of transport adequacy that disproportionately affects women (Sheller, 2018). Infrastructure investments in lighting, shelter, and accessible pathways at rural bus stops represent low-cost, high-impact interventions that can substantially increase the perceived and actual safety of public transport use. These investments should be coordinated with local authorities and evaluated through user satisfaction surveys disaggregated by sex and age.

Finally, the adaptive preferences finding points to the need to actively rebuild institutional trust among communities that have experienced chronic under-provision. This is not a communications challenge but a substantive one: trust is rebuilt through consistent, reliable delivery of improved services, through transparent accountability mechanisms, and through demonstrated responsiveness to community feedback. The most effective way to change expressed preferences is to change the objective reality that underlies them—a point that reinforces the primacy of genuine service improvement over engagement strategies that do not alter material conditions.

6. Conclusions

This study has developed a theoretically integrated and empirically grounded analysis of gender inequalities in public transport access and valuation in Spain, focusing on the compounded vulnerabilities of rural women in high-poverty contexts. By bridging

transport geography, feminist economics, and the capabilities approach, the paper challenges conventional, market-driven planning paradigms. The core analytical contribution resides in the identification and empirical demonstration of a dual disconnection—both territorial and perceptual—that operates through distinct yet interrelated mechanisms to systematically marginalize rural women from transport provision and from the planning processes that might remedy it.

The empirical findings provide robust support for this dual framework. Regarding the territorial disconnection, the analysis demonstrates that rural residence is the dominant predictor of reduced transport access. The magnitude of this structural disadvantage is nearly four times that of immigrant status and substantially larger than regional poverty effects. Crucially, the non-significance of gender-by-rurality and gender-by-poverty interaction terms indicates that territorial deprivation operates uniformly across gender lines. This baseline structural deprivation is so acute that it absorbs gender-specific variations in objective access, underscoring transport poverty as an endemic geographic reality. Conversely, the subjective valuation of transport reveals a highly gendered landscape that exposes the perceptual disconnection. Women attribute significantly more importance to public transport than men. However, this positive gender effect is attenuated in the regional AROPE (At Risk of Poverty or Social Exclusion) rate. This negative interaction provides empirical confirmation of adaptive preferences. In regions characterized by prolonged underinvestment and systemic poverty, expectations are lowered to match a restricted horizon of possibilities.

A lack of expressed demand among vulnerable rural women does not signify an absence of need; rather, it reflects a psychological coping mechanism where individuals adjust their desires to what is perceived as achievable.

These findings demand a paradigm shift in regional development and infrastructural planning. If public transport policy remains tethered to models of revealed demand, historically underserved territories will remain trapped in a vicious cycle: poor service drives low ridership, which planners then misinterpret as a lack of necessity. To break this inertia, transport must be reconceived not as a commercial service to be rationed by market demand, but as a fundamental infrastructure for social reproduction and the care economy. To operationalize these insights, we propose several concrete policy interventions. First, planning authorities must transition from demand-responsive metrics to a capabilities-based framework that identifies and serves objective human needs, ensuring that suppressed preferences do not dictate infrastructural exclusion. Second, governments should establish minimum mobility standards that implement legally binding baseline guarantees for rural areas, enforced through intergovernmental fiscal equalization mechanisms to safeguard spatial justice. Third, service design must become gender-responsive and participatory, integrating care-oriented mobility—such as trip-chaining and the accompaniment of dependents—into transit schedules and route planning to make the daily travel patterns of women visible to planners. Fourth, regional authorities should deploy targeted affordability interventions, including subsidies and fare-abolition schemes in high-AROE regions, to alleviate the compounding effects of economic and transport poverty. Finally, gender-equity and care-mobility criteria must be integrated directly into the application and evaluation procedures of European cohesion and structural funds.

While this study establishes a critical link between transport justice and adaptive preferences, several limitations offer fertile ground for future inquiry. First, the cross-sectional nature of the survey data precludes causal identification or longitudinal tracking of how preferences evolve in response to infrastructural changes. Future research utilizing panel data or quasi-experimental designs—such as exploiting regional variations in transport investment—would significantly strengthen causal inference. Second, the reliance on self-reported data introduces inherent response biases, which may themselves be contaminated by adaptive preferences. Validating these subjective indicators against objective behavioral data, such as GPS tracking or spatial GIS mapping of actual transit networks, represents a necessary next step. Finally, mixed-methods research is needed to provide a richer, more nuanced account of these dynamics. Combining quantitative econometric modeling with qualitative methodologies—such as semi-structured interviews, ethnographic observation of rural women’s daily commutes, and participatory action research—would illuminate the precise mechanisms through which structural inequalities are reproduced, negotiated, and resisted in everyday life. Ultimately, understanding these dynamics is essential for transforming public transport into a vehicle for substantive citizenship and gender equity.

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